UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

GEORGIA STATE CONFERENCE OF THE NAACP, et al.

Plaintiffs,

vs.

STATE OF GEORGIA, et al,

Defendants.

Case No. 1:21-CV-5338
ELB-SCG-SDG

STATE OF GEORGIA, et al.,

Plaintiffs,

vs.

BRAD RAFFENSPERGER,

Defendant.

Case No. 1:22-CV-00090
ELB-SCJ-SDG

Deposition of Moon Duchin, PhD
(Signature is reserved.)
February 27, 2023
1:07 p.m.

Remote via Zoom technology

Reported by: Carla J. Hopson, RPR, CCR-1816

I N D E X

EXHIBITS (For the Defendants)		Page
Exhibit 1	Report of Dr. Duchin	20
Exhibit 2	Rebuttal report	26
Exhibit 3	2020 Census Population	168
Exhibit 4	CV	240
Exhibit 5	Math of Social Choice	244
Exhibit 6	2019 Papers and Links	252
Exhibit 7	The Realist's Guide to Redistricting	253
Exhibit 8	Amicus Brief	255

1 E X A M I N A T I O N S
2 WITNESS: Moon Duchin, PhD Page
3 Examination
4 (By Mr. Tyson) 8
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
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APPEARANCES OF COUNSEL:

JACOB CANTER, ESQUIRE
CRINESH BERRY, ESQUIRE
Crowell & Moring
Email: jcanter@crowell.com
Email: cberry@crowell.com
EZRA ROSENBERG, ESQUIRE
Lawyers Committee For Civil Rights Under Law
Email: erosenberg@lawyerscommittee.org
MIKE JONES, ESQUIRE
Elias Law Group
Email: mjones@elias.law
JACK GENBERG, ESQUIRE
Southern Poverty Law Center
Email: jack.genberg@splcenter.org
JOE ZABEL, ESQUIRE
WilmerHale, LLP
Email: joe.zabel@wilmerhale.com
NATHAN JAMIESON, ESQUIRE
NEIL A. STEINER, ESQUIRE
VINCE MONTOYA-ARMANIOS, ESQUIRE
Dechert, LLP
Email: nathan.jamieson@dechert.com
Email: neil.steiner@dechert.com
Email: vince.montoya-armanios@dechert.com
BRYAN TYSON, ESQUIRE
Taylor English Duma, LLP
Email: btyson@taylorenglish.com

Also Present:

PATRICK HANSON

* * * * * *

THE VIDEOGRAPHER: Good morning or good afternoon. We're going on the record at 1:07 p.m., 2 -- February 27th, 2023.

Please note that this deposition is being conducted virtually. Quality recording depends on the quality of the camera and internet connection of participants.

What is seen from this witness and heard on the screen is what will be recorded. Audio and video recording will continue to take place unless all parties agree to go off the record.

This is media unit one of the video recorded deposition of Moon Duchin, PhD, taken by counsel for the defendant in the matter of Georgia State Conference of NAACP, et al., versus the State of Georgia, and -- or I guess Case Number 1:21-CV-5338 ELB-SCJ-SDG, also Common Cause, et al. versus Brad Raffensperger, Case Number 1:22-CV-00090.

This deposition is being conducted remotely using virtual technology. My name is Scott Bridwell representing Veritext Legal Solutions. I am your videographer.

The court reporter today is Carla Hopson

from the firm Veritext Legal solutions. I'm not authorized to administer an oath. I'm not related to any party in this action norm am I financially interested in the outcome.

If there are any objections to proceeding, please state them at the time of your appearance.

If counsel and all present, including remotely, will now state their appearance and affiliations for the record beginning with noticing attorney.

MR. TYSON: Good afternoon to everyone. Good morning, Dr. Duchin, where you are. I'm Bryan Tyson on behalf of the defendants in both the NAACP case and the Common Cause case.

MR. CANTER: This is Jacob Canter from Crowell & Moring representing plaintiffs the Georgia State Conference case. I'll be making objections for the plaintiffs in the Georgia State Conference Case.

However, any objections that I make should be reflective as an objection made by both plaintiffs in the Georgia State Conference case and the Common Cause case and vice versa.

MR. ROSENBERG: Hello, good morning and

1 good afternoon. Ezra Rosenberg from Lawyers
2 Committee for Civil Rights Under Law also
3 representing the plaintiffs in the Georgia
4 NAACP case. Thank you.
5 MS. BERRY: Crinesh Berry with Crowell &
6 Moring also representing the plaintiffs in the
7 Georgia NAACP case.
8 MR. GENBERG: Jack Genberg representing
9 the Common Cause plaintiffs from the Southern
10 Poverty Law Center, also with Patrick Hanson,
11 who is a legal extern at the Southern Poverty
12 Law Center.
13 MR. JONES: Mike Jones with the Elias
14 Law Group representing the plaintiffs in the
15 Pendergrass and Greg cases.
16 MR. ZABEL: Joe Zabel. I'm at the law
17 firm of WilmerHale. I represent to Alpha Phi
18 Alpha plaintiffs in the related case.
19 THE VIDEOGRAPHER: I believe that's it.
20 MR. TYSON: Also -- sorry. There are
21 also attorneys from Dechert, LLP, who are
22 representing the Common Clause plaintiffs,
23 Neil Steiner, Nathan Jameson and Vincent
24 Montoya.
25 THE VIDEOGRAPHER: If that is it, Madam

Court Reporter, will you please swear in the witness?

THEREUPON,

MOON DUCHIN, PhD,

having been first duly sworn, was examined and testified upon her oath as follows:

EXAMINATION

Q (By Mr. Tyson) All right. Well, good afternoon from the eastern time zone. Good morning to you, Dr. Duchin. My name is Bryan Tyson. I know we met before. It's good to see you again.

We'll be working through your deposition today, and I wanted to -- basically the goal, which I -- I always like to kind of go over our ground rules just so we're all clear on that.

We are virtual as is indicated here. I know you're -- you've taught a lot of classes via Zoom. But just for the court reporter's sake it's best that we don't talk over each other.

It's hard in the same room. It's really hard over Zoom. So as much as we can, I'll finish my question and then let you answer. At -- your counsel, as we've kind of indicated during the initial pieces, may object at different points during this deposition.

Unless they struck you not to answer, you should go ahead and answer the question to the answer best of your ability if you understand it. And if you provide an answer to a question, I'll assume that you understood the way that I asked you.

Does that work for you?

A Yes.

Q Okay. So Jacob and Neil and Ezra have been with me in plenty of depositions and know that there are times when I get to the question mark and no one has any idea what I'm asking. If that happens, just me know that and I'll rephrase my question, I'll take another run at it.

Also, again, our goal today is just to really -- primarily work through your reports in the case and understand where you're coming from, what your expert opinions are here.

I expect this to be a little bit -- I'm going to take some time. So if you need a break at any point, just let me know. We can take as many breaks as you need. My only request is that you don't take a break until after you've answered a question and there's not a question pending when went take a break.

So will that work for you?

A It will. And I'd like to just ask in advance, if it's possible, to plan ahead for a 15-minute break at 9 my time, which is 3 p.m. your time because I need to say "hello" to the folks at a training session for my lab.

Q Oh, certainly. Yes, we can work around that. Not an issue at all.

A Okay. Thanks so much.

Q We'll probably take break or two before then anyway. But we'll see.

All right. So what I'm going to do is just kind of briefly go over background, then try to jump into your involvement with the case, and then get into the meat of your report.

So let me begin with just having you state your full name for the record, please?

A Moon Duchin.

Q And Dr. Duchin, what is the city and state where you primarily reside. I don't need an address, just a city and state.

A I live in Cambridge, Massachusetts.

Q Okay. I have to ask everybody this question. Are you on any medication or have any medical condition that would keep you from fully and truthfully participating today?

A I'm not on any medication and no condition.

Q All right. So let's -- also since we're virtual, is there anybody else in the room with you or are you there by yourself?

A I'm alone in the room.

Q Okay. And you don't have any sort of devices in front of you that can provide instant messages or other information to you while you're talking; right?

A Only this laptop.

Q Okay. That works.

So let's talk a little bit about getting read for your deposition today. Have you talked -- well, before we do that, have you talked about your deposition today with anybody besides counsel?

A Not substantively, only that I have one.

Q Yes. And so in terms of getting ready for your deposition today, what did you do to get ready?

A We did two preparation sessions.

Q And when you say "we," you're referring to you and the attorneys in the case?

A That's exactly right.

MR. CANTER: And I'll just briefly say

please don't -- I'll try to object if it comes up, but please don't answer any questions that reveal any substance that might be privileged, not that -- I'll leave it there.

Q (By Mr. Tyson) Definitely. And I'll be fair. I'm not asking for anything the attorneys said to you at all, just that you met with them. Did you review any documents to get ready for your deposition today?

A Yes.

Q And what were those documents?

A Those were my initial report and my rebuttal report and two reports from John Morgan.

Q Any other documents besides those reports from you and Mr. Morgan?

A No.

Q So, again, without getting into what an attorney might have told you, how did you first hear about these cases involving the Georgia redistricting plans?

A How did I first hear about these cases? I think I was aware of them on -- you know, as a general matter. But I was contacted to -- to be retained as an expert some months ago.

Q Okay. And who contacted you to retain

you as an expert?
A I believe that would be Ezra Rosenberg.
Q Okay. And do you recall approximately when you were retained as an expert in these cases?
A I don't recall when I was retained, but I would say that work started in roughly October.
Q October? That would be October of 2022?
A That's correct.
Q Now, you've served as an expert witness, I know on your CV, in other cases. This isn't your first time. What do you see as the role of an expert witness in a case like this? I'm asking just for your personal opinion, not for the legal definition of what involves.
A I think the role is to take my scholarly expertise and bring it to bear to help understand some of the facts of the case. Yeah, generally I would say that's -- that's the role.
Q Do you think an expert in a case like this should be objective in their presentation to the court?
A Absolutely.
Q Now, we're going to get into some of the background just stuff in a little bit but. I just wanted to check. Have you ever served as an expert

1 witness and opined that a map was drawn primarily
2 based on race?
3 A I'm not sure of the term "primarily" but
4 I have opined that there's evidence of the
5 predominance of race over other principles.
6 Q And those were in other states besides
7 Georgia, right?
8 A In other states besides Georgia,
9 correct.
10 Q And you've served as an expert witness
11 on Gingles Prong 1 in other Section 2 case; is that
12 correct?
13 A Yes.
14 Q And in terms of your work on this case,
15 you're being compensated at $400 an hour; is that
16 right?
17 A That is right.
18 Q And is that the same rate for both
19 testifying and non-testifying work?
20 A Yes.
21 Q Do you recall approximately -- well, let
22 me ask you this. Have you been paid so far for your
23 work in this case?
24 A Yes, I have.
25 Q And do you recall approximately how much

you've billed in this case so far?
A I really couldn't say, but there's been quite a lot of work. So it's been substantial. I really couldn't say how much.
Q Okay. To what entity do you send your bills?
A I have an LLC called The Redistricting Lab, LLC, formed in Massachusetts as a d/b/a.
Q And do those invoices from the Redistricting Lab go to Mr. Canter's law firm or Mr. Rosenberg's law firm?
A I've been sending them to Mr. Canter's law firm who I think coordinates with other -- but you've had to ask him for detail.
Q Okay. Do you have a -- is $400 an hour your regular hourly rate for expert work?
A I have sometimes -- in cases that I signed onto longer ago, there's some where I was charging $300 an hour. But recently I've been using the $400 rate.
Q Understood. But you're not giving the plaintiffs a discount off the normal rate in this case; right?
A No. No, I'm not.
Q So in terms of getting through your

report and working on your report, did the plaintiff's counsel provide you with any facts or data that you didn't list in your report that was part of the consideration of forming your opinions in your reports?

A No, I've tried to be comprehensive in listing the materials I was provided with. It's possible that in the course of discussing them we'll come to something else that I didn't think to include. But I've tried to be comprehensive.

Q Okay. And did the plaintiff's counsel tell you to assume anything that you relied on when you were forming your opinions in this case?

A No, I don't think so.

Q And I know you're currently in New Zealand, right?

A I am, yes.

Q And you haven't spoken to anybody, I'm assuming, about -- with any of the plaintiffs' deposition and what the plaintiffs said in their depositions; is that right?

A I don't know anything about what the plaintiffs said in their depositions, although I'm sort of generally aware that there were some.

Q And I wanted to ask you. One of the

pieces of data we received was a group of plans called the Unity Plans. Do you remember those plans?

A Yes.

Q And I didn't find them in your report anywhere. Is there a reason why they were included in the data but not in your report?

A Yes. Well, I tried to be extremely comprehensive in turning over everything that was in my relevant folders. I downloaded the Unity Plans from the internet and thought I might discuss them.

And so for some of the analytics that I ran they were included because the -- the computer scripts points at everything that's been downloaded. But I ended up deciding that they weren't useful for me to discuss in the report.

Q And you said you decided they weren't useful to discuss in the report. What do you mean by that?

A Well, it's my understanding that they don't have any legal status connected to the case.

Q Thank you.

So in terms of map drawing, are the maps that are contained in your expert reports that we're going to be talking about today the only maps that

you drew in Georgia after the 2020 census?
A No, I would you say that over the course of working on this case I've drawn probably hundreds of maps in Georgia.
Q Apart from your work in this case, have you drawn any maps for any jurisdiction in Georgia since the 2020 census?
A Not apart from this case.
Q And I did want to understand a little bit about your map drawing process. Did you personally draw all the maps that are included in your reports in this case?
A Yes, but I can explain more about what that looks like.
Q Okay. Well -- and maybe I -- I know that the second report has some analysis pieces that are -- we can kind of categorize differently. So let's start with that in the first report.
For the alternate plans that you provided for Congress, House and Senate, can you describe generally the process by which those maps were drawn?
A Yes. Absolutely. And this consonant with my work in other cases. I -- I use a method I call computational redistricting, which is the same

method that produced the ensembles in my rebuttal report.

And what I like to do is use what I call chain runs or algorithmic generation in an exploratory fashion before I draw maps for inclusion.

So I might explore with various kinds of algorithmic alternatives and get a sense of what's possible in different parts of the state before I ultimately draw it by hand.

So that's the process. The process is algorithmic exploration to get a sense of responsibilities and then ultimately hand drawn maps.

Q And what software program do you use to hand draw the maps?

A So in -- in general I'm a very python-based person, and so I typically handle maps in -- using python and various python packages. So there are spatial data packages that help you manipulate maps as block assignments and understand their properties.

So I -- for instance, GeoPandas and -- I could list a few other python packages. And then sometimes software -- my lab has developed a package

1 called Districtor which can be used to see what a
2 map looks like and sometimes other end packages to
3 take a look at different aspects of a map such as
4 GIS packages.
5 Q I understand the distinction between
6 your python packages versus GIS packages. But in
7 terms of the GIS products you've used, do you ever
8 use Maptitude for redistricting?
9 A I think I -- I did go to a map -- I ran
10 a Maptitude training in 2017 and haven't used it
11 since.
12 Q And do you use any of the Esri
13 redistricting products that are available?
14 A No.
15 Q All right. So just -- let's do this.
16 I've marked as Exhibit 1 your report in Exhibit
17 Share, so I'm going to start working through some of
18 the pieces of that.
19 But I'll just first ask, is Exhibit 1
20 the report that you've submitted in this case?
21 A Yes.
22 Q And I know we have lot of maps to look
23 at today, but by my count we had alternative
24 Congressional map; is that right?
25 A That's right.

Q And then three alternative Senate maps in kind of various configurations with the different groupings; right?

A That's not exactly how I describe it. I would say that because of what I call the modular design, which I'm sure we'll talk about shortly, there are many alternatives. What's called Alt Effective 1 collects all the number one alternatives and extends them statewide.

What's called Alt Effective 2 collects all the number two alternatives and extends them statewide. And then Alt 3 is drawn for the whole state.

Q Okay. Thank you. And we're definitely going to get there. So that's -- so those three plans, then, Alt 1, Atl 2, Alt 3 with those different integrations you discussed that could be broken out, and then also three alternative House maps, Alt Eff 1, 2 and 3; right?

A Yes, similarly constructed.

Q And prior to this case, had you ever drawn a statewide legislative plan for Georgia?

A No.

Q And I know you referenced --well, we'll look at that as we go through things. Let me -- let

me move to some terminology because I know there's a lot -- a lot of terms in redistricting and I want to make sure I get your definition down for all of those.

So what would be your definition of a -- of a majority black district?

A Well, I would probably try to specify a little but more, and so I might call it majority black by voting age population or majority BVAP if I'm trying to be precise, so BVAP or black voting age population.

To say that a district is majority BVAP means that of the voting age population more than half if designated by people -- contains people who designate themselves as black in their census response.

Q And I know we use the term majority minority. What is the definition of a majority minority restricting?

A It depends on the minority group that's been specified. But once you've specified a minority group and a basis for population, a kind of universe of population, then a majority minority district is where more than half of the -- that kind of population is made up of people from that group.

Q Okay. But in any case, I'm assuming a majority minority district would not refer to a district where the people who designate themselves as non-Hispanic white are more than half the population; is that right?

A Right, according to whichever population basis you specify.

Q And do you ever used the term a minority opportunity district?

A It's possible I used that term in the report.

Q Okay. What would you mean if you're using the term minority opportunity district?

A Well, opportunity to elect is a bit of a terms of art in this area. But generally it refers to a district where you've shown what the district can be effective for that minority group to elect candidates of their choice.

Q And you use the term coalition district in your report in places, too. What is your definition of a coalition district?

A Well, for the purposes of this case, some of the claims of plaintiffs are based on a coalition of black and Latino voters in Georgia. And so when I say coalition in the context of this

report it refers to black and Latino resident.
Q And I know we defined -- we're going to get into effective district along the way. And I think you mentioned effectiveness earlier. But generally speaking, if you're talking about an effective district, what would that involve?
A Okay. So as you say, there's a precise definition of effective operative in this report. But generally, effective once again means that you have some evidence that the district will tend often to be conducive to the candidates of choice, so a given group, being both nominated from the primary and elected in the general election.
Q You said you work started in October. Do you recall when you started drafting the January 13th report? Was it around the same time?
A Maybe October, maybe November. It's certainly been quite a while.
Q And you said it was a -- substantial amount of time. Do you have any estimate of how many hours it took or how many people it took to put the report together?
A Well, I wrote the report myself to be clear. All the words in the report are written by me. I do have research assistants working under my

supervision. I think it -- there's quite a bit of computer time involved in some of that exploratory district generation that I mentioned before.

So substantial amounts of time. But, again, I don't have a numerical estimate for you.

Q And so the role that your research assistants played was -- was it only in relation to that kind of initial work involving the computer-generated maps? Is that a fair way to say that?

A Sure. I think research assistants support all of computational work. In -- you know, in my approach there's many roles for computation. So I can give you some other examples. But research assistant support all the computational work, but all the conclusions, of course, are my own.

Q Which leads me to this -- the report we have as Exhibit 1 is a complete statement of your opinions on the topics covered by -- well, let me ask this. You have submitted two reports in this case, right?

A Yes.

Q And just for reference, I'll just go ahead and mark your second report or your rebuttal report before I ask these questions. That way it

will be easier to know what we're talking about.
I'm going to mark your rebuttal report as Exhibit 2.
Okay. So that should be in your Exhibit Share folder now.
A Yes, I see it.
Q Okay. So are the reports at Exhibit 1 and Exhibit 2 a complete statement of the opinions that you're offering in this case?
A Exhibit 2 will probably take a minute to load since Exhibit 1 did, but since I -- I am willing to accept that it is my rebuttal report, then I would say that the opinions that I intend to discuss in this case are reflected in these two reports.
Q And you're not responding to Dr. Alford's report about polarization issues in this case; right?
A That's right. I don't think that I've read it.
Q That would make it hard to respond to, I guess.
A It would. It would.
Q And in terms of the relationship between race and partisanship, are you offering an opinion

about whether it's possible to separate race and partisanship in Georgia?

A Well, I would say, you know, that can be inferred from some of my discussion of race versus party. But I don't think I ever opined directly on that question.

Q So let's do this. Let's turn to Paragraph 1.1, and we'll just kind of start working our way through. My goal today is just going to be kind of -- we'll go in order through the report. (Audio distortion) -- and this lists the opinions are giving in this case; right?

A Correct.

MR. CANTER: Brian, I'm sorry. I couldn't quite hear what you just said.

MR. TYSON: I'm sorry.

(Court reporter interruption.)

MR. CANTER: Yeah, and I just want to make sure that we can hear the questions, Brian.

THE VIDEOGRAPHER: I apologize. I was muted. We're going off the record at 1:34.

(Recess.)

THE VIDEOGRAPHER: We are on the record at 1:39.

Q (By Mr. Tyson) All right. Dr. Duchin, we're going to try our new audio thing here and see if this works. Back to Section 1.16 your report. And this lists the assignment that you were given related to this case; is that right?

A Yes.

Q And you were assigned to examine the enacted Congressional, state Senate and state House districts from Georgia in 20 -- that were adopted in 2021; right?

A Yes.

Q So turning to the next page, you stated you reviewed the maps' conformance with traditional districting principles; is that right?

A Yes.

Q And that process -- I'm assuming the reference to Section 6 of your report -- generally involves the metrics that you reference in Section 6; is that right?

A Yes.

Q You also supply demonstration maps for the Gingles 1 prong of a VRA challenge. Could you just briefly explain what you mean by the Gingles 1 prong of the VRA challenge?

A Yes. In my understanding, a Voting

Rights Act lawsuit has to begin with establishing three threshold conditions called the Gingles factors. In Gingles 1, which is the one I'm discussing here, involves the production of demonstration maps with additional majority minority districts.

Q And those additional majority minority districts are not necessarily majority black VAP majority -- or majority BVAP districts; is that correct?

A That's right. In general -- since you're asking about Gingles 1 in general, it depends on the group on whose behalf the challenge is launched.

Q And your maps in this case or in this report -- in some cases you've drawn more majority BVAP districts and in others you've drawn more coalition districts. Is that fair to say?

A That's correct. The -- the claims were sometimes looking for additional opportunity on behalf of black voters and sometimes on behalf of the coalition.

Q And you say the effective districts are shown to be highly likely to provide an opportunity for black and Latino voters to elect candidates of

their choice. Do I have that right?
A Yes.
Q And we're -- I know we're going to have this discussion probably quite a bit today. But isn't it also true that districts that provide an opportunity for black and Latino voters to elect their candidates of choice in Georgia in 2023 also means districts that will elect Democratic members in the general election?
A Well, I've worked quite hard to craft the definition of effectiveness that does not simply default to Democratic opportunity.
Q And is that because your definition of effectiveness includes primary preferences as well?
A In part because it includes primary preferences and in part because it only calls for five out of eight contests to be won by the candidate of choice in the general election who admittedly in Georgia today will be seen to be a Democrat in each instance.
Q Then you say next that you have assessed the maps to investigate the possibility of excessively race conscious line drawing. Do I have that right?
A Yes.

Q And you use a couple of terms there in quotes, packing and cracking. What do you do to determine if a district is packed with blacks and Latino voters, for example?

A So are you asking the definition that I used or are you asking what I do to assess?

Q Well, that's a good point. Let's break it into two sections. Let's start with the definition and then kind of the assessment process. So if you -- if you were to define the term packing, how would you define that?

A Right. So I understand packing to mean the overconcentration of a district with members of a particular group beyond what is necessary for their preferences to prevail.

Q And so in looking at the enacted plans for Congressional, State Senate and State House in Georgia, how did you go about then determining whether particular districts were packed?

A I think that maybe the best indication of that is to compare them to the alternative plans that I furnished, which in my cases show that opportunity can be present with far lower levels of black and Latino demographic population.

Q So in your mind is there a numeric

threshold a particular minority group reaches to be a packed district?

A No. And I'm on the record and quite a few scholarly publications are going against the use of bright-line numerical threshold.

Q And so then kind of the -- I guess the converse is cracking. What is your definition of cracking?

A So generally I understand cracking to be a strategy of dispersal in which a group which could have had influence or controlling impact on electoral outcomes is instead spread out over several districts in slightly suppressed numbers -- slightly or sometimes greatly suppressed numbers in a way that diminishes or eliminates electoral opportunity.

Q And I'm assuming like with packing there's no numeric threshold involves in that. It's an assessment you make of a district and the surrounding population. Is that fair to say?

A Yes.

Q So moving to 1.2 you list the various materials that you used in the preparation of your report; correct?

A Correct.

Q And I wanted to ask specifically about the fourth bullet, the last sentence. You say you were provided with written transcriptions of oral testimony and public hearings in Georgia about redistricting --

A Yes.

Q -- and with corresponding written communication. Is that corresponding written communication the information in the online portal that Georgia has provided for voters to provide input?

A I think so. But in both cases I included the transcriptions and the written communication in the materials that I handed over so you can see exactly what I was provided.

Q Let's move into the summary of your findings here. So you list out the summary that you have. And I wanted to ask specifically. Are you offering the opinion in this report that the enacted Congressional, State Senate and State House plans were drawn primarily based on race?

A I wouldn't say that that's a contraction I would use.

Q Is it fair to say that you're offering data about the use of race but you're not offering

an opinion about the particular motivation behind a plan? Is that correct?

A I think at a high level the narrative that I am offering in terms of my conclusions is that what I observe in the plans is consistent with a pursuit of partisan ends but one in which race was clearly used to achieve those ends.

Q And so your opinion is that the legislature pursued partisan ends but then used race in part to achieve those partisan ends?

A I try to be careful to be clear that I'm not reading minds. And so if you will allow me, I'll continue to use constructions like "I find evidence consistent with the following behavior," so that I'm not pretending to know more than I'm able to discern from the data that's available to me.

Q And you anticipated my next question which was, are you offering any opinions about the reasoning of Georgia legislators in the creation of the Congressional, State House and State Senate plans?

A Right. I would -- I would say that generally I think the kinds of findings that I describe here are evidence that might be persuasive in terms of discerning intent, but I certainly can

1 make no hard and fast conclusions about what was in
2 the hearts and minds of the legislators or the -- or
3 the staff.
4 Q And so then it would be fair to say that
5 you're not offering the opinion that the
6 Congressional House and Senate maps in Georgia were
7 drawn with racially discriminatory intent, right?
8 A I would say that I'm offering evidence
9 that the court can use to make a determination of
10 intent but that it would -- one should be careful
11 not to overstate how conclusively this kind of
12 evidence can operate.
13 Q And my question I think was -- I
14 understand that's where you're coming from. My
15 question was a little more specific, which is:
16 You're not offering the opinion that Georgia's House
17 Senate and Congressional plans were drawn with
18 racially discriminatory intent, right?
19 MR. CANTER: Objection. Asked and
20 answered.
21 A Right. I would say -- you know, trying
22 to be fully cooperative with the question, I think
23 that that's what I've already answered in saying I
24 think I find evidence that can help the court reach
25 conclusions about intent, and that's how -- how far

I understand my role to go.
Q But you're offering information that could help the court reach its own conclusion about intent. You're not offering what you think that conclusion should be, is that right.
MR. CANTER: Objection. Asked and answered.
A I think the conclusions reached by the court that that's a legal conclusion that I will refrain from making in my role as an expert and as a mathematician in particular.
Q In your experience in redistricting is it possible to determine -- let me ask it this way. In your experience in redistricting have you seen examples where maps were drawn with what you concluded was racially discriminatory intent?
A Again, I would probably phrase that as stronger evidence or weaker evidence. And certainly I've seen a range of cases, some with stronger evidence of intent and some with far weaker or no evidence of intent.
Q Let me ask a few questions as we kind of work through the bullets in your summary. You first -- in the first bullet note that candidates preferred by black and Latino voters can be elected

by a simply majority on the statewide basis in Georgia. Is that right?

A Yes.

Q And Georgia as a whole is about 33 percent or a little bit more in its black population as a percentage of the total population; is that right?

A Well, I address that in Table 1. So in total population 33 -- yes, just over 33 percent black.

Q And when you reference candidates preferred by Black and Latino voters being elected by a simple majority on a statewide basis, you're referencing the success of Democratic candidates in recent elections statewide in Georgia, right?

A Not the blanket success of all Democrats, but particularly Democrats widely thought to be preferred by black and Latino voters.

Q And when you say candidates widely thought to be preferred by black and Latino voters, what do you mean by that?

A Well, to be clear, we discussed earlier the first Gingles condition. There's also a 2nd and 3rd Gingles factor while relate to racially polarized voting. And in this case plaintiffs have

a different expert who is doing their Gingles 2 and 3 work.

I did not include the measurement of racial polarization in my work for this case. But I've been made aware generally of the findings by counsel. And I am under the impression that no one contents in general the polarization in Georgia.

Q And it is also your understanding no one contests in general which candidates are preferred statewide by black and Latino voters?

A Well, there might be, especially in down ballot races, some where it's less obvious. But I think for the very high profile races it's -- it's well known that, for instance, you know, Warnock was a candidate of choice for black and Latino voters in Georgia.

Q Then you talk about the enactive plans as conspicuously uncompetitive. Do you see that?

A Yes.

Q What do you mean by conspicuously uncompetitive?

A Well, I mean, that I've studied and written about quite a few states, and I've actually never seen one as competitively drawn as Georgia. I've never seen another.

Q Understood. And you're aware that statewide Republicans in Georgia in the 2022 election got a percentage of the vote as high as 53 percent statewide; right?

A I'm sorry. Can you repeat the question?

Q Yes. You're aware that in the 2022 election statewide Republicans got a share of the vote upwards of 53 percent for some of them; right.

A I'd have to look at the figures to really agree. But I accept that representation. That sounds right.

Q And so when you took about maps being conspicuously uncompetitive, you're not referring to the percentage of seats versus the statewide vote total, are you?

A No, no. What I mean by uncompetitive is that in -- even if you have a race that was 53/47 or closer on a statewide basis, it's remarkable how few of the individual districts would have had an outcome within a 10 point margin. That's what I mean.

So you might have a statewide race with a 4 or 6 point margin, which in every district has a 10-plus point margin. That's what mean by an uncompetitive plan.

Q And you reference the changes in Congressional District 6. You would agree that Congressional District 6 in Georgia was drawn to elect a Republican; right?

A I would agree that it was -- it looks like to me is that it was drawn to disrupt the existing political balance in the district. Lucy McBath represented the district before. And so I think it -- you might say that McBath's district was targeted.

It's true that that is hard to distinguish from generally making the district more Republican, but I would say either of those is -- framings is consistent with the observation.

Q And you reference Congressional District 3 retaining its character as a firewall, and then you reference two parts of the state.

Isn't that really just saying it's the districts between metro Atlanta and the second district in southwest Georgia?

A No, that's not what I mean by that. Should I explain?

Q Yes, if you could, please. That's going to be my next question.

A Just anticipating. What I mean is

rather than -- if you study, for instance, my alternative Congressional plan, you'll see that it's readily possible to construct a district in the geographical area of District 3 that does contain enough black and Latino population and enough crossover vote support to be an opportunity district.

And so when say it's a firewall, I mean a firewall against electoral opportunity for these minority voters. That does not have to do with where it's located, as you can see by inspecting my alternative plan.

Q And skipping a few bullets down, you talk about "If we foreground effectiveness instead of majority demographics, we find districts can frequently be affected even well under the 50 percent plus 1 demographic threshold." Do you see that?

A I am looking.

Q It's the fourth bullet up from the bottom on Page 5.

A Okay. Thank you. Fourth bullet.

Yes, I see that.

Q And so when you talk about effectiveness here -- and we'll talk about this a little more.

1 But essentially this means for the district that
2 will elect a preferred candidate of black and Latino
3 voters in the Democratic primary and will in most,
4 or five out of eight elections, elect that same
5 Democratic candidate that won the primary for black
6 and Latino voters in the general; right?
7 A Well, not necessarily that same
8 candidate because the dataset that I've used it's
9 not the case that the primaries match up with
10 generals.
11 So what I would say effectiveness is
12 about is that the preferred candidate can win in
13 three out of four primaries and in at least, as you
14 say, five out of eight general elections.
15 Q And in Georgia, I guess this -- this is
16 kind of self evident referencing Senator Warnock's
17 election. But there are places in Georgia where the
18 minority preferred candidate can win at thresholds
19 significantly below 50 percent minority population;
20 right?
21 A Right. I think that's exactly the point
22 I'm making in the bullet.
23 Q Going down to the last bullet on Page 5,
24 you reference and the public input and some examples
25 there. And you say, "It also explains why the

enacted plans are dissonant in terms of shared community interest."

What does dissonant in terms of shared community interest mean?

A Sure. Okay. So here I'm referencing the traditional districting principle of respect for communities of interest. That's -- that's what this verbiage is trying to reference.

And my best indicator of what Georgians consider to be their communities of interest comes from the records that I mentioned earlier, the public testimony and the written submissions to the state.

So communities of interest have to do with shared needs in terms of representation. They have to do, as you know, with a variety of factors including employment, economics, culture and so on.

And typically it's considered best practices in redistricting when you hear communities describing their shared needs to keep those communities together in such a way that they'll have a voice with their representative.

And as I detail further below in the report, that definitely does not seem to have been on the CD 6 and CD 14 examples in particular.

Q And so you're not offering the opinion in this report that there are no shared community interests Congressional, House and Senate maps. You're just singling out a few examples where those are not reflected on those maps?

A Right. And I believe the way that I phrase it later, the -- in the last section of the report which we'll presumably get to over time, is that I don't think that the changes to CD 6 and CD 4 [sic] have a justification in terms of communities of interested.

Q Let's move to your -- Section 3 talking about demographics. And so you have a map here on Figure 1. There's a map of the APBVAP Shared. Can you just describe briefly what is reflected on Figure 1?

A Sure. This is what's called a Choropleth in geography. And a Choropleth is as map in which the units are shaded according to something quantitative. And in this case, this is the BVAP. And APB means any part black. It just means everyone who identified as black on the census.

And so the coloring shows us for each of the state precincts in Georgia. The intensity of green in this figure shows us the percentage of

1 black adults.
2 Q And I notice that you didn't include
3 Albany and Valdosta on here as far as cities that
4 were looked at. Is there a particular threshold you
5 used for which cities you identified?
6 A I think I just took the largest ones, as
7 I recall, in order.
8 Q And you also reference at the -- the
9 description, "the swath of the state from Columbus
10 to Augusta broadly called Georgia Black Belt
11 region." Do you see that?
12 A I do.
13 Q And can you just describe what you mean
14 by the Black Belt region?
15 A Sure. In several southern states
16 there's a swatch of territory in the state which --
17 going back in some cases to pre-Civil War times has
18 a history of residential concentration.
19 Often these are agricultural areas
20 historically. And that's the case here in Georgia.
21 Q Are you able to identify any particular
22 counties that are included in the Black Belt in
23 Georgia or is it more just kind of a general
24 regional definition?
25 A I think it's a regional definition.

Q You discuss next the differences in census data, the population -- redistricting data release versus the ACS or American Community Survey data. And I just wanted to make sure I understood a couple of pieces that the B -- the CVAP, so citizen voting age population, number is only available from ACS data and not from the redistricting data release, right?

A Correct. Furthermore, it requires inference to take the C -- the citizen data from the ACS and put it onto the units needed to do this kind of analysis.

Q And that was my next question. In terms of your estimated CVAP you built from block-level adjusted VAP. Can you just talk briefly about what block-level adjusted VAP is.

A Yes, and also there's really quite an extensive discussion of precisely how this is done in the appendix.

So how -- would you like just an explanation -- should I read from this?

Q Just -- if you could just give a general overview. I understand that there's a lot of writing about it. If you could just kind of generally describe the process of what that means.

A Absolutely. Absolutely. So the process is to use regionally specific ACS estimates to poll the citizenship ratio for four different groups: Black, Hispanic, white and other. And so I used tract level data. Tracts are census units typically with about 8,000 people.

So I used tract-level data to get those local ratios of citizenship, and then I apply that to the voting age population of the block level.

Q At the very bottom of Page 7 you talk about how in Section 8, "I will confirm that my alternative plans satisfy the Gingles 1 standard for coalition districts using black and Hispanic CVAP as well as using VAP."

What is the Gingles 1 standard for coalition districts as you understand it.

A Well, here I'm referring to the threshold that was in my understanding confirmed in Bartlett vs. Strickland. That's the 50 percent plus one threshold. That's what I mean.

Q And it's your understanding that that 50 percent plus one standard for coalition district came from Bartlett?

A Was clarified in Bartlett.

Q And did you use that understanding as

you drew your alternative plans in constructing those districts?

A Oh, definitely. They're -- they're designed to meet a 50 percent plus one threshold.

Q And next -- I know we already referenced these tables, but on Page 8 you go into the demographic trends, the different places, and we talked about various numbers. But just in looking at the change in the black CVAP population in Table 2 from 2010 to 2019, that's a movement of almost exactly two points from 2010 to 2019; right?

A 2 percentage points, right.

Q And then Figure 2 has your racial dot density plot.

A Yes.

Q Please describe the difference in a Choropleth versus a racial dot density plot?

A Absolutely. And I think they can both be informative. If you use just one, sometimes you're not getting the whole picture. So as I said before, a Choropleth colors the units. But that's subject to what geographers called MAUP, M-A-U-P, which stands for the modifiable aerial unit problem, which suggests that you can radically change the impressions of the picture just by shifting the

1 units.
2 So sometimes instead, especially when
3 the units are large as state precincts in Georgia
4 can be, it's helpful to go below the unit level and
5 look at individuals.
6 So a dot density plot will use a colored
7 dot to represent some number of people, and in this
8 case I've chosen a one-to-one representation. So
9 there's a small color dot for every single person in
10 the census data. And they're colored here by
11 whether the person has identified as Asian, white,
12 black or Latino.
13 Q And is there a reason why you showed
14 only metro Atlanta racial dot density map and not a
15 statewide map like you did with the Choropleth?
16 A Oh, I show many more dot density plots
17 through the rest of the report. So this is just a
18 zoom-in to an area that's particularly noted in the
19 report as consequential for the redistricting.
20 Q And you'd agree that Figure 2 shows that
21 black individuals in Georgia are heavily
22 concentrated in south DeKalb, south Fulton and
23 Clayton County in the metro Atlanta area, right?
24 A Right. As I state here, besides those
25 also parts of Gwinnett, Douglas and so on.

Q All right. So let's move into Section, Overview of the Enacted Plans.
A Yes.
Q And so this is where -- you're beginning with a review of the Congressional district plan adopted by the General Assembly, right?
A Yes.
Q And so you start by saying that racial polarization in Georgia is essentially undisputed. And I know we talked about that a little bit already. Can you just describe what you mean by racial polarization being essentially undisputed?
A All I mean is that I'm not aware of anyone who has claimed that the general preferences of black and Latino voters are the same as the general preferences of white voters in Georgia.
Q And you would agree that in general elections, white voters and voters of color in Georgia tend to vote for two different political parties; right?
A That's certainly been the case recently. Well, to be fair, that's -- to say that about white voters, that's a statement about the overall trend for white voters in the state. There are parts of the state as we'll see when we go through the report

where there's substantial numbers of white voters supporting Democrats, of course.

But as a general matter statewide, in terms of block voting analysis, I'm not aware of anyone who disputes that generally white Georgian support Republican recently and people of color support Democrats.

Q And so when you reference the newly enacted Congressional plan at the end of Paragraph 1 makes major changes to the benchmark and does so in a way that reduces the number of performing districts for black and Latino-preferred candidates to 6 out of 14 to just 5 out of 14, that is also essentially saying there's a reduction in Democratic districts in the plan from 6 to 5, right?

A Well, here I'm talking about performing, and we haven't discussed that word yet. But typically that refers to actual observed electoral outcomes rather than projected electoral outcomes. And so I think -- so given that, can you repeat the precise question you'd like me to answer?

Q Certainly. And my question was just: When you say that the change in the Congressional plan for the benchmark does so in a way reduces the number of performing districts for black and Latino

preferred candidates from 6 out of 14 to 5 out of 14, that's the same as saying the 2021 Congressional plan reduces the number of districts that elect Democrat members of Congress to from 6 to 5, right?

A Yeah. Well, it would have the same effect, that is correct. but I think those concepts are conceptually distinct.

Q Do you know if District 6 was a majority non white district before the 2021 redraw of it?

A No, I think it was majority white in the benchmark configuration.

Q And so the changes in District 6 changed the racial makeup under a 50 percent threshold and altered the political performance, right?

A Correct.

Q Next you reference the targeting of districts for black and Hispanic voters were removed and replaced with white voters. Do you see that?

A Well, I think what I actually say here, if I'm looking at the right part, is removing black and Hispanic voters and replacing them with -- not just any white voters, but white suburban, exurban and rural voters.

It's important to note that, you know, the areas that were removed also contained white

1 voters who more likely to share preferences with
2 black and Hispanic voters. So it's not a simple
3 swap of people color for white people that's at
4 issue. It's also a question of which white people.
5 Q And wouldn't that indicate, as we talked
6 about, kind of a political goal if you're removing
7 white voters who sympathize with Democratic
8 candidates statewide versus white voters who
9 sympathize with Republican candidates?
10 A I don't think anything I say ever denies
11 that there are partisan goals potentially in play.
12 I never mean to deny that there are partisan goals
13 in play, only to suggest that they might have been
14 achieved in impermissible race conscious ways.
15 Q The reference to targeting the district
16 isn't a reference to the intent of the legislature.
17 It's reference to just kind of this is what occurred
18 in this particular district?
19 A Well, no, I believe this is indicative
20 of intent to make the district less likely to
21 reelect McBath.
22 Q So you can't rule out politics as the
23 sole reason for the reconfiguration of District 6,
24 right?
25 A Well, rule out is a very strong kind of

conclusion, and I certainly don't think that the kind of analysis that I do is likely to ever rule things out conclusively. But I believe it not to be plausible that the -- that the goals have no racial component.

Q And I just want to make sure I'm teasing this out right. When you say they had no racial component, would it be correct to say the legislature could have been acting with a partisan intent that had a racial impact as opposed to saying they were acting with a racial intent that had a partisan impact?

A I think -- so probably I'll end up repeating that narrative many times, so forgive me for repetitiveness. But I think the most likely conclusion is one in which race was used to achieve a partisan goal. That's the mantra that I have een led to by the investigation.

Q And so it's not merely that there was a racial effect of the partisan goal. It was -- it is your opinion that race was used to achieve a partisan goal; is that right?

A Well, what I find is consistent with that. It's also, of course, possible that -- it's possible that the legislators and the map drawers

1 acted with racial animus. I don't claim to be able
2 to discern that.
3 But what I find is consistent with the
4 use of race to achieve partisan goals and of course
5 a disregard for the reduced opportunity of people of
6 color.
7 Q So when you reference -- I guess maybe
8 we're talking about the last sentence of the -- one,
9 two, three, fourth paragraph where you say the
10 overall effect of the Congressional redistricting in
11 Georgia is the institutionalization of black and
12 Latino voters to achieve a profoundly uncompetitive
13 plan in which the line-drawers have gone a long way
14 to locking in the outcome.
15 Is what we've been talking about the
16 instrumentalization of black and Latino voters to
17 achieve a partisan goal?
18 A I think that is another phrasing of the
19 same narrative. So instrumentalization means using
20 people as kind of playing pieces to achieve a goal
21 rather than prioritizing their electoral
22 opportunity.
23 Q And so you'd agree that that goal -- I'm
24 probably going to repeat myself today a lot today,
25 too. But you'd agree that that goal is -- could be

a partisan goal but your view is that it used black and Latino voters as instrument to achieve that partisan goal?

A Yes, that's -- again, my findings are highly consistent with that conclusion.

Q And so your findings are highly consistent with that conclusion, but you're not offering the opinion that the only explanation is that the legislature used black and Latino voters to achieve a partisan goal, right?

A Well, when it comes to redistricting there are so many different choices facing people that it's possible that you can arrive at one by mere chance and that can't be ruled out. So I -- I try not to be overly conclusive in my phrasing.

Q Let's look at some more maps then. On Page 11 here we have a comparison of four different Congressional maps.

A Yes.

Q And the Congressional Alt map in the lower left is the map that you're proposing that has six of these majority coalition districts. Is that a fair way to phrase that?

A Yes.

Q Have you looked at the political data to

1 determine if this map in District 3 would elect a
2 Democratic candidate in a general election?
3 A I believe we can flip to a later part of
4 the report -- let me do that -- to check out how it
5 performs in the dataset that I've been using as my
6 probative --
7 Well, actually I will do that quickly.
8 Q You're looking for Page 92, I think, on
9 the CD Alt plan?
10 A I think it is actually in the earlier
11 section.
12 Thanks. You're probably right. Let me
13 find it.
14 Yes, that's correct. Right. And so,
15 yes, I show that the CD 3 in my alternative
16 plan agrees with the preferences of the minority
17 voters in -- of coalition voters in all four
18 primaries and all eight generals.
19 Q And also looking at Table 50 on Page 92,
20 District 6 as it's drawn provides black voters
21 their -- or black and Latino candidates of choice
22 success in zero out of 4 primaries and only 3 out of
23 8 general election, right?
24 A That's right. Yes.
25 Q In looking at the Congress -- Congress

Alt plan back on Page 11 compared to the enacted plan. It's correct that every district changes at least somewhat between the enacted plan and the Alt plan, right?

A I'm sorry. Would it okay if I opened my own local copy of this report because it's a little slow in the exhibit software.

Q That's totally fine with me if it's the same report in pdf --

A It's the same report.

Q -- and if it will make it go faster --

A Yeah, it will go faster. Thank you.

All right. So you said back to Page 11?

Q Back to Page 11.

A Yes. Oh, is it fair to say, I think you asked, that all the districts changed? I believe that's -- that seems to be true.

Q Okay. And looking at Congress Alt, you'd agree that it connects parts of south Fulton and Clayton Counties with Troup and Meriwether Counties and Harris County in rural Georgia; right?

A Which district are you asking about?

Q District 3.

A District 3. Yes, it does touch Fulton and it does reach down to rural Georgia. It's -- I

would say it's in -- close to the same part of the state it's geographically aligned with where District 3 is in the other maps.

Q Would you agree that there's more of urban population in the Congress Alt District 3 than in the enacted District 3?

A Yes, that seems quite likely.

Q And District 12 on the Alt plan connects Augusta over to Houston County and separates Macon-Bibb County from Houston County; is that right?

A I don't have the county names in front of me in this report, but I accept that.

Q Let's move next to the Senate plan. And you -- again, we talked a little bit about the lack of competitiveness on the plan, and that refers to kind of district performance, not overall number of seats for a political party; right?

A Correct. That's right.

Q And isn't a lack of competitiveness on a plan generally a sign of a partisan goal of the map drawer?

A Well, usually I think you'd say that it's a sign of wanting to create safe seats on both sides. So is that partisan? I think typically when

we call something a partisan goal, we mean to favor one political party. But a safe seat's goal can sometimes favor incumbents from both political parties.

Q And so you outlined your cluster approach here in various pieces. And as I understand our conversation earlier, SD Alt Eff 1 has different configurations in each of the clusters on Page 13; is that correct?

A Yes, that's right. The entire approach in all of my alternative maps is modular in that way.

Q And the idea there is that you could decide to take the Senate district configuration for -- like, for example, SD East Black Belt module and plug it into the enacted plan and just modify only those districts; is that right?

A Exactly. It's designed to limit the ripple effects of a choice made in one part of the state so that you could mix and match options from different regions or selected some and leave the rest of the map unchanged.

Q And are there parts of the map on the Senate map that are unchanged changed from the enacted plan in both Alt 1 and Alt 2?

A So generally what I've done is I've taken some of the proposed Gingles alternative demonstration maps and I've extended those around the rest of the state.

So I believe it to be the case that some of the districts are unchanged but that many parts of the state will have been changed in the statewide configurations.

Q And the Alt 3 map, as you said, changes all the districts to focus on the effectiveness goals that are outlined; right?

A That's right, but still in a modular fashion.

Q I think we're on Page 13 --

A Sorry. Let me just say one more thing before we move on. I think we can see just for example -- so I mention that some districts might be unchanged. And it looks like the whole south -- southwest part of the state from the enacted plan looks fairly identical in Atl effective 1 and Alt effective 2, just as an example that changes weren't made everywhere.

Q Thank you.

And Page 13 you talk about your Alt 3 map, and then in the last sentence you say, "This is

accomplished while maintaining the scores for traditional districting principles that are comparable or superior to those in the enacted plan."

And I just want to pause. That isn't the complete sentence, but I want to pause there. In terms of that, is -- is that assessment about maintaining the various scores what you're discussing in Section 6 of the report on the different metrics for measuring traditional principles?

A That's right. Scores here means the same thing as the metrics.

Q And if it's not something that would be put into a metric, it's not something that you're necessarily taking into account for purposes of maintaining the scores for traditional districting principles, right?

A Exactly. I mean scores to be essentially synonymous with metrics.

Q In looking at some of these districts in figure -- back on the map for state Senate, on Alt Eff 1, there's a district that's just above the red district on the eastern side of the state that begins in that kind of northwest Georgia area, then

kind of wanders its way, it looks like, all the way down over through Dublin and back into Emmanuel County.

Is that -- can you tell, is that a single district there?

A Sir, you said northwest. Did you mean northeast?

Q I'm sorry. Northeast, yes.

A Yeah. No, those are -- if you're looking at Alt effective 1, then those -- it looks to me like those are two different districts with unfortunately similar colors.

Q But then there is a district that touches the red district on Alt Eff 1 that runs and wraps around a purple district; right?

A Yes, that's how it looks.

Q So in the process -- I know we talked generally about the creation of the Alt maps and how you looked at those, you know, different algorithmic options first, kind of get an idea of different places.

When you drew Alt effective 1, what was the process you followed specifically for the creation of this redistricting plan?

A It was exactly what was described

earlier.

Q So did you start with a blank map or did you start with the enacted plan and modify the enacted plan?

A For all of these, I don't start with a blank map except that -- well, to be clear, I'm dong everything on the level of clusters. I know we've said that but just repeating that. And so I don't start with a statewide blank slate.

I start with a region that's been carved out by a district in the enacted plan. So in that sense the enacted plan gets strong deference in all of my alternatives because each of those regions is picked out by a collection of districts enacted by the state.

Q And so you start with an area enacted by the state. Do you begin then with the majority minority districts that you're looking to draw and then draw the remaining districts around it?

A No, it's -- that's not -- I wouldn't -- I wouldn't agree to that.

Q Okay. So can you just give me an example if we -- let's say the SD East Black Belt. We have that as a region on Page 13. Is there a particular process or methodology you would follow

for how you would draw the districts in that particular region when you were looking at them?

A Sure. Should we discuss specifically the algorithmic exploration stage or the hand drawing following that?

Q I'm interested primarily in the hand drawing stage.

A Sure.

Q So how that process works.

A Sure. So I will -- at that point I will have seen a collection of maybe dozens of alternatives, and I'll examine those to try to find some that have properties that seems to handle the tradeoffs of redistricting in a way that seems favorable.

So just to be clear by what I mean by that, everyone who draws maps knows that you have to handle tradeoffs. You have -- to make your map better in one way you're necessarily sacrificing something else and we're trying to take account of many things, of county splits, of maybe opportunity to elect, if that's a priority for the map drawer, compactness, which can be scored in many ways and so on.

So when you see a district like that one

that wraps there that you identified in Alternative Effective 1 that's not going to have a great score in certain compactness methods, like Polsby-Pepper, but it can still have a very good score in other compactness methods like Reock.

And as a line drawer, you just face these trade-offs everywhere. And so you're trying to balance them and come up with something favorable across the board.

Q In terms of the process of doing that balancing, what types of data did you have displayed while you were working on drawing the different components in the hand-drawing phrase to be clear?

A Only the data that you see in the report. Those are the only things I considered. I didn't look at anything else besides the metrics that are discussed here, the -- my so-called effectiveness score, and demographics because the Gingles 1 assignment involves hitting a 50 percent plus one line.

Q Were all those data points displayed as you were drawing all of the effectiveness score, the racial data? Were all those displayed while you were drawing the maps?

A So unfortunately, because my drawing

process is -- I know it's quite conventional in this area to use common software like Maptitude --

I see someone's asked for a break. I'm just noting know that. I'll just finish my answer to this question.

So I think some of our ways that we talk about it are keyed to software like Maptitude. It doesn't work quite the same way in the -- in the different kinds of packages that I use.

But I would say, I think to get to the substance of your question, that in my drawing process I'm aware of -- I have the ability to check in on any of the metrics discussed here at any point. They're not going to be all visible all the time.

In fact, some of the manipulation is done without a visual, right, because I -- I'm able to change block assignments without constantly looking at -- at a picture.

So while it's hard to answer the question in precisely the way that it's framed, I think the substantive answer is that I'm able to call up any of those metrics at any point.

MR. TYSON: Let's go off the record for a minute.

THE WITNESS: Sure.
THE VIDEOGRAPHER: Off the record at 2:34.
(Recess.)
THE VIDEOGRAPHER: We're on the record a 2:41 p.m.
Q (By Mr. Tyson) Dr. Duchin, before our break we were talking about different -- kind of the methodology or methods you drew maps using. And you indicated you could check for the various metrics at any point.
Was that like pushing a button, running a report? What was the methodology or method -- I'm sorry, not methodology -- what was the method you used to check various metrics that you were drawing?
A It could be just running a command at command line.
Q And when you were drawing the -- the Senate Alt 1, 2 and 3 plans, had you already conducted your analysis of the public comments in the public hearings?
A Well, there was quite a voluminous record of testimony, and so I would say I certainly didn't go through that in one sitting. And so I tried to understand that public record over the

span of some time.

And so I'm not sure how it intersperses with the map drawing, which also extended over quite a long time.

Q So it would be fair to say that those processes were running simultaneously, reviewing the -- well, not simultaneously, in parallel, reviewing the public comment and working on drawing the maps, right?

A I think that would be fair, yes.

Q And when you were looking at various metrics -- let's just use compactness as an example, did you ever reach a point where you drew a map, ran compactness reports or looked at scores and then go modify the plan to improve the compactness scores?

A Yes.

Q And the same for county splits. Did you reach a point where you had drawn a plan and then ran a county I split analysis of some sort and went back to unsplit some counties?

A Yes. And I'll mention that the modular method makes it particularly tricky to handle county splits well because it concedes to the design of the enacted plan certain choices of splits to make. That's because the modules are made, again, out of

1 collections in districts from the enacted plan. And
2 what that means is that some county splits are baked
3 into the way the modules are designed.
4 So working within that constraint and
5 still trying to have a good respect for county lines
6 could be quite challenging. That was one of the
7 hardest parts of the module design.
8 Q And then in your drawing how do you take
9 into account communities of interest in Georgia in
10 the various modules?
11 A Well, I think communities of interest is
12 a kind of a holistic considering. I'll tell you one
13 example of a way that the community testimony
14 informed my map drawing. But generally I would say
15 it's a little more abstract.
16 It's not -- it's not a metric in this
17 case. There are other states where I have used
18 metrics for communities of interest but not in this
19 case.
20 So one example is I found that in my
21 study of the enacted plan I noticed that
22 particularly the populous urban counties which had
23 to be split were likely to be split into many pieces
24 by the state. And I certainly read about that kind
25 of thing in the public testimony. And so I tried to

be cognizant of that and pay attention not only to the number of split counties but also to the number of pieces into which they were split.

So that's an example of a way that I draw while keeping in mind some of the testimony that I read.

Q And just to avoid having to repeat those for each of the plan did you follow a similar process as we've described in terms of the metrics and the drawing and the modules for drawing the House plan well?

A Yes. The process was quite parallel for the House and the Senate.

Q And did it differ at all for the drawing of the Congressional plan from the process we've talked about?

A Well, only in that the Congressional plan wasn't modularized, wasn't -- wasn't regionalized.

Q Are there 1, 2 and 3 plans the order in which they were drawn, you drew Plan 1 first, then Plast 2, and then Plan 3, or is that just kind of the number you assigned them after they were complete?

A That's right. The numbers shouldn't be

thought of as sequential. It's just two alternatives. And you'll note as you go through the Gingles demonstratives, sometimes I've offered only one, sometimes I've offered two. It depends on whether I found examples that illustrated tradeoffs in a way that I thought could be valuable to the court.

Q So it would be fair to say as it goes to the plan you selected certain examples that illustrated a particular set of tradeoffs you were considering in one part of the state?

A That's correct.

Q And so we have the different regions we've been talking about, and these regions are based on areas you selected from the current district boundaries, right?

A Yes. That's right.

Q And none -- except for -- well, do any districts cross out of the regional boundary any of the plans that you've created?

A Well, they shouldn't. So if I've executed the design correctly, then they won't.

Q And that's true for Atl 1, 2 and 3, right?

A Yes, my expectation is that you'll find

that all of those respect to clusters.

Q And did you have any particular methodology you used to select those regions, or is it just through kind of working gives a good collection of the districts?

A There's no methodology in the sense of -- no algorithm executed to select the regions. They were chosen by looking for combinations of districts where at least an initial analysis seemed to show some elevated concentration which could amount to packing and some depressed concentration which could amount to cracking.

And then my goal was to group those and see if I could remediate the potential packing and cracking.

Q And so like, for example, in the SD East Black Belt, you're not saying every county in that region is in the Black Belt. It's is a working area basically, right?

A Absolutely. I tried to give them names more evocative than, you know, A, B, C, D, E. But no, I don't mean to say that every county in that region should be thought of as part of a Black Belt, nor, of course, should SD Gwinnett all be thought of as Gwinnett. Right?

Q Well, I have a similar question for HD DeKalb. Like I said, we've already kind of answered that question there, but it's not -- we're not saying it's all connected to DeKalb County.

A That's right, just that it includes a significant portion of the county.

Q All right. So moving to the state House -- let me call you to the state House section and then that will be a good break point before Section 5 and give you plenty of time. You can take a minute.

Again, you have an uncompetitive design, you said, and that refers to districts, not the overall part of the makeup of the plan; right?

A Right.

Q And when you say half the districts were uncontested, that's referring -- I'm sorry -- more than half were uncontested, that's referring to uncontested in the general election, not the primaries; right?

A Correct.

Q And your regions that you selected on the House plan are different than the regions in the Senate plan because they're made up of House districts; is that right?

A Exact right.
Q And did you follow a similar process for how you selected the regions for the House plan as you did how you selected regions for the Senate plan?
A Exactly similar.
Q And we've talked about the design and the Alt House plans was essentially the same as how you worked on the components of the Senate plan, right?
A That's right.
Q And looking on Page 15 at Figure 7, areas of the state that are not having -- they don't have color of any sort are areas where no districts were changed in any of the three plans; is that right?
A Again, that's definitely the design, and so if I implemented it successfully you won't see any changes in the white areas of the state here.
Q The areas in white on Figure 7 also correspond to areas where generally there's less minority population in Georgia. Isn't that right?
A Generally. And so I wasn't observing those patterns of high concentration and low concentration that led me to think that I might se

1 remediable packing and cracking.
2 Q And so the primary focus really was
3 looking for areas where you thought you could find
4 remediable packing and cracking; right?
5 A Well, generally I would say that I was
6 trying to create -- because this is for -- in the
7 first instance my goal was to create Gingles
8 demonstrative maps.
9 Of course I reused the clusters later
10 for the purpose of effectiveness analysis or
11 effectiveness alternatives, I should say.
12 And so to create Gingles districts,
13 again, which require 50 percent plus 1, you need to
14 have some minority population in order to achieve
15 that.
16 Q And in the House section you indicate
17 that there were 42 House districts that were
18 unchanged, but then I didn't see a similar count for
19 unchanged Senate districts, although I think we both
20 can confirm visually there's really some that aren't
21 changed; right?
22 A That's right. But the difference is
23 that in the Senate clusters they cover the whole
24 state. And so that means every single district
25 could at least be potentially changed according to

the design. Or, as according to the design of the clusters on the House side, 42 districts couldn't change.

Q Thank you. So in -- kind of going back over Section 4 of your report, this is really the section where you're presenting these alternative plans, you're not providing any expert opinions in this section; is that right? Or am I missing some piece of the puzzle?

A No, that's quite right. This section's just intended as an overview and introduction to the alternative plans.

MR. TYSON: If we could go off the record, then.

THE VIDEOGRAPHER: We're going off the record at 2:53.

(Recess.)

THE VIDEOGRAPHER: We're on the record at 3:15.

Q (By Mr. Tyson) All right, Dr. Duchin. We're going to move into Section 5 to your report now. So getting into the effective opportunity to elect districts in your assessment here, I'd like to ask a few questions about the different things that we're looking at.

First of all, you reference giving great deference to the legislative enacted plan. And the deference you're referring here is giving deference by using the modular approach of getting them back into existing districts. Is that fair to say?

A Yes. What I mean to say is that I'm attempting to draw effective districts within the frame work of the cluster approach.

Q You reference to the next paragraph, you've offered your alternative districts that showcase effective electoral opportunity and you say, "This shows that the harms to voters can be remedied by better district design."

What are the harms to voters that you're referencing there?

A Well, I mean the harms of reduced or eliminated opportunity to elect candidates of choice.

MR. CANTER: And, Bryan, I think it just says by better design, not by better district design on Page 16.

MR. TYSON: Oh, I'm sorry. I thought I said by better design. Yes, that's correct. Thank you, Jacob.

Q (By Mr. Tyson) And next you say you look

at the alternative districts in the context of -- well, let me make sure I phrase this correctly. The next part of that sentence says, "in the context of racial Gerrymandering demonstrates that better performance on traditional districting principles is completely compatible with greater electoral opportunities for black and Latino voters." Right?

A Right.

Q And in referencing better performance on traditional districting principles, that's referring to the metrics that we'll get to in Section 6 of your report; is that right?

A Well, actually to the metrics and also, as we discussed earlier, to some kind of holistic consideration of the less quantifiable principles like respect for communities of interest.

Q And so is it your understanding that when a legislature is drawing redistricting plans it should create districts that maximize the number of districts electoral opportunity for minority-preferred candidates?

A To be clear, when you say "should," are you asking about requirements or are you asking about best practices?

Q So I'm first about requirements, then I

want to get to best practices.
A Sure. There's no maximization requirement that I'm aware of anywhere in the country.
Q And you reference best practices as well. Is it a best practice for a legislature to draw as many electoral opportunity for minority-preferred candidate districts as it can?
A Well, I think that one of the features of the American electoral system is that there's a lot of control at the state and local level about guidelines. And I can't speak comprehensively about guidelines around the country having only seen those in certain states and localities.
I've never seen one -- I've never seen a written set of guidelines that calls for maximization.
Q Now, moving down through that section, you say there are many reasons that we should not rely on the 50 percent plus 1 line as a predictor of electoral opportunity. What is that referring to?
A Yes. Here I'm trying to carefully distinguish that Gingles 1 v. Bartlett bright-line from the notion of opportunity, which is a softer and more contextural notion.

Q And so not relying on the 50 percent plus 1 line as a predictor of electoral opportunity, you're not saying that's the state of the law today. You're just saying -- you're trying to distinguish where Bartlett is from that?

A Oh, I do think that in the state of the law today that these two concepts are distinct. The concept a majority district has a role in the law, but that's distinct from the concept of an opportunity district even in the law today.

MR. CANTER: And I'm going to object to the extent it was calling for a legal conclusion. Just be careful on that point.

THE WITNESS: Thank you. I think that's -- that's a good reminder. We're talking about my understanding that informs my expert work.

I certainly don't mean to be opining on anything that requires a legal conclusion.

Q (By Mr. Tyson) Now, have you drawn maps for jurisdictions to the used in elections?

A Yes.

Q And have any of those been statewide plans?

A Well, it -- here it depends on -- often

drawing maps that are ultimately enacted involves participation from many people. But I had a role in, for instance, the drawing of the Massachusetts state Senate districts in this cycle.

Q And in that role do you advise legislators or others who are drawing or working with you on those plans that maximizing electoral opportunity for minority-preferred candidates is a goal they should ascribe to?

A I've certainly never advised that as a goal.

Q And so ultimately in this report, I guess since we're getting into the section, it's criticizing Georgia for not drawing enough majority minority districts on its Congressional House and Senate plans. Is that fair?

A Oh, I wouldn't say so. Rather than criticizing Georgia for not doing enough, what I'm trying to do here is create a framework for measurement. And then, as I say in the section we've already reviewed, providing maps that demonstrate that it's possible to get more opportunity while still being very respectful to DPs.

But I don't think it amounts to

criticism per se. That's -- again, my goal is to -- here to give a framework and offer alternatives not to criticize per se.

Q Let me move into probative elections and the process for identifying those.

A Yes.

Q And you start by saying that it's well understood in voting rights -- in the voting rights sphere it's well understood that certain past elections are more probative.

Are you relying on literature for that or other discussion? What are you referring to as the voting rights sphere?

A Well, certainly in the first instance the scholarly peer-reviewed literature to which I've contributed in this area.

And so I have publications where I've discussed the selection of the probative elections and the kind of weight that you might put on different contests in a context like this one.

Q And you reference several factors that probative contests often include the following, and one of them is that when they have a viable POC candidate on the ballot; is that right?

A Correct.

Q And so generally a race that has a person of color on the ballot who's a viable candidate is going to be more probative of future electoral success than of one where there is no person of color candidate on the ballot?

A That's right. And I go a little bit beyond that to say that depending on the minority group on whose behalf, the -- the claim is advanced, you'd -- you'd want to see a person from that group on the ballot in order for the election to have the sort of highest level of probativity.

It's important to clarify, though -- sorry.

Q Go ahead. I'm sorry. I didn't meant to interrupt you.

A Oh, no, not at all. It's important to clarify, though, that nothing here should be taken to say that contests with all white candidates have no value. That's certainly not what is meant here.

But that all things been equal, it's considered a bit more informative, a bit more persuasive when you include elections that have members of the minority group as candidates.

Q And so looking over at Table 3, I just want to talk through some of those races there

because, for example, the Clinton-McCain race versus Trump-Pence in 2016, there was no person of color candidate on that race; right?

A Correct. That's corrected.

Q And there was no person of color in the Perdue-Ossoff runoff in 2021; right?

A Correct.

Q And so how did you go about selecting those races versus other races that were statewide in Georgia in the same period?

A Well, partly, as I said, I did not perform a polarization analysis, but I did communicate with counsel about the findings of their other expert who did perform a polarization analysis and confirmed that these elections are ones in which there are clear indications that people of color supported the Clinton ticket and supported Ossoff.

So my -- to your broader question about the method for selecting these? I did not prepare the database of elections myself but was, as you saw in the discussion of materials, some curated data for these elections.

And from the elections that were available to me, I chose ones according to exactly the principles identified on the previous page.

1 So I prioritized more recent elections.
2 I prioritized but didn't insist on those that have a
3 minority candidate on the ballot. I looked for --
4 And I, again, confirmed with counsel
5 that there's -- a confident statistical inference
6 can be made about the preference of the groups that
7 are being considered. And I prioritized elections
8 that were at least somewhat close or had enough
9 regional variation to be useful for an analysis like
10 this.
11 Q Is there a particular reason why were
12 you didn't include the November contest between
13 Senator Perdue and Senator Ossoff and just the
14 runoff?
15 A As I sit here today I can't tell you why
16 I selected one rather than the other. But I
17 think -- if I recall correctly I found them to be
18 similar enough that it wasn't necessary to have them
19 both.
20 And so I chose one of them. And I think
21 the runoff was probably interesting for two reasons.
22 One is it has just to two candidates, so it doesn't
23 have the kind of confounding variable of right ends
24 and third-party and so on.
25 And two, I think it's valuable to have a

variety so that there's at least one runoff in each category. So I have two runoffs, as you see, in the general's dataset and one runoff in the primary's data set.

Q And that kind of actually was going to be my next question. In terms of the percentages, the Trump-Pence versus Biden-Harris race, you have the Democratic share as over 50. I'm assuming you're excluding third parties to reach that number.

Is that right? Or does it just not include -- exclude third parties?

A Absolutely correct. And I think this is explained, again, on the previous page, at leat I hope it is. I'm always just showing the major party share.

So, for instance, in the race that you identified, the Trump-Biden race, the D share would be votes for Biden over a denominator of votes for Biden plus votes of Trump.

Q And that's because of the redistricting context. The third party doesn't really had any analysis -- or doesn't add any benefit to that analysis. Is that fair to say?

A Yes. Not only doesn't it add value, but I think given that the role here is to use statewide

elections to predict what are gong to be districted elections, I think it would actually -- the dynamics of third-party involvement in statewide races is quite different from local.

So, yes, it's my -- it's is consistent with all my past practice to focus on that two-party in a state like Georgia where that's what's relevant ultimately.

I'll note that there are other -- you always try to do -- I always try to do this analysis in a very thoughtful and responsible way, and that involves knowing something about the individual state's electoral dynamics.

There are other states where you cannot neglect third-party participation if you want to understand districted elections, but Georgia is not one of them.

Q And looking at the primaries that you selected, all of those were from 2018 and all involved black candidates. Is that fair to say?

A Yes.

Q And I know one of the things you referenced is a blow-out election, you know, versus, for example, the Robinson race where it's a 63 percent roughly portion of the statewide vote. Is

there a threshold you use to determine when something moves from kind of -- it's into blow-out territory where it's not really useful from the data perspective?

A Yes. Well, you can't -- there's no bright line. But you can get a sense by looking, for instance, at Table 5 on the next page. And so there you can see that Robinson's got, as you say, 62.9, almost 63 percent statewide. But if you look around the districts it can dip as low at 47.89 and it goes up here as high as 76, over 76.

And these are just for Congressional districts. When you move to smaller districts, I verified that the Robinson race was still informative because you could see widely varying results at the district level.

Q And in the 2018 school superintendent primary, you're aware there was another black candidate in that race along with Ms. Thornton, right?

A I don't remember the names of the candidates but that does match my memory.

Q Okay. And is -- how do you take into account when there's multiple black candidates versus a white candidate, for example, in that 2018

1 superintendent primary?
2 A Well, again, here I relied on
3 verification from counsel that a polarization
4 analysis had indicated Thornton as the candidate of
5 choice for Black and Latino voters.
6 Q And this is going to be an obvious
7 question as well. But you didn't include any
8 Republican primary contests, and is that because
9 there is not a sufficient of black voters in a
10 Republican primary to indicate a preference or a
11 particular candidate?
12 A That's correct. There's -- well, there
13 are two reasons, and that's one of them. There
14 aren't a lot of minority voters in Republican
15 primaries. And so the inference itself would be
16 difficult or perhaps impossible to do well.
17 But also, because of the clear
18 preference of black and Latino voters for Democrats,
19 the ability to nominate and elect has to go through
20 Democratic primaries.
21 Q So moving into the Section 5.2, how
22 built the scores that's involved there. You've
23 found a district electorally aligned with the
24 preference of black and Latino voters -- I'm sorry.
25 You will find a district effective if it is

electorally aligned with the preferences of black and Latino voters in at least three out of four primaries and at least five out of eight general elections; right?

A Correct.

Q And if you had not included the primaries then being electorally-aligned in 5 out of 8 general elections means it's likely to elect a Democrat only; right?

A Well, so you'll notice that 5 out of 8 as opposed to, say, 7 or 8 out of 8, that's the barest possible majority. And so it indicates that more than half of the time a Democrat was elected but it does not require the district to be a Democratic block.

Q So you say that -- the next sentence that it ascertains that minority preferred candidates can both -- be both nominated and elected from the district and it distinguishes minority preferences from related but distinct Democratic party preferences. Do you see that?

A That sounds right. Let me find it.

Q The second sentence in 5.2?

A Yes, I agree.

Q So in looking at kind of where those

1 preferences diverge, on Page 84 of your report you
2 have Table 46, which is the Senate -- enacted Senate
3 plan.
4 A Yes.
5 Q And I was looking to see which ones, if
6 any, there was a divergence between the primary and
7 general. And to me it looks like it was Senate
8 District 6, Senate District 14 and Senate District
9 42 and District 40.
10 Are those the only ones where you see a
11 divergence between primary effectiveness and general
12 effectiveness?
13 A Okay. So we're looking for one with
14 zero to 2 primary wins but 5 to 8 general wins? And
15 so I agree that District 6 -- I'll just clarify. So
16 I agree District 6 is such a district, 14 -- I'm
17 just scanning through quickly.
18 MR. CANTER: Could you please remind me
19 what page you're on right now?
20 THE WITNESS: Page 84.
21 MR. TYSON: Page 84, Table 46.
22 MR. CANTER: Thank you.
23 THE WITNESS: Yes, Districts 40 and 42
24 both have zero in the primary, 8 in the
25 general, and those are the ones that I see.

And so the conclusion that you might draw from these is that under my notion of effectiveness, these are likely to elect white Democrats.

Q (By Mr. Tyson) And when you say "these," you're referring to the districts we just talked about, and that is 6, 14, 40 and 42?

A That's right. And so you call that the label that's attached. And of course that label won't be correct all of the time. For instance, I believe District 6 has an Afro-Latino representative.

But what I did back in the section where effectiveness was first defined, is I performed a check that you could sometimes call ground truthing in the statistical literature. So I have a predictive label of effectiveness, and I compared that to the actual outcome of 2022 election.

And what you see is that the track record isn't perfect, of course. It would be hard to design a perfect predictive analytic measure here. But it's in my view extraordinarily good at predicting.

Right. And you can see in particular --

Q And getting to that -- I'm sorry. Go

ahead. I didn't mean to interrupt you.

A Oh, not at all. You can see in particular of the Senate districts marked ineffective, that one, SD 6, is the only one of 37 where that prediction was kind of -- didn't -- was not bourne out in 2020.

Q So looking back at Page 17, at 5.2. So I think this -- we may have just answered this question. But you have a reference at the end of fourth paragraph in Section 5.2. It says, "White and/or Republican candidates can certainly be preferred by voters of color, this is imperfect."

And do you have examples of where Republican candidates were preferred by voters of color or is this really only about white candidates?

A I am aware of examples in Georgia where that's the case. But again, in other states, I have been the Gingles 2 and 3 polarization expert, but I am not in this case.

So I could probably more fluently relay examples to you if I had done the polarization study myself, but I did not.

Q And the end of that sentence it says, "It's at least an indication that can help us assess the labeling mechanism."

A Right.
Q And there it's just providing an ability for us to kind of compare plans. Is that a fair statement?
A Oh, no, that's not what I meant by that.
Q Okay.
A Instead I meant have I done a good job constructing a label of effectiveness. This is going to give us at least some corroboration that the effectiveness label tends in general to correspond to performance.
Q Okay. Got it. Thank you, Doctor. That's a helpful correlation.
So moving into Table Number 4 in terms of the enacted Congressional plan, we could say the enacted Congressional plan has five opportunity districts, each of which ware electing a person of color Democrat. Is that correct?
A 1, 2, 3, 4, 5 that I've designated effective for electoral opportunity, correct. And, yes, I believe all five did perform in the actual election of 2022 in seating a candidate of choice.
Q If we move to the next page you state, "In addition, this method works quite well to distinguish race from party." This is obviously not

a regression analysis or any sort of other statistical analytics. But is it your view that can distinguish racial voting behavior from partisan voting behavior?

A Well, what I mean here by distinguish is that the effectiveness label is not merely a correlate of Democratic success. It distinguishes the preferences of the minority groups at issue hear from the preferences of Democrats.

Q And that's because it's taking into account Democratic primary votes where there was a person of color on the ballot that was also the preferred candidate of the black and Latino voters?

A There are two mechanisms by which it distinguishes race from party in this phrasing. that's one of them, the use of primaries. And the other is the use of a low threshold, 5 out of 8, for success in general elections.

Q And so on the Congressional plan there were no districts that would elect white preferred Democrat. Every district that would elect a Democrat elects a person of color Democratic under your effectiveness measure?

A That's right. Under the -- under this framework, I identify no districts likely to elect

1 white Democrats, correct. I think that was the
2 question, right.
3 Q And -- yes, that's right. And then the
4 -- then you reference there's districts on the
5 Senate plan and that's out of the 56 state Senate
6 districts; right?
7 A That's right.
8 Q And eight districts out of the 180 House
9 districts; right?
10 A Right.
11 Q And so for districts that don't fall
12 into that category, the other 53 Senate districts
13 and the other 172 House district, does race and
14 party then overlap completely in these districts on
15 your effectiveness measure?
16 A Well, no, because if I understand the
17 phrase -- actually, maybe you can rephrase that and
18 I won't be guessing.
19 Q Sure. So what I'm trying to understand
20 if you're talking about the method works well to
21 distinguish race from party?
22 A Yes.
23 Q And what I'm trying to understand is on
24 the Congressional map there's really no
25 distinguishing between race and party because --

A In.
Q No? Okay. Can you tell help me understand -- what we're talking about there?
A You bet. So the enacted Congressional map -- this is a feature of the enacted map that it has no districts in that kind zone in between.
You'll notice in particular -- I keep saying it's a fairly or extremely uncompetitive plan. So you'll notice that the general's numbers are all zero and 8, right?
And you'll see that tendency to have the zeros and 8s throughout the Senate and the House plan as well, although it it's not a perfect streak the way it is in Congress.
But the point of designing this frame. Is also to assess proposed districts, not just enacted districts. And I feel that this -- the analysis described here in the bullet points and this discussion of likely white Democratic districts is going to be helpful of for me in assessing proposed districts as well as enacted.
And there I think it will have a lot work to do, an dit's important that that work doesn't conflate race with party.
Q Okay. Thank you. That's really helpful

that makes sense.

All right. So looking back over Section 5 of the report again, are there opinions that you're offering in this section of the report or is this still more kind of building towards your analysis?

A Right. I would say the second. t his is proposing and explaining a tool for the subsequent analysis.

Q So let's then move to Section 6, metrics for the enacted plan. And I like how you refer to redistricting as an extremely complicated balancing act in the process.

And you'd agree, drawing all 250 districts across all three plans is a complicated undertaking. I guess we can all agree on that to say the least; right?

A No question.

Q And so the various different factors that have to be taken into account, those are what you're talking about on the metrics in this section, different criteria that a map drawer has to take into account when drawing a plan. Is that fair?

A The general principles quoted here? Yes, those are the one -- just verbatim and entirely

quoted from the state's guidelines. It has -- it's much shorter than guidelines I've seen that other state and doesn't attempt great precision, avoids specifying metrics.

And so I've discussed some -- you know, I sort of have room to discuss some principles and -- especially metrics for measuring those principles that go beyond the ones in these guidelines.

MR. TYSON: Sorry, Jacob. I saw you drop off and I wasn't sure if you were still on. I was checking the list.

MR. CANTER: All right.

Q (By Mr. Tyson) So you -- to that point you reference it's unusually terse for a redistricting framework at the state level, the principles the legislature adopted. How many other states' redistricting framework have you reviewed?

A Well, I've been an expert in seven states in this cycle and have reviewed the frameworks for other states where I helped advise legislatures and commissions. So I would say I've probably gotten to know the frameworks in at 15 or 20 states.

Q And so when you're referring to this

being unusually terse framework, that's in reference to the 15 or so that you've looked at in other states?

A Yes, what's what I meant. I meant that of the one that I reviewed, I think this may be the shortest I've seen.

Q And have you looked at Georgia criteria or principles of redistricting from prior redistricting cycles?

A No, I haven't.

Q So in looking at the various metrics -- we'll move to population balance. And I guess this is the first -- Table 7 is the first of several tables that are going to compare various metrics among the enacted plan and then various alternative plans. Is that right?

A That's right.

Q And so in looking at the enacted Senate district for the alternative 1, 2, and 3, you'd agree the deviation is higher -- the total deviation is higher on all the alternative plans than on the enacted plan; right?

A Yes, it is.

Q And that's also true for the House alternative plans? Higher deviation for each of the

alternative than for the enacted plan?
A Yes, that's correct.
Q And then looking at compactness, you'd agree that compactness is something you have to measure in relationship or comparison to something else. It's not an objective measurement. Is that generally correct?
A I think the term I would use rather than objective -- I mean, to me objective just means not influenced by personal discretion. So all of these would be objective in that sense. But I think the question is about whether it can sort of stand alone or whether it's best used comparatively.
I've definitely argued very frequently that compactness scores are best understood comparatively. Although I think some people persist in using them as though they can be read on their own.
Q And so you'd agree that there's not a Polsby-Popper score where a district is not compact, it's just more or less compact than something else; right?
A That's right. And furthermore, more or less compact by the likes of that one metric. So I kind of referenced this earlier when we were talking

about a C-shaped district. But Polsby-Popper and Reock, those are contour based scores that measure slightly different things.

And so would probably -- unless there was emphatic agreement among all of the metrics, I would avoid saying something is more compact than another full stop. And I would try to specific measured how.

Q And in looking at the compactness scores -- let's just take them kind of one at a time. So the alternative plan, I guess, on Polsby-Popper is slightly more compact on the Polsby-Popper score than the enacted plan. Am I saying that in the right formulation?

A That sounds good. Are we talking about the Congressional?

Q Yes, I'm starting with Congressional and Polsby-Pipper.

A Right. So the alternative plan is more compact by Polsby Popper than the enacted plan is on average.

Q In your experience is a difference in two hundredths of a point on Polsby-Popper a significant difference in the plans?

A I think they usually call that two

points, as in two percentage points rather than two hundredths.

Q Oh, two points. I'm sorry.

A I would try to resist making any blanket statements about, you know, how big of a difference is officially significant. I don't think that there are -- I think it really depends where you are and what you're measuring.

I've written about this at length. Polsby Pepper scores in particular can penalize you for following coastlines. They have all kinds of features that make it desirable to understand them in context and not try to say anything like 2 percentage points is an official big difference. I would resist that.

Q And then conversely, I guess, for the Reock on the Congressional plan, the alternative plan is more compact than the enacted plan on the Reock score as well; right?

A Right. So not conversely, but in -- it's not compact on both Polsby-Popper and Reock.

Q On both. Yes, I'm sorry. That's right I was going the other direction. Yes.

And so for all the differences between the various plans in Table 8 would you categorize

any of them as significant differences in compactness scores?

A That's not -- I'm not sure. I mean, it's possible that words like "significant" have crept in in individual places. But I would say generally if one plan is more compact than another on all three of these measures, Polsby-Popper, Reock and cut edges, then I'm comfortable saying that it's generally more compact.

And that's certainly the case for this CD Alt versus enacted CD. It's -- it's more compact on all three of these measures. And so I would say CD Alt is generally more compact than the enacted plan.

Q And you knew the compactness scores of the enacted plans when you were drawing the alternative plans for Congress, House and Senate; right?

A I knew them? I had certainly reviewed them, yes.

Q And did you have as one of your goals in drafting the alternative plans a compactness metric to hit?

A No, I didn't have a numerical goal.

Q And your redistricting program that you

were using to draw the various plans didn't display the compactness scores as you were drawing the plans. You had to push a button or do something to get that score, right?

A That's right.

Q Moving to the political boundaries discussion on 6.3. This is the number of split pieces and jurisdiction splits. And I know I understand the difference in that, but if you could just briefly just kind of explain what the distinction is between county splits versus the numbers of splits in a county or the number of county pieces.

A Sure. Absolutely. And so county splits might be better called split counties. It's just the number of counties who -- which have parts belonging in more than one district. So a county is called split if it is touching more than one district. That is, if it -- if part of its territory is contained in no more than one district.

County pieces doesn't just ask a county if it's whole or not whole, but counts the number of districts that it is shared among.

So if you have a county that is part of three -- where parts of its territory belong to

three districts, that contributes one to county splits but it contributes three to county pieces.

Q Thank you. And in looking at the various comparisons on -- let's just -- let's start with just county splits or the number of times -- well, the number of counties that are split. We'll just call it that. That's the first column in Table 9; right?

A Yes.

Q And so on the -- looking at the Senate district, the comparison of the enacted to the alternative plan on Alt 1 and Alt 3 have the same or more county splits and Alt 2 has three fewer counties that are split; right?

A That's correct.

Q And on that House plan, the enacted House plan as compared to the Alt plans, Alt 1, 2 and 3 alternative plans have the same number or more county splits than the enacted plan for the House; right?

A That's right.

Q And you have a count of municipality splits. Do you know Georgia prioritizes avoiding splits of municipalities?

A Well, what I tried to do -- so I'm aware

that that's not only referenced in the guidelines we just looked at but also it's a traditional principle. But states really vary in what they consider to be the relevant kind of municipality.

So I chose the definition here, as you see, census places with functional status A, active government providing primary general purpose functions. Later in the -- when it came time to do the rebuttal report, I had a chance to review the deposition transcript of Director Wright, who was the map drawer, as I understand it.

And in that transcript she did two things. One was to mention that cities and municipalities are the same thing. That's an element of her testimony in her understanding in redistricting relevant ways in Georgia, but, two, to say that that was really quite a low priority for her as a map drawer.

And so while I considered adjusting the split count for munis to only look a cities, I ultimately decided based on her testimony that that wasn't necessary to include.

Q And when you indicated that it was part of the -- the municipalities are part of the principles of redistricting --

A Oh, that was my memory. I suppose I should have gone back to check.

Q Yeah. I was going to ask you where that was because I don't believe there's any reference to cities in the principles.

A Sorry. I stand corrected. You're quite right, which is probably another reason that I was that a little bit on my own in deciding what the relevant kind of municipality was for the purposes of this report.

But I do stand by what I said a moment ago, that it is a traditional principle.

Q And then the precinct splits that you have listed here, is this only census VTDs or is this the precinct information that you got from counsel?

A Okay. This is not census VTDs and actually I think that's an important point that I was to emphasize. So we can go into the reasoning if you want, but I think census VTDs are not particularly relevant in this case. And so are what I understand to be the State's own precincts which best reflect their understanding of administrative geography at the time of redistricting.

Q And are you aware of the process that

jurisdiction has to go through to change precinct boundaries in Georgia?

A I'm not aware of the Georgia specific rules, but it is something I've spent a great deal of time trying to understand nationally.

Q Let's go next to the racial demographics in Table 10. And so just to kind of walk through each of our columns here, majority BVAP is majority any part voting age population -- I'm sorry -- the majority BVAP column refers to the majority any part black voting age population on the census data; right?

A Exactly.

Q And then majority BHVAP refers to majority AP black plus Latino voting age population on the census data; right?

A Well, right with one clarification. You can't simply add any part black to Latino because you will have double counted Afro Latino residents. So you subtract those off so that the BHVAP doesn't double count anyone.

Q So you don't use -- you don't use know single race black. You would use any part black and then subtract individuals who identify as black and Latino?

A That's correct. And that way what --
Q And then --
A I'm sorry.
Q I'm sorry. I'll let you finish your answer. I'm sorry.
A Thank you. That way what you've effectively constructed in HVAP is black or Latino. So anyone who checks the box on the census form indicating that they were black or indicated that they had Hispanic and Latino identity.
Q And then the majority BHCVAP number takes the citizenship race and the ACS data, the block data that you referred to earlier and determines the number of individuals who are in that checked either black or Latino or both and who are citizens of voting age; right?
A That's right. So is uses exactly the process described earlier to estimate citizens of voting age in the black and Latino VAP categories and adds those together.
Q And the effective district column is the -- is your effective district reference you talked about in Section 5 of the report where it's district that are performing in both the primaries and the general election, right?

A Right. I usually save the word performing for empirical outcomes in elections. So it's the districts designated effective by the label we described before.

Q And just -- and just so we're clear, the districts where, for example, on the state Senate where they're not electing candidates of choice on the four primaries but are -- are 5 of 8 or more on the general would be Democratic districts that would not be included in the effective column; is that right?

A Right. For instance --

Q Or likely Democratic districts. I'm sorry. Yes.

A Well, exactly. That was the distinction I was going to make up. It's that the label predicts that those would be white Democrats would be likely to be elected. But it's just a predictive label.

Q And so the number of likely Democratic districts in a general election would be higher than the number on the effective column on this table, right, or could be?

A It certainly could be, that's right. It could also -- if you were just looking at likely

Democratic districts, you might pick a higher threshold than 5 out of 8. And so if you did that, it could be higher or it could be lower. It's just a different -- and that's -- that was my point from earlier.

This really is not attempting to get a measure of Democratic performance. It's doing something different.

Q And so in looking then -- let's kind of look at the specific groupings we have. So we have the enacted plan has two majority BVAP districts and five majority BHBVAP [sic] districts, right? BHVAP districts. Sorry.

A Yes. Let's get that right. Okay. Sorry. So the enacted plan has two majority BVAP, five majority BHVAP and just four majority BHCVAP.

Q Okay. And so the differences from the enacted plan to the Alt plan for Congress with plus 2 BVAP, plus 1 BHVAP, and plus 2 BHCVAP and plus 1 effective, right?

A Correct.

Q And the Senate plan here. On just the majority BVAP column are either going to go plus 3 majority BVAP for Alt 1 plus one majority BVAP for Alt 2 and minus 6 majority BVAP for all three. Do I

have that right?
A That looks right.
Q And similarly for the House, only Alt 1 increases the number of majority BVAP districts and that's plus 1, and Alts 2 and 3 both reduce the number of majority BVAP districts over from the enacted plan, right?
A I agree.
Q Let's move next to out incumbency and core retention setup. So you reference the incumbent database that you were provided by counsel but U suspect that it's not current data given where we -- where they stand. Please explain generally what you're talking about in Section 6.5.
A Right. I was provided with incumbent addresses. I then geo-located them, and based on what I found I'm not sure that they're fully accurate or up to date for everyone.
One reason is that there is a requirement of living in the district for legislative districts, though not for Congressional and I wasn't finding that all the incumbents lived in the districts from which they were elected.
So that leads me to think there were some errors.

Q And you don't know the source of that incumbent database but you provided it in your data; right?

A I actually don't know the source except that it was provided to me by counsel.

Q And so then I wanted to come down at the end of 6.5 where you reference the state's line drawers clearly placed a low priority on core retention.

What is just since you're giving a definition of core retention is that principle referring to?

A So core retention generally refers to preserving the -- either the physical geography of districts from their benchmark configuration as much as possible or the population, reassigning as few people to new districts as possible.

I've seen it handled both ways in terms of land and in terms of people. I think it would probably be a bit more common and more accepted to do the measurement in terms of people.

And so -- should I go on and explain how the measurement is done.

Q Yes, if you could.

A Sure. Yeah, so you have to remember

that the benchmark plan was drawn with different blocks because the census bureau changes the particles, the atoms of redistricting each time there's a new decennial release.

So what you have to do then is take the boundaries of the old districts, take the population according to the new census and ask each block is your district assignment based on the boundaries from the last plan the same before redistricting as it is now after redistricting.

So there's a little bit of imprecision that comes from those changing blocks. But for the most part in my experience when different analysts do this calculation with different software they get the same or almost the same answer.

Q Okay. And when you're looking at that comparison, are you looking just at did the district's number change or did the -- are you looking at did this voter get moved into a district with a different group of people than they were in that district previously?

A Right. I mean, that's a key question and people often forget that the labels, the numbers that you put on districts, those are a matter of convention.

So if you kept all the districts exactly the same but swapped the numbers, that could show up as poor retention if you just do it by district assignment.

So later when we get to -- I can't remember if it's -- maybe Section 8 or 9, a later section of the report I'm going to try to distinguish those by looking at displacement in the sense of labels but also looking at what I call dismantling districts in the sense of breaking up their residence across multiple districts.

Q Here when you're referring to more than 2 million residents were reassigned in the Congress and state Senate plans, you're just referring to district numbers only; is that right?

A Right. But I suppose it's worth mentioning that I did check that the new numbering is optimal in the sense that there's no renumbering that would have made the core retention numbers look better. I did check that. And that is the case.

Q And is that for Congress, Senate and House you checked that?

A Yes. You could eyeball it for Congress if the districts are big enough, but it's a -- it's a computation for Senate and House.

Q And so you're aware from Director Wright's deposition that the House districts are traditionally renumbered at the end of each decennial redraw; right?

A Yes.

Q And so it's your testimony that that renumbering of the districts doesn't impact your conclusion that 6.1 million people were voting in a different district than before here on Page 24 of your report?

A That's right. I -- my recollection is that I ran a check to see whether any alternative numbering would improve the core retention numbers, and I found it would not.

Q And so when you say that this is an unusually high displacement, what is that in relationship to?

A That's in relation to my experience in other states. I have never found an instance with 60 percent displacement in my limited -- admittedly limited experience.

But I have looked at numerous other states frequently both at the state level and at sub-state levels you'll find. In states and localities where there's an emphasis on core

retention you'll find far higher retention numbers.

Q And so wrapping Section 6 -- one more question on this front. You are aware that on the Senate plan there are districts that would be collapsed in south Georgia and move to north Georgia as part of the process; right?

A I did read that in the transcript, the collapsed districts. And that's completely consistent with -- with what I inferred from my study of the map.

Q So wrapping up Section 6 of the report here, you've reported a variety of metrics, but we start at a point where you're offering opinions but you're still just reporting statistics about the various plans; right?

A Well, to some extent there are opinions here such as the opinion that relative to other states I find there to be low evidence of a priority on core retention. You could characterize that as an opinion.

And so along the way in the discussion of these, there's some implicit opinions that are articulated. But generally I agree with you that the point of this section is to report the metrics.

Q Let's move next to the Gingles

Demonstration Plans. So in reviewing -- I'll start with Congress, Section 7.1. And the alternative plan that you've drawn does not make district 6 a majority-minority district, it remains a majority white district; is that right?

A Yes, that's right. In my CD Alt plan District 6 is 57.1 percent white by VAP.

Q And District 3 is a district that now has become a majority black VAP and BHVAP district, right?

A That's correct.

Q Then moving to the Senate plans, you indicate in the second paragraph there on Page 25 under 7.2 that the increase in majority BVAP, BHVAP, BHCVAP districts is accomplished while maintaining other traditional principles. Do you see that?

A I do.

Q And what is the basis -- is the basis for you saying that the increase is accomplished while maintaining other traditional principles like compactness and splitting scores that are generally comparable to or better than those of the state's enacted plan that the metrics we looked at in Section 6 are largely similar?

A Similar or better, that's right.

Q And so in dealing with the incredibly complicated puzzle that we know redistricting and the tradeoffs that are involved, when you're creating the alternative Senate plans were you able to prioritize any of the principles over any others, or does each district involve a balancing of those principles as you drew?

A You're always balancing. And as I indicated earlier, when I found what I thought were materially different ways of handlings the tradeoffs, I offered two options rather than just one.

Q Let's look at some of those options, turning to Page 26. And this is the SD Atlanta region; is that right?

A Yes. Correct.

Q And so in this -- in this plan District 16 as it's drawn, it looks like it's the southernmost district -- we'll call it that just for easy reference on this -- includes parts of Clayton County with other more rural counties south of Atlanta, is that right?

A I'm not sure I could pick out Clayton confidently without a label, but I think if I have it right, then yes.

Q And Fayette County -- we'll make it a little easier. Fayette County is all dark blue on Alt 1?

A Okay.

Q That includes a part of south Fulton along with all of Fayette; right?

A Yes. That's what it looks like.

Q And so is there a particular methodology you used in deciding to put, for example, south Fulton with all of Fayette?

A That wouldn't have been, you know, a sort of explicit consideration. I looked to see if there were ways of drawing the maps that balanced the principles that we've discussed.

These should be understood, of course, as demonstration maps that show that it's possible to do several things at the same time. And that's the intent of presenting them here.

Q Okay. And so you weren't considering, for example, the rural nature of southern Fayette and the more urban nature of south Fulton as you were drawing the alternative plans, right?

A Generally as we discussed earlier, I had certain aspects of community testimony in mind because, as we discussed, I reviewed that testimony

at the same time that I was doing map drawing. But as a general matter, I think it's important to emphasize again that these are particular kinds of demonstrative plans that have a particular racial threshold that they in my understanding have to hit by law and that they're not the same as remedial plans which come at a later stage of the Voting Rights Act.

Q And so these are examples, they're not districts that the legislature should have necessarily created? It's more just to show a problem?

A I think the role of Gingles 1 demonstrative plans is to show that there's a problem and to show that the problem is remediable.

MR. CANTER: Bryan, we've been going --

Q In looking --

MR. CANTER: We've been going just about an hour, just if you're -- Moon, if you're fine, then we can keep going. I just wanted to --

THE WITNESS: Yeah, I -- I'd love to keep going for now.

Q (By Mr. Tyson) All right. So looking over at tables 12 and 13, this is where you're

comparing the enacted plans to the alternative plans, right?

A That's right.

Q And so in looking at Alt 1, for example, you have districts 34 at 72.2 percent on BVAP, right?

A Yes.

Q And in Alt 2, District 39 is at 86.5 percent on the BVAP number, is that right?

A That's right.

Q Do you consider either of those districts to be packed under your definition?

A Well, so the definition of packing is elevation of the -- that I gave before. So my -- my working definition for the purposes of this report is the elevation of minority population past what's necessary to achieve a certain goal.

And so here -- in particular, to achieve electoral opportunity. So here my claim isn't that I've tried to optimize demographics. In fact, as I think we all know in redistricting, there's a delicate balance we're trying to strike where you must be race conscious at least to hit the 50 percent plus 1 threshold.

But you try to be minimally race

conscious because it's -- it's best not to let -- you're required not to let race predominate over other concerns.

And so this area, we're looking at the Atlanta region, has a lot as we saw in the dot densities before. It's -- it's quite a segregated area. There are areas with very high concentration. And so if I'm only looking at race in order to meet that 50 percent threshold, then it is likely that I'll tend to see some districts with extremely high black voting age population.

So, again, if I'm not exclusively trying to bring that down but only trying to draw minimally racer conscious alternatives that meet the threshold requirement, then it's not surprising to see high concentration.

Q And just so I understand that last point, so your goal is to draw minimally race conscious districts that are above 50 percent, that essentially -- like, for example, District 39 on Alt 2 is leftover population after you created those other districts that were above that 50 percent threshold?

A No. Rather what I mean to say is that based on the size of the Senate district and the

regions which are very heavily black I found that I was creating some district with very high black percentage just as a matter of human geography but that even though that was happening it did not impede my ability to draw additional majority districts. So that the Gingles threshold standard is quite easily met in this part of the state.

Q And so then in your mind the 86.5 percent district on Alt 2 wouldn't be packed because the Gingles threshold can be met in districts around it?

A Well, the term packed is -- is not as we saw before a matter of bright lines. It's definitely true -- as I said, when I have two different demonstration plans it's often that I'm trying to illustrate a tradeoff.

And so here Alt 2 has fewer majority districts than Alt 1 does but still more than the state. And on the other hand, it's a bit more compact, maybe even substantially more compact depending on what you think counts as a substantial difference.

So you're seeing tradeoffs here. And I think it's the -- the stats that we see in Alt 1 where there are nine majority BVAP districts, ten

1 majority BHVAP and also ten by BHCVAP. What I've
2 shown here is that that's readily accomplished while
3 being highly mindful of other principles. Alt 2
4 shows that if you dial up certain other principles
5 you can still even with a very heavy emphasis, say,
6 on compactness, you can still achieve that while
7 increasing the number of majority districts over the
8 state.
9 Q Let's look next to Page 28 which is the
10 SD Gwinnett area. And this one, unlike the prior
11 set of maps, only has an Alt comparison, not an Alt
12 1 and Alt 2 comparison. Is Alt 2 any different in
13 this area?
14 A There is no Alt 2. I'm sorry. Can you
15 ask that a different way?
16 Q Certainly. So I just wanted to
17 understand in the SD Atlanta region you provided
18 enacted, Alt 1 and Alt 2. In the Gwinnett you only
19 have enacted an Alt 2. And so my question is: Is
20 Alt 2 in SD Gwinnett different than the enacted or
21 different than Alt 1, or are you just selecting one
22 to look at?
23 A Oh, I'm sorry. I don't mean to be non
24 responsive. But there is no Alt 2, so I can't
25 describe it's properties. But --

Q Okay.
A Yeah, maybe if you rephrase. Because there's no Alt 2 to describe.
Q Let me ask this: Why is there not an Atl 2 on Page 28 but there is an Alt 2 on Page 26?
A Absolutely. Fair enough. I'm just trying to -- just trying to understand the question. So I've offered two alternatives: One I found, too, that illustrated a tradeoff in a way that I thought might be interesting for the court.
So in Atlanta we saw -- we just discussed the tradeoff. The tradeoff was districts that you could arguably describe. You might even say there's some -- there's some unintentional packing or some overconcentration in some of the districts in Alt 2 as you just described.
And if you reduce that, you can create more majority districts. However, Alt 2 is more compact. You know, we just described the tradeoffs.
In Gwinnett I didn't have an example of a tradeoff that I wanted to illustrate. And so I think Alt 1 works as a Gingles map, is I think quite compelling. And again, I always -- in all of these clusters I found many examples, not just one. But I didn't find that there were two that were kind of

1 materially different in ways that might be valuable
2 for the court in Gwinnett the way I found in
3 Atlanta.
4 Q So looking at Page 30. This is SD East
5 Black Belt.
6 A Yes.
7 Q So we have the Alt 1 plan that, like we
8 talked about earlier, kind of walks around the
9 purple district that's centered or I guess goes into
10 Augusta.
11 Both of these plans, though, split
12 Laurens County, which is kept whole in the enacted
13 plan; is that right?
14 A Which one's Laurens.
15 Q Laurens -- well, Laurens is on Alt 1
16 where it's a split county between the purple and the
17 orange-ish-beige district.
18 A Okay. Just a moment. I'll try to find
19 it. Purple and beige. Yes, I think I found it.
20 Q Okay.
21 A No, that's not it. No. I'm sorry. So
22 which part of the district is it in?
23 Q It's the southern part of the -- I guess
24 that's District 24.
25 A Oh, yes.

Q And it has that portion into Dublin in the purple part. Yeah.
A Okay. And what about it?
Q That is green and whole on the enacted plan; right?
A Uh-hmm. Yes.
Q And are you familiar with Macon-Bibb County on the western side of all of these -- of this region?
A Yes, generally I am.
Q And all -- all these plans split Macon-Bibb County; right?
A It looks like it.
Q Looking at these maps, is there a particular district on Alt 1 that you're opining the state should have drawn and failed to do so?
A Oh, it's not my understanding that Gingles 1 exactly works that way in my understanding. It's not that the state should have found any particular district that I drew, but that I'm demonstrating it was possible to draw a district in some way.
So the state could have, of course, found a totally different configuration that nonetheless is -- resists this kind of Gingles

improvement, if you will.

Q And, again, in terms of-- I'm sorry. I'll let you finish.

A I keep doing that. I apologize. In particular, the -- the third coalition district that both of my alternative maps have, I am suggesting that the -- had the state drawn a third coalition district, I would have not been able to produce a Gingles map improving on that.

Q And in terms of the SD Black Belt, East Black Belt Senate district, you didn't conduct any sort of ability to elect analysis on these alternative plans like you'd done on the effective scores; right?

A Well, I think that is an ability to elect analysis, the effectiveness scores. And I do have for these plans. We can find it later in the report. It's --

Q Okay. So you would consider the effectiveness scores to be an ability to elect analysis that you conducted on these districts, right?

A Yes.

Q Okay. And so in looking at the configuration of these districts, so if -- for

example, you have Augusta in Richmond County in Alt 1 going down into the split of Laurens County and over into Milledgeville. But as I understand it, you don't have necessarily a particular reasoning behind why you connected certain parts of these districts together; is that right?

A That's right. It's not the case that I would approach these by saying, oh, this county and that one should be or can't be together. I was really looking broadly at what's possible from reconfiguring these seven districts.

Q So it's not a community of interest you're looking to protect or put together in these various Alt configurations?

A Well, again, I didn't have a quantitative measure for communities of interest here, which I have been able to use in other states.

But I'll just point out -- although I'm sure we'll get to it later, I'll just point out to preview that the way that the state collected testimony didn't lend itself to a mapping approach very easily because the testimony is all narrative and didn't include mapping data.

Q And just so I can understand -- I know we talked about the various regions and you've only

selected out a few of the regions. I didn't see that there were, for example, a DeKalb or -- I'm sorry -- a northwest or southeast or southwest region in this Section 7 of your report. Is that because those were unchanged and they're only changed on the Alt 3, or is that because they didn't have an illustration that you wanted to point out?

A I would say that I have quite a high standard for what I would offer as a Gingles demonstration map. And so while I had, as you can see throughout the rest of the report, no trouble in reconfiguring maps to create more electoral opportunity all around the state, I've only selected some to put forward as Gingles demonstratives.

Q Okay. And that helps. So in terms of the -- basically on the Senate map there's three areas where you're putting forward a Gingles demonstrative, Atlanta, Gwinnett and the East Black Belt; right?

A Yes. Exactly. So a total of five maps in three regions.

Q Let's move next to the state House. So we have, first of all, the HD Atlanta area, which is quite a big spot south of -- south of Atlanta here. And you have both Alt 1 and Alt 2. And actually, I

did ask this earlier. But when we were looking at the title underneath where it says Enacted 18/18/18, and that's referring to majority BVAP, majority BHVAP, and majority BHCVAP; correct?

A Yes, that's correct.

Q So in this area you've gone from enacted plan an 18 majority BVAP district to Alt 1 has 20 majority BVAP and Alt 2 has 19 majority BVAPs; is that right?

A Yes, that's right.

Q So in looking at these and -- actually, let me just -- and this may not make a lot of sense to ask but the primary difference, it seems to me, between these three on the western side involve the treatment of Douglas County, which the -- the second county over after the green part that's in Carroll. The enacted plan is a lot more kind of north-south oriented district. The Alt plans are more east-west oriented.

And is there particular reasoning why you've reconfigured Douglas County this way?

A Well -- okay. So I'll mention. So even though there are 25 districts in the clusters, you've correctly noted that a number of them didn't change at all, like that green district, which I

1 think is number 71 all the way to the left.
2 And that's partly because given the
3 deference involved in carving out 25 from the
4 enacted plans, it was quite hard to change some of
5 these while still being respectful of county lines,
6 for instance.
7 So you're right to notice that a number
8 of districts don't end up changed at all in the
9 alternatives, even though I could have changed them
10 within the regional framework.
11 As to the question of converting
12 primarily north-south to primarily east-west, I'm
13 not sure I would characterize my alternatives as
14 primarily east-west. To me they look fairly plump
15 and compact.
16 And that reflects a priority on
17 compactness among that whole list we keep discussing
18 of elements to balance.
19 Q And similarly on Alt 1 where there's a
20 piece of Clayton in kind of a -- a olive-colored
21 district that starts in Clayton and runs down
22 through Fayette down into rural Fayette and
23 Spalding, there's no particular community or
24 explanation for the configuration. It just -- it's
25 a district that can be drawn that is now majority

black. Is that fair?
A Well, we can -- we can cross reference and see if that particular one is now majority black, but I believe you if that's what you're representing. Is that District 75 maybe?
Q That's district, 75 yes. So I believe it was majority black previously on the next page --
A That's right.
Q -- but it's been lowered in -- from 74 percent down to 54 percent.
A I agree. And, you know, incidentally when I redraw I have to contend with the question of labeling. And so what I've done is I've -- I've run a computer script to identify optimal labeling. And what I mean by optimal is that the most people retain their district assignment that's possible under any way of labeling these.
So the reason -- even though, as you point out, the district extends much farther south in the alternative plan than it used to, it still overlaps in enough population with its enacted configuration to get that label.
Q Okay. So you'd agree at the very least district 75 has been elongated from enacted plan to Alt 1 configuration, right?

A That's definitely right. It reaches significantly further north south in the Alt 1 than it did in the enacted.

Q Turning over to Page 34 and Table 17 and 18, I wanted to ask you about Table 18. You said that Alt 2 dominates the enacted plan. And that's based on the county splits and number of cut edges only; is that right?

A So -- sorry if that's unfamiliar. So dominates is a technical term from optimization in which you say that one -- if you have multi-objective optimization, if you have several different metrics you're considering, to dominate is just to be better in all.

That's all it means. I know the connotations are sort of aggressive, but it's -- it's a technical term.

Q Great. Thank you. Thank you for that clarification. I definitely was thinking a more aggressive reading of that, not the technical reading.

So in looking at the Alt plan again, I noticed that on Alt 1 counted four districts that are greater than 80 percent on the Black VAP number, a district that's over 90 percent on Alt 2 in

1 District 57 on the Black VAP number.
2 Are these districts packed in your
3 estimation?
4 A It depends whether you're using the word
5 packed to kind of connote the intent to dilute the
6 vote. And certainly if you mean packed that way,
7 then they're not packed. Because there's no
8 dilutive intent, I can assure you.
9 If, on the other hand, you mean the more
10 restricted population concentration beyond what's
11 needed to achieve certain goals, I would say that
12 those are very high numbers but they reflect the --
13 what I found in the geography.
14 Now, of course, you can always attempt
15 to unpack that to counteract the human geography by
16 creating, for example, elongated districts. But I
17 found that that was not necessary here in order to
18 significantly improve on the number of majority
19 districts overall.
20 So, again, just to summarize. That was
21 a bit of a mouthful. What I'm saying is, yes, those
22 numbers are very high. No one's claiming you need
23 90 percent black population to have opportunity.
24 But, you know, the -- the tradeoff of compactness
25 and county splitting and so on that would be

1 necessary to bring those down isn't needed here in
2 order to meet the Gingles standard.
3 Q If we keep working our way along through
4 the southwest region, and this is a region -- in
5 looking at this, this looks like it's a plus 2 on
6 all three of the majority and coalition categories;
7 is that right?
8 A Yes. So now we're in HD Southwest, and
9 I see plus 2 in all categories.
10 Q And one of the things on the Alt plan I
11 noticed is Albany is the -- kind of population
12 center area. It's connected all the way down to the
13 Florida border. Again, is there a particular reason
14 why you're putting Albany with a border county
15 with -- on the Florida border like that?
16 A I would just repeat the explanation from
17 earlier that says that these are intended to be
18 demonstrations of what's possible, not necessarily a
19 call for a particular configuration in -- you know,
20 in this remedy at the end of the day.
21 Q And going over to Table 19, the HD
22 Southwest Alt 1 also does split more counties than
23 the enacted plan, right?
24 A That's correct.
25 Q And I think I know the answer to this

1 based on what we talked but the same question. Why
2 do we have an Alt 1 only for HD Southwest when we
3 have Alt 1 and 2 for the HD Atlanta region?
4 A I would say that even though I found
5 lots of Gingles qualifying maps in this region, I
6 didn't find two samples that really illustrated any
7 particular tradeoff I wanted to communicate to the
8 court.
9 Q Moving right along to the East Black
10 Belt on Page 37. This is a plus 1, it looks like,
11 on majority BVAP. It shows Alt 1 and Alt 2 as
12 compared to the enacted plan, right?
13 A On BVAP, that's right. And then there's
14 a difference on the HVAP, on the coalition
15 categories. There's an additional district in Alt 1
16 compared to Alt 2.
17 Q And it looks to me just from trying to
18 look at the configuration that there are more
19 districts going Augusta on the Alt plans than on the
20 enacted plans. Does that look right to you or sound
21 right to you?
22 A We could try to count.
23 Q I'm sorry. As to Alt 1. Yes.
24 A I don't -- just informally, I don't --
25 it doesn't look like there's a very different number

of colors in the area. But let me try to count. That would be helpful.

Q That's all right. I was just trying to understand. But I think that what we've talked about here, you're not saying a particular district like this -- you're not saying it has to be configured this way, you're just giving an example of what could be done?

A That is exactly right.

Q And then on Table 20 on the next page, the Alt 1 map does split one more county than the enacted plan for this region; right?

A That's correct, and Alt 2 has one fewer. That's an example of a tradeoff, yes.

Q There we go. All the different complicated things you have to balance on a map.

A That's quite right.

Q So in looking over at HD Southeast, this is one I wanted to ask about because it looks like the difference in the Alt plans and the enacted plan is minus one on the majority BVAP district and no change on the kind of coalition grouping districts. Can you help me understand that?

A So what you've found quite rightly is a typo that I did notice in the preparation session.

So if you just slip to the next page, you can see that there are five coalition districts by VAP. So that should say five, not four. And that's a typo.

Q Got it. Okay. And so that's five for both the majority -- for both the BH -- I'm sorry. That's true for the BH VAP HVAP number, right?

A That's right. And we can just -- let's quickly flip ahead and check this out for -- let's see. So that's Districts 161 -- so 161 is the additional majority BH VAP district in both of these. And I'm going to quickly flip ahead to the next section and look at House District 161 and not. But it stays the majority by CVAP.

Unfortunately, there's just so much data associated to these maps that I had to split it, in some cases, across multiple tables. So the numbers should be 055 for both of the Alts.

Q All right. And then, again, I think I know the answer here, but in terms of not presenting reconfiguration for HD Cobb, DeKalb or Gwinnett, that's just because you didn't feel like it met the standard for Gingles 1 maps in those areas. Is that right?

A That's right. And that's not to say that another mapper couldn't -- I'm not opining that

it's impossible to meet the Gingles standard, but just in my personal way that I like to balance the demands, I didn't find anything that I choose to pursue.

Q And your methodology for choosing what you were going to present and what you weren't was just your own standard of looking at the map and determining what you felt like was the strongest?

A Well, you know -- so, as I said a moment ago, we're engaged in what technical folks call a multi-objective process where you have all these different metric attributes, the eyeball tasks, and communities interest, and many other things.

And so to me the question is did I find maps that I could confidently describe as meeting the most stringent Gingles demands while being in my view balancing all the other attributes in a way that I could describe as being comparable or stronger.

And so I wasn't able to meet my own standards. And again, that doesn't mean that someone else couldn't or that I couldn't with more time.

Q But to be clear, in Section 7, Section 7 contains all the maps that you're presenting as

Gingles demonstration maps in this case, right?
A Yes, quite right.
Q And aside from presenting these maps as Gingles demonstration maps, are you offering any other opinions in this part of your report or just providing the maps and the data that you selected?
A If opinions come out in the discussion in this section it's minimal. So it's possible that some conclusions are implicit. But as you say, this section is mainly intended to present the maps and the data.
Q Dr. Duchin, we've been going about an hour and a half, and this is probably a good break point before to go to Section 8, if that works for you.
A It works for me.
MR. TYSON: We can go off the record.
THE VIDEOGRAPHER: We're going off the record at 4:43.
(Recess.)
THE VIDEOGRAPHER: We are going on the record at 4:54.
MR. TYSON: Thank you, Scott. And Carla, you were right. I forgot our read-on period there.

Q (By Mr. Tyson) All right. So we're going to move to Section 8, and I think this might be a record for the fastest section for us to cover because -- I just want to make sure I'm correct that this section of your report shows the population percentages and the difference on the Alt plan between majority BHVAP districts and majority BHCVAP districts; is that right?

A That's exactly right.

Q And so for the entirety of section 8 you're not offering any opinions. You're just presenting the data; correct?

A Correct, to the extent that any opinions are implicit, it's that certain districts remain majority districts by CVAP.

Q We can move to Section 9 on Page 46. All right. So in Section 9 we're now shifting from the Gingles 1 map into kind of a different goal of the Alt 3 map. Is that fair to say?

A Yes.

Q And so the Alt 3 maps that we'll be looking at in section 9 related to -- well, would it be correct to say they relate to maximizing effectiveness or increasing effectiveness?

A Well, certainly not maximizing. One

could also do that. But that's not what I've done here. They do have increases in effectiveness, but the goal here is to illustrate that it's readily possible in Georgia to achieve effectiveness without majority minority population status.

Q So when you call these effectiveness oriented plans, what does the oriented mean in that title?

A Well, that means that under Gingles, my understanding of my assignment and of the current state of the law is that you have to get to 50 percent in order to have a qualifying plan.

And this shows what might happen if you considered traditional principles and you considered effectiveness as I've constructed here, but you release that regard for the 50 percent line.

Q And so in the first paragraph you say that you increased the number of majority districts for the coalition of black and Latino Georgians while simultaneously ensuring that traditional districting principles are highly respected. What does it mean to highly respect traditional redistricting principles?

A It means to take them very seriously as goals.

Q And does that refer to the metrics that you've discussed in Section 6 in terms of respecting those traditional districting principles?

A I would say it's reflected in the metrics.

Q Are there other traditional districting principles that you're highly respecting in the creation of these Alt 3 plans that are not reflected in metrics?

A Well, you know, as we can see, for instance, in the deposition transcript of Director Wright, the state didn't use any particular compactness metric but used an overall holistic assessment of district shape.

And so that's an example of a consideration where you look at the districts and ask if they look pleasing to the eye that I think is a legitimate way toto think about compactness a well that isn't based on a metric. that's just an example.

Q Are there any other metrics -- I'm sorry. Are there any other metrics that you use -- I'm sorry. Are there any other traditional redistricting principles that you used in the reaction of the Alt 3 plans that cannot be measured

in metrics besides kind of the eyeball compactness discussion?

A I would say that it's all the same considerations as in the previous sections. So referring back to what we discussed before, most of those things are metrizable except for anything holistic to do with compactness or communities of interest.

Q And you reference in the next paragraph that the existence of crossover support for black and Latino candidates of choice, Asian American, white and other voters is a certainty.

And I'm assuming that's based on the fact that black preferred and Latino preferred candidates can win statewide in a state where they're not the majority, right?

A That's one demonstration. And another is precisely what's to follow, which is showing a large number of districts that have -- that are labeled effective in my framework while having far from a majority.

And that demonstrates the presence of crossover support, so-called crossover. I mean, it's a term that is frequently used. But doesn't -- as usual with many of these terms, doesn't have a

very precise meaning.

Q And general collection crossover support for black and Latino candidates of choice is Asian American,Want white and other voters voting for Democratic candidates, at least in Georgia in 2023?

A Well, remember that the analysis includes primaries. So --

Q Right. And I was asking specifically for the crossover support reference here in the general election. That crossover support is supporting Democrats; right?

A Well, in the general election, yes. In the primaries it means showing up in the first place and then also aligning with the preferences of black and Latino rotors.

Q I wanted to ask you. At the last sentence in that paragraph before we get to 9.1. You say in the enacted plan the state has not just avoided majority districts but has even conspicuously limited the number of districts providing effective opportunity to elect well below the level that is easily attainable from a race neutral mapping process.

So how are you distinguishing here partisanship and race in the mapping process?

A Well, I don't think that sentence refers to partisanship at all. It just says if you were to undertake -- let's hypothesize a race neutral and party neutral mapping process. Then you might expect more opportunity.

This might be a good time to note even though we're discussing my initial report, that that's a theme that I come back to in the rebuttal report where the state's expert, John Morgan, drew what he described as a neutral plan. And even his neutral plan has more effective districts than the state's.

So I would call that conspicuous limitation of the number.

Now, as you have kind of indicated with the question, that can be in the service of partisan goals but the effect is to reduce the number of opportunity districts below what a blind process might have found.

Q And the usage of the term the state has not just avoided, has conspicuously limited sounds like kind of intent language to me. You're not saying that this was an intentional decision by the map drawers to engage in this kind of process of limiting opportunities to elect districts, right?

A Well, you know, as we discussed earlier, that's probably a conclusion for the courts. But I do find this to be suggestive of intent.

Q When you say suggestive of intent, it means that -- well, what do you mean by suggestive of intent?

A Well, I mean that as always I try to carefully describe my role as one of providing evidence to make a conclusion from. And I think this evidence supports a finding of intent.

Q But you're not saying that it was intentional conduct. You're just saying it supports -- the data support a finding of intent?

A This is just my attempt to -- add a kind of necessarily humility about the -- what my role is in a case like this. So I provide evidence. I can suggest that I find the evidence suggestive. But ultimately that's a conclusion for the court to draw.

Q Let's look next to the section 9.1 which talks about Congress. And you say that it's extremely to improve on the limited number of effective districts, and to do this involves relieving the packing and cracking from the enacted plan.

So can you explain to me just what figure 16 chose and how figure 16 demonstrates relieving packing and cracking from the enacted plan?

A Sure. You bet. So this is -- again, as we saw earlier, this is what's called a Choropleth. But now instead of the units being state precincts, the units are Congressional districts themselves.

So we are seeing the different districts and the shading is the coalition's share of -- this is probably VAP, although I wish I had specified. I think this is probably VAP rather than CVAP in these figures.

So what I do I mean by relieving the packing and cracking, here again, this -- this kind of calls us back to the earlier conversation about district 3 as so-called firewall.

So you see in the benchmark plan, the enacted plan and the Duncan-Kennedy draft plan, in all three of those you see that district 3 has a lighter shade, indicating lower coalition share of voting age population.

And then you have intense purples in the metro Atlanta area and a pretty strong purple down there in the southwest.

By contrast -- that's the packing and cracking. The visual correlate is when you see the sort of deep colors next to the light colors informally. Again, any analysis of this kind is a holistic collection of many parts, and a visual like this is only intended to be corroborative of other kinds of analysis.

But I still think this figure really helps us understand what's going on. As well you can see in my alternative plan at the lower left, is that some of that population has been distributed in ways that don't create such concentration in the Atlanta area and that allow for District 3 to be reconfigured with significantly more coalition share in a way that in fact turns out to correspond to effective opportunity.

Q Let's go next to the Alt 3 plans for the legislature. So we have, I guess, our various different modules. And we're starting with the SD Atlanta module for Alternative 3, right?

A Right. Correct.

Q And so in turning to the next page to Table 27, again we have a district that's sitting at, you know, 76.8 percent on its black voting age population, District 34. But that's in

your mind not a packed districted because you were able to draw more effective districts in this particular module since we're now in a non Gingles context?

A You could call it packed if by that you mean that 76.8 percent BVAP or 88 percent BHVAP isn't necessary to achieve effectiveness in that pat of the state. But certainly not intentionally packed. The point of this section is to show that if you turn off all use of race, you can still get to lots of effective districts in ways that are very TDP respecting, right?

So there's -- you know, whereas in the Gingles context you have this delicate tight rope of 50 percent plus 1, but not too much use race. Here there really is no particular consideration at all for racial demographics in the drawing of the districts, just effectiveness and the other TDPs.

Q And so when you were drawing these maps without these racial considerations and looking at effectiveness did you display political data or effectiveness scores on the maps as you drew the districts?

A So the only consideration of political data is in the building of the effectiveness score

and nothing beyond that. And, yes, these are definitely -- they're called effective disoriented, so definitely they're like -- they place a high priority on the creation of effective districts. Again, that's the only way political data is used, and demographic data isn't used at all.

Q And I just want to make sure I understand. Like what are you looking at when you're drawing the Alt 3 maps? Like did you have visible effectiveness scores for certain areas so you could know to take that in or out?

How did you make the call as to where to put the lines?

A Exactly the same as before. Some exploratory runs that show me what's possible so I guess a sense of how many effective districts might occur just by line scrambling.

And then from looking at some interesting examples in terms of TDPs that come out of that process. Then making some hand decisions and executing them for the hand drawing phase.

Q Okay. So you're algorithm that you would -- you would configure it to work in a particular district and to draw more effective districts on the various iterations that you would

review before you hand draw; is that right?
A Right. And we can -- we can, and I suppose we will talk more about this as we go -- as we get to the rebuttal report. But these exploratory algorithms they're never assigning people on the basis of a score.
But they are making decisions about whether to accept proposed changed that are probabilistic where if a score is driven up, you're more likely to the change.
Q And so looking at the SD Gwinnett on Page 49, again we have a district that's, you know, over 80 percent BVAP but this is also a map that has effective districts in this region; is that right?
A That's right. It seems to me, if I'm counting right, they have two more effective districts but whereas the enacted plan never goes above -- it looks like 66 percent BVAP. I have a district that gets to 84.8. And that's because the pattern of where people live made that happen while I was paying no attention to do demographic levels.
Q And going over to the southwest Senate districts, this is an area where the number of majority black districts stayed the same, but you added a -- an additional coalition district that's

already got an effective district. We aren't looking at race in that additional --

A Exactly.

Q -- effective district; is that right?

A That's right. Exactly right.

Q And for the East Black Belt area --

A I'm sorry. If I can -- if you don't mind, just add something quickly before we move on?

Q Certainly. Yes.

A This is great sample where the district is -- District 11 in my alternative effective map 3 is aligned in four out of four primaries, but only six out of eight general elections.

And that's something that just doesn't occur in -- very much in the enacted plans is something that has sometimes preferred the Democrat and sometimes preferred the Republican. So these aren't Democratic maximization maps by any stretch. They just need to be aligned with that candidate of choice at least 5 out of 8 times, and here's an example.

Q And on that District 11, if a district that starts in Columbus and runs all the way down to the Florida border are there particular geographic or community considerations you're taking into

account or is this really just focused on effectiveness?

A This -- this section shows a focus on effectiveness.

Q So you can't identify any particular geographic or community reasons to link that part of Columbus with this part of south Georgia?

A Well, no.

Q -- in the effectiveness?

A That's right. And once again, I'm not suggesting that some -- this particular configuration is in any way required. I'm showing what might happen if you were drawing with an eye to effectiveness and the TDPs.

Q I'm looking over to the Augusta area. It looks like from this that in the process of adding the effective districts there's not a single district that's below -- above 50 percent on either BVAP or BHVAP on this east Black Belt Alt 3 map, right?

A Right. That's -- that's quite notable here. So while no districts get to 50, four of the districts are nonetheless effective, labeled effective.

Q And looking over to SD Southeast gets us

to the coastal area. And, again, I think I know the answer given our discussion, but there's no particular reason for dividing Chatham County in half the way you have. It's really just driven by what could make 1 and 2 both effective districts; right?

A Well, I mean, I do try to avoid county splits. So the claim here isn't effectiveness trumps the TDPs. Is that's I'm trying to harmonize effectiveness with the TDPs. But as to why some particular county is split and not some other, indeed there's -- you shouldn't draw from that any kind of necessary inference about my community of interest reason.

Q And looking over at Figure 22, this is one I wanted to ask about because this is one of the only ones I think I saw where you had effectiveness in the primary but not effectiveness in the general in districts 32 as it's configured.

So you say your goal here -- or that this area increases effectiveness by creating a competitive SD 32, it is well aligned with black and Latino preference in primary elections. Can you explain that a little more for me?

A Sure. And I'm not quite sure why the

numbers are aligned funny. That I can't answer. But I can tell you that the -- it's a little subtle. But the coloring of the cells is a slightly different shade from what it was in the others.

So it's sort of a sea green if you will. I was running out of colors, I think, by this point. But what that means is that this isn't technically an effective district by my definition. So technically I need three primaries and five generals. And I'm not offering that here.

But instead it's just what you read. It's well aligned in primaries, three out of four, and competitive in general. It's 3 out of 8.

And so that's a -- that's a district that I think if a candidate of choice for Black and Latino voters were to run a strong campaign, I think they've have a chance. But it doesn't meet my technical definition of effectiveness.

Q And so this isn't a situation where you're saying like, for example, Senate district 32 on Alt 3 is required by the constitution or the voting right acts. You're just giving an example of possibly or what this could become an effective district under your definition over time?

A Right. I think nowhere in this report

would I draw any district that I claim this specific district is required. These are really all demonstrations of different kinds.

And in this section the -- the function of these is at least twofold. One is it's set up to talk about racial gerrymandering and other constitutional concerns in the following section, which I'm sure we'll get to shortly.

But it plays another role as well which is to sort of highlight that tightrope walk I described for Gingles maps where you need to get to 50 percent without letting race predominate.

And so these shows that if instead of 50 percent you were thinking about effective opportunity, that that might not require the 50 percent in some parts of the state. There could be other parts of the state where you absolutely do need 50 percent to have effective opportunity.

But what I find is that all -- in many regions you can find opportunity at well below to 50 percent line.

Q Let's click our way through the state House then, plan 3. So looking at the Alt 3 for metro Atlanta area.

A Yes.

Q We again have a collection of four districts as I counted them of 80 percent BVAP in the process of getting to the increase in effective districts. And again, that wasn't something that you looked at because you weren't looking at racial issues while drawing, right?

A I was not.

Q And in the HD Cobb area, we have a 93.1 percent BVAP district in Districts 58. And again, no particular reason for that configuration beyond that's what happened when you figured these other effective districts.

A Right. That would be the story throughout that you can see some very high numbers here as a function of the human geography that says especially black but also to a lesser extent Latino people live residentially in some parts of the state in area that are extremely heavily concentrated with minority residents.

It's possible to reduce those numbers. But if you're not looking at race, you might tend to see really high numbers like these.

Q And you also have one of the -- one of the changes I noted on this chart, too, is in District 43. There's a decrease in the number of

generals that are successfully for the minority preferred candidate from 8 to 5 in District 43. But still because it met the definition of effectiveness under your method you counted that as an effective district, right?

A That's absolutely right. And not a great indication that we're not sort of -- aiming for Democratic performance here but for opportunity under this constructed definition.

Q So looking at DeKalb on the next page, I guess the same answers in terms of high BVAP percentages and nothing difficult in this region versus any of the others; right?

A Identical answers.

Q And for particular configurations, again, like connecting areas of Milton with areas of Roswell or parts like that in north Fulton, that wasn't a consideration you were looking at in drawing these plans, right?

A Right. I mean, with the knowledge -- I'll will just sort of reiterate. With the knowledge that I gained throughout this process about areas where people were talking about shared community concerns, that probably informs all the map drawing in the back of my mind.

But because it's not visible on a map, those considerations aren't always going to be front of mind in the mapping process.

Q And so then for Gwinnett, for Southwest for East Black Belt, the process that you followed was the same for all of those regions, including fro Southeast region, right?

A Yes, quite the same.

Q That makes that part of the process a little bit shorter then. So in terms of Section 9 of the report, are you offering of any opinions in this section of the report or just presenting the plans that you drew in light of what you described at the beginning of the section?

A Well, there's -- there's really very minimal text at all in this section. So to the extent that I intend conclusions -- they're conclusions about possibility, right. So the existence of these demonstrative plans shows that certain things are possible. And that's all that I want -- wanted to conclude from that section.

Q Let's move into our racial gerrymandering section. And so your method of looking at racial gerrymander as I understand it in this section is through core retention or conversely

population displacement.
Is that the methodology you used to look at racial gerrymandering consideration?
A So 10.1 looks at retention displacement and so called disruption. 10.2 looks at splitting. So those are the two major methods I propose. 10.3 looks at community narratives. So those are the elements I have her in Section 10.
Q And so in terms of -- you titled this section racial gerrymandering. I think as we talked very specifically so far, you're not saying that Congress, House and Senate plans are racial gerrymanderers, right?
A I'm not sure that I'd know how to designate something a racial gerrymander full stop. Instead, I understand racial gerrymandering to be a legal terms of art referring to constitutional provisions that have been interpreted over the years to tell us race shouldn't predominate. So an equally apt title for this section could be the predominance of race over other criteria.
Q And you conclude that races predominates over other criteria as least as to retention displacement, district disruption, splitting of geographic units and community narratives; is that

1 right?
2 A Well, it's a -- it's a selection of
3 evidence and lack of evidence. So in 10.1 I'm going
4 to look at the patterns to do with where
5 displacement's occurring, which districts are
6 disrupted and so no. And I'm going to compare the
7 choices to TDPs and I will repeatedly find that they
8 lack a TDP justification.
9 In 10.2 I'll look at splits and I'll
10 consider how many there are and whether they have a
11 kind of racially distinct character that fits
12 patterns of packing and cracking.
13 And 10.3 that's more about a lack of
14 evidence. 10.3 I'll review community narratives and
15 sort of report that I cannot find a community of
16 interest justification for some of the choices that
17 were made.
18 Q And in this section I didn't find much
19 of any discussion of possible political motivations
20 for any of those factors. Did you consider politics
21 as an explanation for retention displacement,
22 district disruption, or splitting of geographic
23 units?
24 A Well, just as a baseline matter
25 throughout the report, I absolutely acknowledge that

partisan considerations can be in play. My question was just was raced used to achieve them or is there evidence that racial considerations were also in play.

Q And so -- but specifically in this section of your report, you're not analyzing any political data in comparison to racial data for these various geographic changes; right?

A I think in this section itself you won't see that. But the section is supported by several appendix tables. And, for example -- let me just flip ahead and find them.

So Section C supports the split of subsection of 10, and there you will see political data compared to demographic data.

Q So in terms of finding a complete analysis in Section 10, you have to include all of Appendix C to see the complete analysis of that. is that fair to say?

A I guess the way I would phrase it is that I think Section -- Appendix C can be helpful. But I've tried in section -- in the body of Section 10 to present what I think is a collection of useful facts and observations.

Q Let's start with District 6. And you

note that District 6 was remarkably close to the ideal size before redistricting began. Right?

A I say nearly at the ideal size, correct.

Q And you're not saying that the only change that should have been made to District was to add in the people that were missing or take out the ones that were there and make no other changes to the district; right?

A Well, if you were really -- this is -- this is where you can -- this is an exact example of the kind of analysis that lets you gauge priorities. And so if core retention were a top, top, top priority, then maybe, yes, you would see only the absolute minimum number of changes made.

And so this tells us something that we already knew, which is that core retention wasn't the very top priority. No one has claimed to my knowledge that it was.

But I mean that just to illustrate the method. By looking at the changes that are made, you could infer at least kind of a coarse priority order.

Q Let me mark as Exhibit 3, drop into the share file. And I can share it on my screen if it would be quicker. Actually, it might be a little

bit easier.

And I'll represent to you that this is -- I can't share my screen, so if you could open Exhibit 3. And I'll represent to you this is a document downloaded from the Legislative and Congressional and Reapportionment Office, Ms. Wright's office, involving total population deviations when the 2020 census was applied to the prior -- the benchmark Congressional plan.

(Court reporter instruction.)

A Also, I have it on my screen now.

Q Okay. So in looking at this chart, you'd agree that Districts 14 was under by more than 36,000 people from what it needed to be the ideal population size; right?

A Well, okay. Hang on a second. Let me just --

Q And we just -- I'm sorry.

A Well, let me just review the chart for a second so I have an idea of what I'm looking at.

Q Certainly.

A Okay. So let me tell you what I think I'm seeing, just -- I just want to make sure we're on the same page.

Q Uh-hmm.

A So the 765,136 is the ideal value after the 2020 census, and this is showing the 2020 total population of each and how different it is from that ideal.

Now, this is showing District 6 to be only 700 people off from the ideal. So I'm totally sure that I was getting the exact same numbers, which I should double check if we -- if we're going to care about the precise numbers I double check this against mine.

But just accepting as presented these numbers here, I'm now happy to answer questions abotu the chart.

Q Okay. And I just want to just check off a couple of pieces on the chart.

A Yes.

Q And so this chart, Exhibit 3, shows that Congressional District is underpopulated by over 36,000 people from the idea size for the 2020 census, right?

A Yes, that is what the chart seems to say, if I'm understanding.

Q And District 7 is over populated by more than 94,000 people from the ideal district size according to this chart; right?

A That's right. It's the most overpopulated on this chart.

Q And 14 -- well, and District 11 as well was also overpopulated by more than 37,000 people, right?

A Okay.

Q And those are districts that all -- at least in part touch District 6, is that right?

A Let's see. What was the list again? 14, 11 -- I just want to make sure I'm --

Q And 7.

A Yes, that sounds right. I'm trying to -- I'll just flip back to my map.

14, yes. So that doesn't touch 6, right?

Q 14 does not touch 6. It touches 6, yes. There's -- I'm sorry. 14 is on your chart here, but it doesn't touch District 6, you're correct.

A Right. I mean, it does in my alternative map, but not in the enacted plan, the benchmark plan, or the Duncan-Kennedy plan.

Q And so you'd expect that there would be changes to all the districts. You're just pointing out -- when you're pointing out this closeness of District 6 to the ideal district size, that's not

1 looking at anything else in context, right?
2 A That's right. It's merely saying that
3 if -- that one could conclude from that merely that
4 if core retention were the top of mind
5 consideration, only very small changes would have to
6 be made. But of course we all fully recognize that
7 there are many other considerations in play.
8 Q And on District -- I'm sorry. On Page
9 68 you're discussing this -- back to Exhibit 1.
10 You're discussing the transfers that took place
11 here.
12 A Once again, what page are we on?
13 Q I'm sorry. Back on Exhibit 1, your main
14 report, Page 68.
15 A Yes. Okay. I'm there.
16 Q Okay. And so you note that there were
17 swaps or transfers of more urban, more black and
18 Hispanic neighborhood out of CD 6 while bringing in
19 whiter suburban areas; right?
20 A Correct.
21 Q And you say at the end of that
22 paragraph, "This transition looks to be plainly
23 dilutive of voting power."
24 What about the transition is plainly
25 dilutive of voting power?

A The fact that the district has become out of reach for the preferred candidates of black and Latino voters through racially distinctive swaps of population.

Q And so the dilution of voting power you're referring is of black and Latino voters because they were previously able to elect a candidate of choice in District 6 and now are unable to do so?

A That's right. Also, though, let's -- if I could read the full sentence. There's a little bit more here. So it says, "Since CD 6 --"

Q Go ahead.

A Thank you. "Since CD 6 was a performing district for the coalition of black and Latino voters before its transformation and none of the transfers improves representational prospects in non-performing districts, those things taken together, that's what tells me that this transition looks to be plainly dilutive of voting power."

So just to be perfectly clear, I'm taking one more thing into account besides the fact that racially distinctive population swaps happened and a performing district was put out of reach. Those are important facts.

But equally because nothing changes in a vacuum, if you change a district you change its neighbors. And I also considered whether any of those swaps improved the prospects in the neighboring districts, and they do not.

So taken together, that's what supports the conclusion that this transition looks to be plainly dilutive.

Q And how do you rule out that the transition could be plainly political in terms of the goals of the map drawers?

A I don't need to rule it out to conclude that it's dilutive, right? It could be both political and dilutive.

Q Moving next into the changes made in CD 14 into Cobb County.

A Yes.

Q And you say that -- I'm going to point here. In that -- in the next paragraph after what we were just looking at, you say Figure 31 makes it clear that the movement of these areas of Cobb into the district can't be justified in terms of compactness or respect for urban/rural communities of interest."

How does Figure 31 illustrate that to be

the case?

A Okay. So what we can see in the figure -- well, the figure's doing a lot of work, so let me unpack it a little bit. So this is another dot density plot where every dot represents one person according to the census. And the black outlines show you the district.

Now, we're not seeing county lines here, only district lines. We'd have to cross reference with other plots to see the counties.

So one thing the figure shows us, is it allows us to assess compactness just be looking at the shapes of the districts. And so you can see that the part of 14 that we're talking about, which is that tip heading towards Atlanta into Cobb does not improve compactment along any of the compactness metrics that are available to us or by the eyeball test.

And so I would be comfortable saying that it doesn't have a compactness justification.

To the second part, the urban rural? So the way that you can see that on a dot density plot is the literal density of the points. So population density shows up as more points while rural or less populated areas show up with fewer points per, you

1 know, square inch, say.
2 And so what we can see is that most of
3 District 14 is quite rural, is -- has quite low
4 population density. But it's precisely that tip
5 that we were just discussing where you start to see
6 much thicker and incidentally much greener dots.
7 And that shows you that it's picking up denser, more
8 urban and blacker population right there at the tip.
9 Q In terms of assessing urban versus a
10 rural population, are you primarily relying on
11 density for that? You're not saying that this part
12 of south Cobb is an urban area?
13 A Well, there are a few ways that you can
14 within a demographics framework assess urban rural.
15 One is density, definitely. Another is the census
16 actually provides an official designation or urban
17 and rural at the block group level. And so you can
18 refer to that, if you want.
19 What I'm relying on here is mainly
20 density.
21 Q And just to be clear, you didn't refer
22 to the census designation of these blocks, you
23 relied on density; right?
24 A That's right. And, again, it wouldn't
25 be blocks in the census. I think it would be block

1 groups.
2 Q I'm sorry. Yes. That would make sense,
3 it would be block groups versus blocks as well.
4 A Right. I guess I'll one thing. Another
5 reason I'm describing tip as a more urban area is
6 precisely the community testimony. So reading
7 through that and hearing the concerns of people
8 there, they use the word urban but also they
9 describe concerns that are common to urban area.
10 So I think not only is there higher
11 population density but also the narrative
12 description of residents is consonant with what we
13 would call urban areas of the country.
14 Q Let me ask you about the last paragraph
15 or the last sentence in that section. You said,
16 "Thus, the shift in the final enacted plan,
17 submerging a dense majority black segment of Cobb in
18 CD 14 was not necessary" --
19 Can you still hear me, Dr. Duchin?
20 A Yes. Thank you.
21 Q Okay. Sorry.
22 -- "was not necessary to balance
23 population while keeping Pickens intact."
24 And what I was going to ask you is what
25 do you mean by not necessary? Is it that it could

have been draw another way or is there some level of necessity you're referring to here?

A Oh, by necessary I mean the only possibility, right? And so, saying something's not necessary means just that there were other possibilities.

And here there's a particularly powerful demonstration, which is the Duncan-Kennedy plan which is made, as I understand it, by legislators as an officially-released draft plan in a process of considering Congressional alternatives.

And it's that plan itself which keeps Pickens whole and balances population that shows us that it wasn't necessary to do it as it was ultimately enacted.

Q And in this section you're pointing out features of the designs of District 6 and 14 but you're not offering a specific opinion about why the legislature configured them with the boundaries they did, right?

A Well, no, I -- I think here, as always, I can give evidence from which we might infer priorities. But I can't be certain.

Q Moving to the state Senate, you reference that District 4 and Districts 14 have zero

1 overlap with their previous population. Are you
2 aware now from Director Wright that that's because
3 of the collapse of those districts in south Georgia
4 to move to the north Georgia?
5 A Well, I definitely understand that it's
6 characterized that way and I have no reason to
7 dispute it. But here I'm just describing the bare
8 fact of zero overlap.
9 Q Okay. And then you give some examples
10 of Senate District 14, Senate District 56, Senate
11 District 7, the differences references there. And
12 am I correct that essentially what you're pointing
13 out primarily in this section is the racially
14 imbalanced shift shifting heavier minority
15 population out of Republican districts and shifting
16 whiter or less minority population percentage -- of
17 the percentage matter into the districts?
18 A Yes, I would say that's the focus here.
19 I also tried to describe to the extent that I can
20 who the incumbent was and some context for why that
21 person might have been, you know, of particular
22 interest to groups of plaintiffs to black and Latino
23 voters. But, yes, you're right. The main
24 quantitative tool here is to look at the
25 demographics of the outbound shifts and the inbound

shifts.

Q And how did you go about doing the -- garnering the information about, for example, Senator, now Representative Au or Senator Islam?

A Let's see. So I think I -- one thing that I had encountered is a list of who -- I'm actually not sure how to pronounce it. Galeo or Galeo had -- had endorsed in the elections. So I got -- you know, I really used sort of every means at my disposal to try to figure out who were the candidates aligned with the grass roots organization representing black and Latino voters.

So the -- this endorsement is a matter of public record. Other than that, I mean, I'm sure I looked at PDM many times to try to figure out what I could about the reelection records. But I didn't use any other non-publicly available resources.

Q And do you consider racially imbalanced population transfers in and out of a district as evidence of racial predominance in the consideration of a district map?

A I would call it suggestive evidence, not conclusive evidence, but suggestive evidence.

Q Do you think a racially imbalanced population shift is suggestive of a racial goal of a

map drawer?

A Well, I would say consistent with. It really depends. This the kind of assessment for which you want to try to use many different kinds of information together.

So there's no -- unlike, say, my effectiveness determination, which I described at length and which became just a yes or no, effective or not effective label. There is no official label in play here. It's -- it's just a matter of assembling as much evidence as I can. That's how I think about it.

Q And in this report you assembled as much evidence as you could about the racial considerations in the drawing of these maps; is that right?

A I tried to be -- I tried to be comprehensive. I mean, as you know, it's a big state with a lot of districts, a lot of counties. And so I'm sure if I had another few months I could have maybe found some other quantitative approaches.

But this -- this reflects an effort to be quite comprehensive in my analysis.

Q And so are you offering the opinion in this section of your report that race predominated

in the creation of District 56, 48, and 17 -- and 7? I'm sorry.

A You mean predominated over TDPs?

Q Yes.

A Am I offering that opinion? I don't think there's a place where I say something like that quite that way. But I do think I'm presenting evidence that shows that decisions with a marked racial character were made in ways that made traditional principles worse.

And so, yes, I think it's reasonable to conclude that race predominates -- that race-inflected decision making predominated over TDPs, yes.

Q And are you reaching that conclusion for the Congressional Districts 14 and 6 as well?

A That racially-distinctive decisions predominated over TDPs? Sure. I'm comfortable saying that.

Q Even though you're making that statement about Congressional District 6 and 14 and Senate 56, 48, 17, you still can't rule out a political goal that just had a racial impact; right?

A But it's not just a political goal, the racial impact. It's, as I've said a number of

1 times, it's a political goal achieved through racial
2 -- racially-distinctive decisions or the use of race
3 data or the operationalization of race.
4 So I would distinguish that somewhat
5 from mere unintended impacts. I see evidence of the
6 use of race to achieve partisan goals.
7 Q And part of the evidence of that is
8 noted in Appendix C of your report; right?
9 A I think Appendix C is included because
10 it supports that --
11 Well, it's not included because it
12 supports that. It's included because I've tried to
13 be as comprehensive as I can about all aspects of
14 the relevant data. But I do also think that it is
15 -- it fits with that general narrative and helps me
16 arrive at that conclusion.
17 Q If the examples you've given of racially
18 imbalanced population transfers also on Appendix C
19 showed politically imbalance population transfers,
20 you'd expect to see that, right?
21 A I'm sorry. Which part are you asking if
22 I would expect?
23 Q You would expect to see racial imbalance
24 -- racially imbalanced population transfers matching
25 with politically imbalanced population transfers;

right?
A Under which hypothesis? Sorry. Let me try and answer that in the spirit I think you're asking. If race was used to achieve partisan goals, then we'd expect to see racially-distinctive transfers and corresponding politically distinctive transfers.
Now, we might see differences in racial demographics that are greater than or about equal to. I'm not saying anything in particular about the relative magnitude. But I am saying that to arrive at a conclusion like the one that I'm describing, that race was used to achieve partisan goals, then you'd expect in many places to see gaps in both.
Q And I guess what I'm trying to understand is -- I understand the perspective of race being used to achieve a partisan goal and you'd see a partisan differential basically and a racial differential.
If partisanship was being used to achieve a partisan goal, wouldn't you also expect to see both a partisan differential and a racial differential in Georgia?
A Well, I think that's -- that's a fundamental question. I address that more head on

in the rebuttal report, which I'm sure we'll come to.

So in this -- you know, in the content of the current report, you're correct that I haven't directly addressed the question of whether partisan differential can be achieved without concomitant racial differential. But I do think I get to that in the rebuttal report.

Q Okay. And for purposes of this, report, you'd agree that that type of analysis is not here, it's in your rebuttal report; right?

A Let me just give a moment's thought of -- to whether there's anything in this initial report that really speaks directly to that. I mean, I guess the only thing I would say --

And this is worth saying is that the split count or all does speak to that. So -- so let me -- let me address that for a moment.

So there's county splits, and we've talked about those on several occasions. We've talked in passing about precinct splits.

But I think to your point that you were just asking about, precinct splits are especially important because precincts are the level at which votes are reported. And so if you're splitting

precincts you cannot claim to be doing do, I think -- as far as I'm aware, you cannot claim to be confidently doing so on the basis of election history.

Of course you can use the predictive analytics to try to guess who voted how. But in my understanding the primary tool that you have at your disposal when you split precincts is demographics. That's what's available to you when you split precincts.

And so I find that the state has split far, far more precincts than my alternative maps have. And again, we're talking about state precincts here, not the census VTDs.

And to me that is -- that is suggestive of race, not party, as a kind of explanation.

Q So beyond the precinct splits we just talked about and for purposes of this report, you don't have further analysis to discuss splits of a partisan nature having a racial impact that may be unintended, right?

A That's right. The strongest evidence is that of split precincts.

Q Well, let's move into the state House. I wanted to ask you about -- I think this gets into

our discussion earlier about the nature of the shifts that happened. And you say a startling 32 districts were not only moved or relabeled but effectively dismantled.

Can you just explain what -- what you're referring to there?

A Yes. And I believe I give a kind of local working definition right there in the same sentence, which is that fewer than 30,000 residents assigned to any single district. So here the ideal size is about 60,000 of the state House, it's 59,511. And so this is saying not only is it a cosmetic relabeling that you might expect under numbering rules, but in fact that constituency has been broken up.

Q And the swingy category as you're using the term there is defined as candidates from each major party would have won 2 to 6 out of the 8 general contests in the dataset of probative elections; is that right?

A Right. And again, that's just a local definition for the purposes of this subsection. I'm not trying to trademark the term in any broader sense.

Q Noted. I totally understand that.

And so in looking at -- let me find -- on Page 71 in Figure 33 there's some references to the changes in various districts that you have on Table 40.

A Yes.

Q And you say that the images make it clear that the shifts are not explained by traditional districting principles like compactness or respect for county lines. You see that, right?

A I'm looking for that.

Q That's the description for Figure 33 on Page 71.

A Yes, I see that.

Q And you don't know if these changes were the result of incumbent requests in those districts to be redrawn that way, right?

A Oh, no. Certainly not. I would have no way of knowing that.

Q And you don't know -- you didn't look at the communities of interest that were kind of apart from the public comments, so you're not aware of specific communities of interest that might explain the reconfiguration of these districts, right?

A My knowledge of communities of interest really should be understood to be limited to what I

could learn from that record.
Q And so the same question as to the Senate districts that we talked about. Are you saying that the districts listed in Table 40 on Page 71 were drawn primarily based on race to the detriment of traditional districting principles?
A Well, again, I -- I would probably stop short of using a word like "primarily," but I would say they were drawn in a quite racially-distinctive way.
And I think what I mean for you to -- for readers to draw from these figures is we can see they have more countries reversals than they used to have, they're less compact looking than they used to be.
And so I'm not seeing at least that level any possible TP justification, although certainly, as you say, there could be others that aren't on the record.
Q And did you review precinct shapes as part of your analysis of traditional districting principles for these districts?
A I definitely do take that into account where I can, yes.
Q And my question was specifically, did

you take that into account for the five districts in Figure 33 when looking at their shapes?

A Well, I'm sure I looked at it. I can't at this -- sitting here today, I can't recall exactly how I took it into account. But I would say that I highly aware of the constraints produced by trying to preserve funny shaped precincts, sometimes very large --

I should note. That hasn't come up yet. But Georgia has an extraordinary number of very large precincts. And so precinct splitting just absolutely has to occur. And the question is which and where and how much.

Q And we also have a number non-contiguous precincts which is also a unique feature at the election --

A That's actually -- that's actually quite common.

Q Oh, really? I didn't realize that.

A Yeah. Rather frustratingly for people like me.

Q All right. Well, on that note, let's move to the splitting of geographical units. That seems right for that.

So getting to this section, again you're

1 showing racial shifts basically of what was in
2 particular districts -- well, let me step back for a
3 second.
4 This is -- this section of the report is
5 discussing the splitting of counties where one
6 racial group is primarily in one portion of a county
7 and another racial group is primarily in another
8 portion of a county. Is that fair to say?
9 A Right. I guess I would say that what I
10 look at is which part of a county landed in
11 different districts. And I look to see what other
12 parts in different districts have -- have quite a
13 different racial makeup.
14 Q And so when you would look at these, did
15 you also look at the political makeup of the split,
16 for example, of Bibb County on Page 72?
17 A I did also look at that. And let's see.
18 I think you'll -- I think you'll find that in the
19 splitting appendix. Yes, you will. So that
20 splitting appendix we talked abotu before does
21 contain all that information for these county
22 splits.
23 I should actually quickly mention -- this
24 is a good point to mention. There are so many
25 precinct splits that I didn't try to include a full

table of all precinct splits in the report. But it's in the -- my analysis of precinct splits in this exact way was provided in the backup materials that I handed over.

Q So it's not included in your report, just the backup materials, right?

A Right. I think, for example, under House splitting the table runs to 700 lines. So it would have been hard to include it in the report in a very readable way. But it definitely is available to you in the backup materials.

Q So looking on Page 101, Appendix C. This is the Bibb County that you call a race -- minutely racial conscious decision between District 2 and District 8.

You'd agree that the portion of District 2 from Bibb County that is -- I'm sorry. The portion of Bibb County in District 2 went 71 percent and a little bit more for President Biden and the portion of Bibb County in District 8 went almost 54 percent for President Trump; right?

A Yes, that's -- I had to do the subtraction on the fly there. But, yes, that's right.

Q And so how did you rule out --

A Can I clarify, though --
Q Go ahead.
A I just wanted to clarify. When I was talking about minutely race conscious, you don't see that in this table. That's the figures that show you where the line was drawn and how it compares to the dot density.
That's what I'm referring to when I say "minute." I mean decisions like microscopic decisions about whether the lines turn to the left or the right.
These are aggregate statistics that I wouldn't call minute.
Q And so then let's look back at Figure 34.
A Sure.
Q Are any of the portions -- and that's Page 72 if you need it.
A Thanks.
Q So you're saying minutely race conscious decisions is the boundaries of -- between Districts 8 and Districts 2, not the people that are in each one?
A Well, the boundaries control the people that are in each one. But I'm saying that if you

follow that contour, I find it quite suggestive of a racially -- racially conscious decision process for sure.

Now, having said that, just to be clear, yes, there are precincts here in the -- if you're trying to keep precincts whole -- it's not like you're drawing freehand, right? You have some constraints.

But given the high level of precinct splitting, I don't think that was regarded as a kind of hard constraint. Precincts are certainly split for various reasons in various places.

And here on balance you just see a whole lot more green dots, for example, on one side of the line than the other, and even some winding that makes that quite pronounced.

Q Are any precincts split in Bibb County this border between 8 and 2?

A We'd have to cross reference the splitting table, and we could do that. But I -- you know, as I said a moment ago, I acknowledge that when you keep precincts whole that's a real constraint on the shapes.

So that's completely acknowledged. But, as I pointed out a moment ago, lots of precincts are

split. And if you're trying to kind of be even handed in an area like this, you might choose to split a precinct to reduce this heavy disparity in racial demographics across the boundary.

And that hasn't been done here. So whether by sorting which precinct goes where or by deciding to split and not to split, that's the -- the sort of combined effect of those decisions is a heavily race sorted boundary.

Q I guess what I'm trying to understand is how you're concluding it's a heavily race sorted boundary, race conscious decision making when it's consistent with putting Republicans -- more Republican population into a Republican district and more Democratic population into a Democratic district.

A Sure. I never deny the presence of partisan motives. So that is -- I'll concede that throughout, including there. And so again, the question: Was race used to accomplish that? Or at least that's one question you could ask. It's not the only question you could ask, but it's a question that was on my mind as I was analyzing this.

Q Well, and I'm not trying to -- I really do want to understand the distinction here because

you're calling these race conscious decisions.
A Yes.
Q Why are you not calling them politically conscious decisions? How are you distinguishing one from the other on Figure 34 in the split in Bibb County?
A Okay. So to be clear, I think -- I've said this a few times, but I don't find those to be mutually exclusive. It can be both a partisan conscious and a race conscious decision. And in fact, if the ultimate conclusion is that race was used to achieve partisan goals, then you will find them both co-occurring.
Q And so you'd agree that partisanship and race, at least in terms of the splits in the counties that you're discussing here are co-occurring in each of these examples you've given? We can look at the others, but ...
A Well, what I don't have in front of me right now, although we can try to cross-reference if it's helpful. I don't have at the precinct level the race and the party makeup according to the elections. I picked -- as you can see throughout Appendix C, I chose the Biden election and one of the Abrams elections as ones to present. But I have

no reason to believe that it would look very different if you made a different choice of elections.

So what I don't have in front of me right now, and so I'm prepared to describe on the fly, is whether each of these precincts fits the pattern that race and party are kind of intwined in the way that we're describing.

But as a matter of generality, that's certainly true in a lot of the state. Once we get to the areas closer to Atlanta, it's the conjoinment, as the political scientists call it, is a little bit weaker. But see more, again, so-called white cross-over voters.

But the -- generally speaking in the less metropolitan areas, less urbans, the less dense areas you'll see race and party tracking together as a general --

Q And so you're not -- you're not denying that there could be a completely partisan goal with no race conscious decision making at all that could lead to a split of a county that ends up having a racial-looking split if the goal was political, right?

A Well, anything is possible, and I do

mean that very sincerely. You can achieve things that look really conspicuous must by chance. But here I find that, you know, the indicia of racial sorting are quite strong. And so generally that's suggestive of the use of race at least as a proxy.

Q So are you offering the opinion in this report, looking at Page 72, that race predominated over other traditional districting principles in the splits in the Congressional map of Cobb, Fayette, Fulton, Douglas, Newton, Gwinnett, Muscogee and Bibb Counties?

A Well, I made a slightly more qualified determination here the way I wrote it, which is to say that I see patterns consistent with a packing and cracking strategy.

Q But you're not saying there was a packing and cracking strategy. You're just saying the data are consistent with that kind of strategy?

A Well, that's right. I -- I try not to overstate the kinds of conclusions that can be drawn from these kinds of methods.

Q In turning to the precinct split analysis, which is our next section, you reference the -- and so in looking at these -- and I saw you've given seven precincts as examples of split

precincts. Did you do --
A That's right.
Q -- this kind of analysis for any other precincts on the Congressional plan?
A Yes, and that's -- that's what I referenced just a little bit ago as being contained in full in the backup material. So you can see the complete record of which precincts are split and the stats for the splits.
Note that as I referenced before, these won't -- we won't be able to look at race versus party in these precinct splits. It's really race only because you cannot break down party preference based on cast votes below the precinct level.
Q And just -- and I understand you have that in the backup materials. But just so we're clear, in the written portion of your report, your expert reporter, you've only discussed seven precinct splits in the Congressional plan; right?
A I think that's correct. Let me just tour through the section.
Yes, just these seven.
Q Okay. And do you know if Marietta 5A, Marietta 6A, and Sewill Mill 03 are contiguous precincts or have noncontiguous portions?

A Well, let's see. CD 6 and 11. I don't -- let's see. They might be contained in the figures in Appendix C.

Let me take a quick look. But otherwise, from memory I wouldn't be able to say. I don't think those are in the figures. So I can't say from memory.

Q Okay. I didn't see them either, so that's -- that's --

A Okay. We agree.

Q And in Table 42 you use kind of the same language we just said. There's a showing of significant racial disparity consistent with an effort to diminish the electoral effectiveness of CD 6 for black voters.

You're not saying that was the effort. You're just saying the evidence is consistent with that kind of effort, right?

A That's right. I've made an effort to be disciplined about the language.

Q When you reviewed -- the next page over there's kind of a District CD 4 and 10 precinct split with the boundaries.

A Yes.

Q Did you look to see if there were other

geographic features, like highways or other areas along which those boundaries were split?

A That is something I generally do look for. I can't tell you with confidence, you know, in realtime whether I looked at that for these particular splits. But that is generally something I do consider.

Q Next you look at the state Senates. And we have similar -- a similar kind of county precinct sequence. And you being with the county splits. And you note there is significant racial disparities between the splits in Fulton, Gwinnett, DeKalb, Cobb, Bibb, Chatham, Douglas and Houston and Newton, Clarke, Hall, Muscogee, Fayette and Richmond Counties.

You're not saying that these -- you're saying, like the Congressional plan, that these are splits consistent with a racial goal, not that it was definitely a racial goal in those splits, right?

A Right. I would never try to claim that I can definitely conclude anything about goals.

Q And you also say that numerous counties were split into unnecessarily many pieces, again, in that district than necessary. You're just referring to that if it was done and there could have been a

reduction in precincts -- I mean in county splits?
A Right. Necessary refers to possibility. And so, for instance, some counties are so large that they're larger than Senate districts and so they must be split. Those are necessary splits.
And, you know, some counties are so large they must be split into at least a certain number of pieces. And my point here is that the actual number of pieces far exceeds that necessary count.
Q And then you reference that there were 13 state precincts split with a significant racial disparity; right?
A Yes.
Q And you didn't identify any other precincts that were split on the Senate plan with a significant racial disparity besides the 13, right?
A Right. And I think -- what I -- if I wrote this well, which I hope that I did, what I meant by significant is the same 20-point disparity that was referred to earlier in the paragraph, although I -- it would have been better if I had specified within the sentence.
Q And then for the state House plan you listed out 30 counties, and I won't read off all of

those. But I'm assuming the same opinion in terms of you find the racially sorting splits consistent with a racial goal, but you can't say for certain that it is a racial goal, right?

A That's right. And I'll note that here it returns to a theme I mentioned, you know, a few hours ago, which is that, as I wrote here, the large counties take the brunt of the splitting. So, you know, Fulton 22 pieces and Gwinnett 21 and so on.

And that's something that I gleaned from the public testimony was undesirable from a community's point of view.

Q And then you say the number of precinct splits was a striking number. Any special meaning for striking there, like dominate earlier?

A No, there's no technical meaning, just that I was struck by it.

Q Okay. And you identified only 47 precincts in the state House plan that are split with a heavy racial disparity across the division; right?

A That's right.

Q Then you conclude this section by saying racially distinctive precinct splits provide particularly strong evidence that race has

predominated over other principles in the creation of the map. Do you see that?

A I do.

Q And so, again, this is -- you believe this is strong evidence of racial predominance, but you're not saying for certain that race predominated based on the precinct splits alone, right?

A That's right. There's no attempt at mind reading, if you will.

Q So let's move to community narratives. In terms of the public input, you described it as voluminous. So would you agree Georgia provided lots of opportunities for public input in the process?

A Sure. I mean, it certainly was a lot to work through.

Q And as I understood the kind of keyword approach that you took, you kind of loaded up all the different testimony and then looked for keywords and phrases. The legislature as far as you know didn't have a kind of keyword analysis like you've conducted here when they were drawing the maps; right?

A I mean, unfortunately I was able to discover no process on the part of the legislature

for taking seriously all that testimony. So as you said a moment ago, many opportunities were provided. But I don't see any indication that it was used to inform the choices that were made.

Now, again, that doesn't mean I can be certain that it wasn't used. But there's no public record of how it was used. If there had been, I would have been happy to follow the method.

Q And in looking at this section of your report, are you offering any opinions about the public comment or is it just kind of you -- you created this keyword summary of it and pointed out various things that people said from different areas?

A So I did -- I did some keyword searching, but I also attempted to read it through in full. I mean, and there's so much of it that I think you could probably better call that an overall skim and then a keyword search.

But your question is am I characterizing that testimony beyond what's presented here?

Q Right. Well, my -- the question is -- I'm sorry. My question is for this section, Section 10.3, the only opinion I saw in this section was that the changes to CD 6 and CD 14 lack

1 justification by community of interest reasoning.
2 Is that correct that that's the only opinion in this
3 section?
4 A That's the only opinion as such. But
5 there are other useful, I think, pieces of
6 information in this section about the kind of
7 character of different parts of the state,
8 particularly CD 14 and the states northwest had
9 quite a volumen of strong testimony about what it
10 was like and who lives there.
11 You know, I would say that a great deal
12 of the public testimony was sort of expressing
13 support or lack of support for certain decisions.
14 What I tried to do in this Section 10.3 was to
15 extract community of interest testimony, which is to
16 say what do particular neighborhoods, regions or
17 areas have in common that's salient to redistricting
18 decisions.
19 There were a lot of other preferences
20 expressed that I didn't attempt to summarize.
21 Q I know we've been in this report for a
22 little while, but are there other opinions that you
23 offer in this report that we haven't discussed or
24 that are not -- well, let me ask it this way.
25 First of all, are there other opinions

you're offering in this report that we haven't discussed in the testimony so for today?

A I think we hit all the highlights.

MR. TYSON: If we could go off the record for just a minute.

THE VIDEOGRAPHER: We're going off the record at 6:17.

(Recess.)

THE VIDEOGRAPHER: We are on the record at 6:43.

Q (By Mr. Tyson) All right, Dr. Duchin. We're going to pick up Exhibit 2, your rebuttal and supplemental report.

A Yes.

Q S this report, as I read it, you basically have three purposes. You're responding to Mr. Morgan's September 5th report, supplementing your report in light of Ms Wright's deposition, and making a correction to one of your appendices is that right?

A That's right.

Q Okay. So first of all, let's talk about your response to Mr. Morgan in Section 1. You talk about the use of an ensemble analysis and I'm familiar with that. But if you could just kind of

for the record explain what a -- what an ensemble analysis involves.

A Sure. Excuse me. And the simplist level, ensemble here just means a collection as in a collection of alternative maps. But typically in the context of redistricting analysis, when people say they're talking about an ensemble they usually mean a collection made by an algorithmic process.

So you might use a computer to generate many, many alternatives and then look at the aggregates statistics of that collection and use those comparatively to understand choices made in a given map you're evaluating.

Q And in your view is it impossible to draw any conclusions such as Mr. Morgan draws in his report based on his single alternative plan because it's not a -- kind of scientifically rigorous way in your mind to analyze that concept on a redistricting map. Is that fair to say?

A Well, whether or not the alternative is to be scientific, I think even to be systematic you might look to a collection of alternatives. And so, for instance, I give an example here on Page 1 where Michael Altman and Mike McDonald have a paper -- these hand-drawn maps to do a comparative analysis,

in particular maps that were made in a student mapping competition. And that -- I think that can also be quite valuable.

And so I don't mean to be -- by saying I was going to undertake a more scientific approach, I don't meant to say that the computational approach is the only one possible. But -- I do mean to say, as you noted, that you can't reliably infer intent from just one alternative map.

Q And you'd agree generally with Mr. Morgan that racial considerations can have an impact on district shapes if the map drawer is taking race into account; right?

A I would phrase it just as we've been doing for the last few hours, that you face certain tradeoffs and that there can be relationships between demographic attributes and shape, no question.

Q So in your analysis on Section 1.2 you're -- you have a comparison -- a similar chart to what we looked at before in terms of the various categories, majority BVAP, majority BHVAP, majority BHCVAP, and in the fourth column or the fifth column is titled effective opportunity. Is that the same as effective on the prior tablet -- table, or is it

something different?

A It's exactly the same thing. It says below, "Labeled as effective, et extra, et cetera." It's the same effectiveness we have been talking about for the fast few years.

Q And in terms of the configuration here, you'd agree that there is a -- a decrease in the number of majority BVAP districts on Mr. Morgan's plans for the Senate district and House district plans versus the enacted plans, right?

A There are definitely fewer majority BVAP districts, yes.

Q And are you using your Alt 1 maps as a comparison as opposed to 2 and 3? Is there a reason why you selected Alt 1?

A No. I could just have easily have suggested -- have selected Atl 2. Alt 1 contains more of the Gingles alternatives, but anything would have done. I could have included them all, but I was trying to be succinct and to make the simplest points that I could here.

Q So you make the statement on the next page about a few of the remarkable facts of Mr. Morgan's plan, you say. And the first is that Mr. Morgan's race-blind Senate plan has a greater number

of districts majority black and Hispanic VAP and an equal number by CVAP to the enacted plan.

And so by noting that, you're just pointing that out here. You're not offering an opinion about why that is or what happened with that, right?

A Well, no, I -- I take him at his word that he drew without regard to race or partisanship. And so I found it really quite striking that just by accident he had more majority coalition districts by VAP, anyway, than the state plan, which is subject to the Voting Rights Act, which he was ignoring. So I did -- I did find that rather striking.

Q And you'd agree looking back at the table that there is a -- there are fewer majority BHVAPs than majority BHCVAP districts in the enacted plan on Mr. Morgan's House plan, right?

A Yes, there are.

Q Okay.

A But you'll note, and I'm sure we'll get to this. Almost the same number of opportunity districts are effective.

Q And the -- again, just -- I know opportunity being a word we haven't really used as effective before, but the effective just means 3 of

the 4 primaries and 5 of the 8 generals on your effectiveness plan; right?

A That's exactly what it means.

Q And when you reference the effective districts that are involved, again, here you're not offering an opinion, you're just noting that this is the case, there are this many districts that are effective on the plan, right?

A That's right. The table is just a count.

Q And then just so we're clear, there's also kind of a narrative summary. That's the next -- top of the next page. And I didn't see any opinion there either, or just a reference to this is how many plans had. Is there any opinion in that first paragraph of Page 4?

A I think to extract something approaching an opinion you'd go to the next two paragraphs here.

Q Right. And so then the opinion that you're offering about Mr. Morgan's plans is that -- well, the opinion is really is that the state's Senate plan gave black and Latino voters less electoral opportunity than the blind plan drawn by Mr. Morgan for the Senate, right?

A That's right. And, you know, before

encountering the Morgan report, it was already my impression that in terms of the black and Latino coalition, as you saw, we -- we discussed this earlier, that there was a stark limitation of the number of majority districts as well as the number of opportunity districts.

And I think -- I found Mr. Morgan's plan to fit well with that finding, that determination on my part.

Q And in that last paragraph where you're referencing the Senate plan and the Voting Rights Act, you're not offering the opinion that the current Senate plan doesn't comply with the Voting Rights Act. You're just pointing out that it's supposed to comply with the Voting Rights Act, right?

A That's all I'm saying here.

Q So going into 1.3 about pursuing majority black districts, and Mr. Morgan's various regional ones. You then ran this chain of districting plans for 100,000 steps on the various different regions Mr. Morgan identified; is that right?

A That's right.

Q And when you were running your

compactness scores this that ultimately was -- became Figure 3 on Page 5, you were only using cut edges, compactness score and not Reock or Polsby-Popper; right?

A That's right.

Q And is there a particular reason why you only used that one metric of compactness as opposed to others?

A Yes. Because I was doing a chain of a hundred thousand, and the cut edges score as a matter of just computation is calculated in milliseconds, whereas it takes a bit more time, maybe a second, for the Polsby-Popper and Reock scores because they're based on contours.

And so it would have been inefficient to calculate those at every step.

However, I did, as you can said from the appendix here, from the Visual Comparison Appendix, Appendix B, I did select a subsample of the run outputs to both show visually and also to look at various kinds of compactness scores. And I verified that the compactness scores are comparable to or better than the ones that -- that are discussed here for comparison.

So in some since you asked why I only

included this one, it would have computationally inefficient to calculate the others a hundred thousand times. But also, having read Director Wright's testimony and before reading that I wasn't sure if the state used any particular. But she disavows the use of any compactness metric at all.

And so I don't think there was a particular reason to favor one over the other.

Q And in looking at Figure 3, this is a comparison of -- the enacted plan is the yellow dots and then these other -- those look like lines. I know they're not lines. They're items are the various parts of your experiment that you ran with a a hundred thousand steps; right?

A That's right. Those, what look like lines, are made up of blue dots. And there's one dot per plan. So you're seeing a hundred thousand dots.

Q And the higher the dot, the less compact -- or the yellow dot, I'm sorry, the less compact the plan is as they're all on the cut edges scores; right?

A Right. Exactly on that Y axis, higher up is less compact.

Q And in terms of this type of analysis

that you've done here, I understand from Appendix A deviations were given a little bit -- you were given specific deviation measures for your hundred thousand steps; is that right?

A Deviation measures, you mean population deviation?

Q I'm sorry. Yes, so let me take a step back for a second. So when you were conducting your chain of districting plans for this analysis in Section 1.3, did you have limitations on the number of counties that would be splint on those particular maps?

A No, I did not limit the number of county splits. Instead, I implemented, as I describe here in Section -- in Appendix A, I implemented a kind of filter, you might say, that prefers county integrity, but I didn't impose a hard limit.

Q And deviation, did you set limits for the analysis on the deviations of the hundred thousand steps?

A For that I did. For population deviation, yes. As described on Page 11, I put a hard limit on the allowable population deviation.

Q So for each of these you couldn't say for each of the steps how many counties are split on

a particular iteration along this blue dot grouping on Figure 3; is that right?

A Well, I could certainly go back. I've you -- I've provided raw materials that are sufficient to actually -- it contains all hundred thousand plans for each of these runs.

So the backup materials do contain replication data that you could use to go through and calculate that, absolutely.

I will say that I have -- oh, sorry.

Q I'm sorry. I'll let you finish your answer. Yes.

A Sure. I will say that I've confirmed that this method of prioritizing county integrity gives me in general maps that have a comparable number of county splits to ones that are viewed in the enacted plan.

Q So what is the opinion that you reach at the end of this 1.3 section about Mr. Morgan's inclusions?

A I think he's -- I find that he's definitely wrong and having said literally that the only way to get additional majority black districts is with worse compactness. I think that's clearly shown to be wrong by the creation of tens of

thousands of examples.

Q In the primary you're also concluding that Mr. Morgan's method is inadequate to reach the conclusion about the connection between compactness and racial considerations; right?

A Yes.

Q Let's move to Ms. Wright's deposition. And you talk about her testimony on partisan advantage. And so first I wanted to ask in terms of the pursuit of partisan advantage.

Did the information from Ms. Wright's deposition cause you to reconsider or review any of the splits of counties or precincts that you said were racially -- racially sorted in your January 13th report?

A If the question is whether I literally went back and reviewed them again after I gave the testimony, no, I did not. It did, though, give me an overall sense of how priorities night have been balanced such as there's a section of her deposition where she concedes that -- as I had already suspected in the initial report, there was a willingness to tolerate additional splits of urban counties and that that might have been done for partisan reasons.

I think that I recall that being described in her report.

Q And then you had proceed to conduct an analysis on -- a similar analysis, I guess, using plans with -- favoring plans with more Mr. Trump favoring districts from his presidential run in 2020. Is there a reason why selected the presidential race instead of the public service commission race that Ms. Wright referenced?

A Not a particular reason except that I had a quite limited amount of time to execute this after I got my hands on the deposition transcript. And I tried a few -- so as a responsible data scientist who's trying to present things a fully and with as high quality as possible, I always try to do robustness checks and make sure that my findings aren't unduly influenced by arbitrary decisions that I make.

And so to that end, I considered using different elections, although I did not conduct these long hundred thousand step runs with multiple elections. But I did -- I did look briefly at whether that would -- a choice of different elections would change the findings.

I also looked at whether seeking

1 districts with a 55 percent Trump advantage rather
2 than just a 50 percent would influence the findings.
3 And I found that the findings were robust -- robust
4 to these different upstream choices.
5 So I have a pretty high confidence that
6 the selection of the Trump election doesn't distort
7 the findings here.
8 Q And so your selection in 2.1, you're
9 working through the experiment on partisan
10 advantage, and you say, "I can ask whether plans
11 selected for partisanship but with no race data tend
12 to have the same hallmarks of racial sorting that I
13 find in the enacted plans."
14 And this is not an analysis that you
15 conducted for your January 13th report. Why is
16 that?
17 A Well, at the time of the January 13th
18 report I was not aware that the parties responsible
19 for creating the state's plan were acknowledging
20 partisanship as an open pursuit. I became aware of
21 that when I read the deposition transcript. And
22 that suggested a study like this.
23 Q Can you walk me through what Figure 4
24 shows based on the experiment that you conducted for
25 House, Senate, and Congressional.

A Yes, I'll note that Figure 4 should be thought of as just setting the table for the findings which occur in Figures 5 and onward. So just as a preliminary matter, what Figure 4 shows is that these chain runs succeed in producing maps that are at least as Trump favoring while being respectful to traditional principles.

In this case I've just chosen compactness to single out. But as I said, I confirmed from these kinds of chain runs that they're also comparable to or sometimes better than the enacted plan on the other TDPs that have metrics associated to them. I've just chosen compactness here as an example.

So that's what you see in these figures. You see the number of Trump-favoring districts. Again, that yellow or amber dot represents the enacted plan. And what you're seeing is a cloud of data points that shows you the kind of tendencies encountered along this run.

And you can see that it's -- these chain runs are finding more Trump-favoring districts, especially at the House level, while finding comparable or usually better compactness.

Q And so then the number of blue dots that

are below the yellow dot are districts that are more favorable politically and more compact; is that correct?

A Being below just means that they're more compact by the measure of cut edges. And being to the right means that they have more Trump favoring districts.

Q And so on the Congressional analysis then it's in the middle in terms of the plans there. Is that -- what is that -- the placement of the yellow dot in the Congressional on Figure 4 tell you about the Congressional plan?

A What that says is that the enacted Congressional plan has 9 districts where Trump got more votes than Biden. This is the 2020 election. And that in this run with this kind of -- so-called temperature setting meant to select -- to more likely select things with more Trump advantage, I was finding 7 through 11 Trump favoring districts most of the time.

I was slightly more often finding 10 to 11 rather than 7 or 8 in this run.

Q And when you're talking about setting the table -- and I know we'll get to the next page. But then -- so the range for each of those indicates

that the number of districts that you've found for that particular plan --

So for Senate, for example, it was generally between 28 and 35, House generally between 95 and I guess a click above 110, somewhere in that neighborhood?

A Yeah, 94 to 111, it looks like. And, you know, in the Senate run it looks like there might be one example with 28, but more examples a little bit higher.

Q And did this experiment -- sorry.

A Sorry. I'll mention just to help you kind of orient yourself to the figure. So this is a run. It's called a chain because it literally is executed as a sequence of changes. So you can think of it as a chain of changes.

And the reason you see these kind of tails in the scatter plot is that often the -- the beginning point, the initial map that was used at the beginning of the sequence of changes would have been not very compact.

And so for the first thousand or two thousand steps the changes are making it more compact and then as it enters the region where you see a cloud and stays there for the rest of the

time.

So you should -- I did verify this by confirming that those tails that you see are happening in the early part of the run. And that for most of the length of the run it's circulating around that cloudy region.

Q And you say that -- for Figure 4, this is examining the effects of partisanship. How does this type of analysis affect an analysis of interaction of race and partisanship in the drafting of redistricting plans?

A Well, so here I used the term effects. We might also say the entailments or we might say the necessary correlates. And so what this helps you understand is whether a pursuit of partisanship, at least in the manner described here will necessarily entail other properties.

And so something that we're seeing is that a priority on more Trump-favoring districts doesn't necessarily force less compactness. You can see that here. That's demonstrated conclusively here.

And what we'll see in the subsequent figures is that it doesn't necessarily force a cracking pattern in the demographic population of

the districts either.

Q And for these different pieces, did you -- do you -- did you analyze any racial data or did you just instruct the steps not to consider that in terms of the development of a plan?

A As far as I'm aware, there are no -- well, at least no publicly released ensemble techniques. They use race to propose a change to a plan. I've just never seen that.

Instead what you might see is what I described here, which is making a random proposal of change and then flipping a coin to decide whether to accept that change. Sometimes that's done in a way that take a look at racial demographics.

But here in the first experiment where I was looking for more majority black districts it was that coin flip that takes the number of majority black districts into account.

But in the second part where we're leaking at partisanship, no race data was used at all at any stage, proposal or acceptance.

Q So we don't know for sure what the number of majority BVAP districts, majority BHVAP districts are on any of the steps. So we just don't know the -- what that is, right?

A That's right. We don't know that, although I handed over enough materials to go back and compute if one would like.

Q Well, and I guess what I'm really trying to ask is that in terms of districting plan that provide effective districts, there's no interaction here between effective districts, partisan goals, race. This is solely looking at the question of Trump favoring districts and compactness; is that right?

A Well, that's what you see in Figure 4. But, you know, again, it plays sort of a table setting role. All I'm showing here is I designed the experiment to get at least as many Trump favoring districts while still being compact and respecting counties.

And this confirms, at least, that I achieved more Trump-favoring districts and good compactness. I could have shown you the same plot for other features, but I did check that it was doing a good job with the other TDPs as well.

Q Okay. So let's move beyond the table setting to the food on Figure 5 and the other analysis. So can you walk me through -- next you're looking at whether the enacted plan is unusual in

its racial balance among highly partisan alternatives.

So can you explain the next step of this analysis that you conducted after the process in -- displayed in Figure 4?

A Absolutely. So this takes the same hundred thousand plans that we just observed on the previous scatter plot, the same plans -- not similar, but identical -- and now considers how much BVAP shared is in every district.

Now, because these proposed -- these alternative districting plans don't come to you with a numbering, I haven't tried to number them geographically. Instead I've just sorted them from -- in this case there are 14 districts because these are Congressional plans. And so I've sorted them from the one with the lowest BVAP share to the one with the highest BVAP share.

So you have to be a little bit careful of that when you interpret a lot like this. The Column 6 is the one -- sixth from the bottom in terms of its BVAP share. It's not necessarily anywhere close to District 6 in the state.

Q And so moving into Figure 5 then, can you walk through what the box whiskers plot

demonstrate about the BVAP share of these various plans versus the enacted plans.

A Yes. Absolutely. So let's focus on the last column, the right-most column, which is in all cases looking the district with the highest BVAP share across all hundred thousand and one plans. Right? There's the hundred thousand that I generated, plus the one enacted plan.

So the box and whiskers is showing you -- the box goes from the 25th to the 75th percentile of observations and the whiskers are set from first to the 99th. So what this is saying is that 98 percent -- at least 98 percent of the plans that I constructed in this process have somewhere between what looks like 57 percent and about 78 percent BVAP in their highest BVAP district.

The middle of the box or sort of noted within the box is a horizontal line, and that's the median. It looks to me like that median level in that highest BVAP district is about 68 percent.

So what that's saying is that about half the plans that I constructed had a district with more than 68 percent BVAP and half did not have a district with more than 68 percent BVAP.

When you see the enacted plan right

there about that level. So it's level of BVAP typical of the highest BVAP you would observe in this universe in which you're seeking more Trump districts.

Q And then the districts you've highlighted in the middle, those are the ones where the enacted BVAP is lower than what you would expect to see in those districts; is that correct?

A That's right. What you see in the one indexed 6, 7, 8, and 9. So, again, this doesn't correspond to District 6, District 7, District 8, and District 9. It's just the ones that are in the middle in terms of the BVAP level.

What you see is that it's above or below that bottom whisker. And so in the 6th index and the 9th index district, that means that no more than 1 percent of plans that I produced had BVAP that low.

And I would estimate visually, although we can look this up. I, of course, have the exact statistics, that no more than 2 or 3 percent of the ensemble had BVAP that low in the ones indexed 7 and 8.

Q And then indexed at 11 and 12, those where the enacted plan had BVAP higher than what we

1 expected in the ensemble plan, is that right?
2 A That's right. Sorry. Excuse me one
3 second. I thought I might sneeze.
4 Yeah. And what you said there,
5 especially in the one indexed 11, is just really
6 high above the whiskers. But we shouldn't be too
7 surprised because that's right at that 50 percent
8 line which, as we know, has a particular legal
9 relevance. Right?
10 So, yes, it would be unusual for plans
11 simply seeking Trump advantage to be -- to have as
12 many districts at or close to that 50 percent line.
13 But given that that's occurred, what that means is
14 that we're going to have to see BVAP below median
15 elsewhere. Because there's a fixed amount of BVAP
16 in the state, and the districts are all very close
17 to equal populous.
18 And so the question is: Where is the
19 BVAP going to be low. Will it be in the highest
20 districts where there's already an opportunity to
21 elect? Will it be in the lowest districts where
22 there's probably, all things being equal, less
23 chance of opportunity to elect. Not impossible, as
24 we'll see, but less likely. Or will it be in the
25 middle range which, all things being equal in a

50/50 state would be where you're seeing the opportunities -- where districts are more contested, where districts are more competitive, where Trump advantage might be sought at the expense of opportunity.

Q Okay. And you say at the end of your discussion in Figure 5 this does not suggest a race neutral pursuit of partisan advantage, but rather a highly race conscious pursuit of partisan advantage. Do I have that right?

A Yes.

Q And your conclusion there is not that the legislature definitely pursued partisanship in a race conscious manner, but that the evidence is -- would support that conclusion, right?

A As usual, yes.

Q And then the charts on the next page for this House and the Senate, do those generally show the same things we've been discussing regarding the Congressional plan or do they do something different?

A They generally show the same thing. Now, in the Congressional plan, that so called middle range that I've highlighted is really centered at the middle. In the Senate plan you can

see that it's shifted a little bit up from the dead center.

Well, of course, there's 56 Senate districts, so the center would be at 28 and the green zone that I've highlighted is centered a little higher than that. And the House -- of course there are 180 districts, so I've only shown number 60 through 120 here.

And 90 would be the center. And the green zone that I've highlighted has again shifted a little bit to the right of that.

The reason I chose those districts to highlight is that that's where I was seeing the general pattern of depressed BVAP. And, as I said a moment ago, you'd expect in a roughly 50/50 state all things being equal, that middle range is where you'd expect to see cracking or the lowering of BVAP in a way that pursues partisan advantage.

If that pursuit of partisan advantage was more aggressive, so if it wasn't sort of limited to just the middle districts but trying to pursue more districts, then it would be shifted a little bit up. And that's what we see here.

Q So is it your conclusion that the general assembly could have been a lot more partisan

than it was and chose not to?

A Well, I definitely don't think they were seeing seeking maximum numbers of Trump favoring districts. The evidence here suggests, as you saw, that it was possible to get quite a few more Trump favoring districts.

Now, of course the -- the tendency to have more Trump votes than Biden isn't a perfect indicator of success in districted election. It's just a proxy. But to the extent that it's a useful proxy, which I think it is, it's definitely true that they could have achieved even more partisan advantage.

Q And so if the legislature had thought to achieve more partisan advantage, is it possible that these charts in Figure 5 and in Figure 6 would reflect more favorably as less race conscious then?

A Let me see if I understand the question. You're asking if my chain runs were even more aggressive or if the state was more aggressive?

Q It was trying to understand if the state was more aggressive. So if the date was pursuing a partisan advantage but not a maximized partisan advantage, would that be in part, at least, an explanation for what we're seeing in Figure 5 and

Figure 6, or would that not matter?
A Well, keep in mind that my chain runs are also not maximizing. So I do think it's a reasonable experiment to use for the pursuit of partisan advantage that is successful but not extremal.
Q So when you reference the signature of cracking for the House and Senate it's referring to that lower than expected BVAP the middle range of districts. Is that a good way to summarize that?
A Sure. And I should say, it's not just lower than expected meaning like low medium. It's frequently below that first percentile. It's really quite low in a number of places, especially in the Senate map.
Q And for the Senate and House, the same -- the same limitation as on the Congressional. You're not saying that it shows that there was a race conscious pursuit of a partisan advantage. You're saying this is just evidence they would support a conclusion of race conscious pursuit of partisan advantage.
A That's right. I think it's suggestive evidence.
Q Okay. So I want to ask -- the next page

over, 2.2, the last sentence of the first paragraph says, "In a partisan motivated plan for a 50/50 state, we would expect cracking in the middle range of districts as discussed above. If that partisanship is pursued aggressively, we would expect it to extend somewhat above the middle range if the controlling party tries for more districts. That is what we see here."

Did I read that right?

A I went on mute. Yes, you did, and that's what I just tried to explain a moment ago, that the -- the highlighted range is shifted somewhat above the dead center, and I think that that's consistent with a more aggressive pursuit of partisan advantage.

Q And so then there's a discussion of the ten random plans from the Trump favoring collection of the Morgan alternative plan. Can you just walk me through what the various sequence of numbers are on -- in this paragraph on Page 10?

A Sure.

Q The next paragraph. Sorry.

A I should say, this is -- this is an attempt to give you some intuition about the unlikeliness of the observation. It's not kind of a

rigorous, sort of significance test in a statistical way.

That would be difficult or probably impossible to do here because of the very complicated correlations. But so this just supposed to give some intuition.

Okay. So here's what the numbers say. So if you look -- start with the Congressional case, which is discussed in the second paragraph on Page 10. And so I say, "The relative position of the enacted plan is 1-1-1-1." What I mean by that is if you consider enacted plan and ten alternatives.

So that's -- and those ten were spaced out from the chain run. So I grabbed -- there's a hundred thousand plans in the chain run. So to get ten I grabbed something every 10,000 steps. Right? So they're spaced out from the chain run.

And among those 11, the enacted plan is lowest every time in the districts indexed 6 through 9, so 1-1-1-1-1.

By contrast, if we look at the Senate plan there are 19 districts there and it's lowest of all -- and now there are 12 alternatives because there's the Morgan plan, the ten generated by computer and the enacted plans, another 12

alternatives, and the enacted plan is lowest of all 16 out of 19 times.

Twice it's second and once it's third. That's how to read the sequence of numbers. And then of course it's the same thing in the House where the numbers vary from 1 most often to 2 and in one case get up to 6.

Does that make sense in terms of -- have I explained those relative position numbers?

Q Yes.

A Okay. And then there's a probability calculation. And, as I said, this is just illustrative to get some intuition. But going back to Congress, if you were -- if you were drawing independently from the same distribution -- that's what i.i.d. means, then the probability of being last out of 11 four times in a row would be one out of 11 to the 4th, which is less than 0.00007.

And I've done corresponding calculations in the other cases.

Q Thank you. And at the end of this section you say -- or actually, next to last paragraph, you say, "In addition to these ensemble comparisons, we find corroborating indications that race was operationalized by the map makers by

1 considering other elements of the plan, such as the
2 high number of flip precincts."
3 And not to beat a dead horse here, but
4 you're not saying that race was operationalized by
5 the map makers. You're saying there's indications
6 that race was operationalized by the map makers;
7 right?
8 A Absolutely.
9 Q And in the summary you find the enacted
10 plan to have properties associated with the cracking
11 of minority voters, depressing their numbers in a
12 range of districts in a manner that reduces or
13 eliminates their opportunity to elect candidates of
14 choice.
15 And, again, you're not saying the
16 enacted plan was intended to crack minority voters
17 in this way. You're saying that it has properties
18 associated with that kind of cracking; correct?
19 A That's right. It may be a coincidence,
20 but it looks an awful lot like it would if you were
21 trying to crack minority voters.
22 Q And then the last sentence, "This is
23 consistent with a hypothesis that a race was used to
24 achieve partisan outcome in the state's enacted
25 plans."

The same thing here. You're not saying race was used to achieve partisan outcome in the state's enacted plans. You're just saying it is evidence that it's consistent with that fact; right?

A Yeah, I -- and I got further than consistent with. I say highly suggestive of.

Q Would any of your opinions about the impact of race and partisanship be changed if you knew that the map makers had not referred to racial data in the drawing of the enacted plan? And I'm not saying that they did. I'm just saying, would that change your opinion if that hypothetical was in place?

A If I knew for a fact that race data hadn't been used? Well, you know, I think I can say -- you typically ask someone to draw a plan who knows the state pretty well. And my understanding is that Director Wright has been in that position or a similar position for years.

And so I think it would be hard for her to turn off her knowledge because my impression is that she's a highly competent map maker with some significant local knowledge of Georgia.

I think it would be hard to turn that off just because you turned off, you know, the "show

me race" button in your mapping software.

In another case that I was in recently, one of the witnesses called that a mind wipe, saying you'd need a mind wipe to not know anything about race and geography if you really know a state.

So it's hard for me to kind of conjure up the counter-factual, someone who knows the state well enough but doesn't know anything about -- you know, is kind of legitimately blind to patterns of residential demographics.

Q Moving to the correction of the report. The correction that you made to your report in part -- or appendix C, I guess if your supplemental report doesn't change any of your conclusions, does it?

A Oh, certainly not. It's extremely minor. I just have flipped the fractions, and I had the numerator and denominator reserved. It -- I'm just trying to be quite comprehensive and transparent here, but I think the correct meaning can be easily understood from the original report.

Q Let's move from these to your CV. I just want to walk through a few background and other questions. Let's use Exhibit 4, which is the CV provided to us.

A Okay.
Q And let me know when you have that.
A It's loading.
Q Okay. Sometimes Exhibit Share works quickly and sometimes it work slowly. And it doesn't always seem to be related to file size.
A Okay. It just loaded.
Q All right.
So I want to ask if you would just walk through a few pieces of your background here. Obviously you had your degrees in mathematics and women's studies from Harvard and your master's and PhD from Chicago in mathematics.
What was the year where you first drew a redistricting map?
A Well, I got interested in redistricting only relatively recently in 2016. And since then I have become deeply professionally and intellectually engaged in trying to understanding redistricting with new tools from mathematics.
So probably it would be 2016 that I -- maybe 2017 that I first drew a plan.
Q And the MGGG redistricting lab at Tufts began in 2017; right?
A Well, there's a question of naming.

MGGG started as a group of friends, Metric Geometry and Gerrymandering Group was a collective of mathematicians and recovering mathematicians who wanted to think about redistricting.

And then I kind of transitioned it into a lab over the span of the next few years. So the lab moniker probably first got attached in 2018, was certainly in place by 2019.

Q Okay. So the reference in your CV to 2017 for the lab is just when it first kind of officially started even if it didn't get named that until later?

A That's right. As a collective we started issuing white papers and doing study and running a large summer program and building our open source software. That all started in 2017.

It official became a lab a little bit latter. I'm representing that the work of the lab began in 2017.

Q And at Tufts you're currently on a tenured position as a professor of mathematics; right?

A That's right.

Q And in any of your professional experience list here at various universities, I'm

assuming you've always left on your own terms or not -- not removed from any position; right?

A I've never been fired. I think that's what you're asking. The positions that -- the positions at David and Michigan were term, three-year post-doctoral positions.

Q Let's turn to your publications. I know you have kind of -- as I read it, kind of two sections. One is a -- has more of a redistricting focus and one is much more your pure math focus on those pieces.

Is it fair to say the publications on Pages 2 and the top of 3 are your publications that are related to redistricting and the census primarily?

A Mostly redistricting and the census. Some of this work relates to alternative electoral systems. So I would say I study social choice and elections more generally, not -- not limited to redistricting.

A few of these papers are on somewhat different topics, such as measuring segregation. So that's related, but not identical to electoral work. And there's at least one paper that's -- the last one listed here, that's just about migration

patterns of mathematicians around the world.
So I would say there's a variety of different topics covered here.
Q And you've worked at least initially with -- on the efficiency gap and partisan gerrymandering questions in some of your publications; right?
A Definitely. And also -- I see. So this is the 2022 CV. My -- my most recent returns to a kind of theme of measuring partisan fairness in redistricting. So that's been a topic throughout.
Q And you didn't use any efficiency gap or other partisan fairness metrics in your analysis of the Georgia plans in this case, right?
A Well, that most recent paper is actually about using proportionality as a fairness metric. So to the extent that in this report I'm able to look at how seat chairs relate to vote chairs, I suppose implicitly you could call that a partisan fairness metric.
Q But beyond that type of analysis, you didn't use any of the other deficiency gap type statistical analyses for your work here; right?
A I didn't. But actually, one of the interesting things about efficiency gap compared to

partisan symmetry and other notions, is that you can read it off of seats and votes.

So you could, actually. You don't need any special calculations. You could work out efficiency gaps all through the report if you were so inclined.

Q So I'm looking at your teaching and courses that you're -- have developed or customized. I was looking at those. It seems to me that the only one really one kind of related directly to redistricting was mathematics of social choice.

Are there redistricting parts of other courses you've taught?

A Yes, the classification lab looks at lot at censuses. So that's -- that's fairly related to this work. And Mathematical Models in Social Context we actually use redistricting as an example in that course as well.

Q And --

A Actually, I should also mention the Markov Chains course also heavily uses redistricting as an example because the chains that we talked about in the last rebuttal reports, "chains" is short for Markov Chains, which is a leading mathematical method that I had the pleasure of

teaching at the gradual level.

Q I've dropped another exhibit in here, Exhibit 5. This is something I found on the website. It's the syllabus from the Mathematics of -- Math of Social Choice.

A I'm waiting for it to load.

Q Okay.

A Okay. It's just loaded.

Q Okay. So is this the -- I'm sorry. The syllabus from the Math of Social Choice from Tufts in 2021?

A This would have been during shutdown, so 2021 sounds -- oh, it says 2021 at the bottom. Zoom Semester Redux.

So, yeah, I taught this. I think I taught social choice at Tufts three times and once at Boston College.

Q And in the middle of the -- what's the class about, you say, "We'll develop some mathematics to help us understand what's hard and sometimes impossible about our goals for systems of social choice."

A Yes.

Q What do you mean by our goals for systems of social choice there?

A Well, it's -- I'll say it's an unexpected pleasure to get to talk about my curriculum designs. So thank you for that opportunity.

Q I saved this for the end for you, so --

A I have something precise in mind with that phrasing. So forgive me for slipping into professor mode for a moment here.

So what we call social choice, that phrase comes from the mid 20th century when Ken Arrow and other economists built axiomatic frameworks for studying elections. And what -- what that means is Arrow wrote down a collection of axioms of fairness. So he wrote down what your possible goals might be for a system.

So the axiom there really is a kind of property that's satisfied by some systems and not others. So it has the status of a goal.

And so what are those goals? I'll give you some examples. One of his axioms was something called Pareto efficiency which means if every single voter has the same first choice, that person should win.

So that would be a goal -- I mean, it sounds pretty reasonable, right? And so that would

be a goal. I wouldn't want to choose a Democratic mechanism that doesn't satisfy that property is the status of the goal.

And Arrow really kicked off the interest of technical people in studying elections by proving a kind of bombshell theorem in 1951. That said, if you just put down three simple goals, then you cannot meet them all of the time. No social choice system can simultaneously offer you guarantees to meet multiple fairness goals at once.

Q Thank you. That's a helpful explanation.

A That's what I do for a living.

Q So let's go next to -- back to your CV. I want to talk a bit more about the redistricting lab.

A Yes.

Q And in the -- let me see if I can find the cite. You say that the lab has provided -- there we go, Page 7 in program developer. It provided public mapping support for roughly 140 localities after 2020 census data was released.

Were any of those 140 localities states and state legislative maps?

A The public mapping support? Yes. For

example, we were hired by the Michigan Department of State to do the public mapping support for the Independent Citizens Commission in Michigan.

Another example is Alaska.

Q Any others?

A I could give you a few. I'm really -- I'm very proud of this work. We really did a lot of -- this isn't a service of communities of interest.

And so when I mentioned earlier that I love it when I can be concrete about communities of interest. This is the kind of work that you need to be able to do that.

So we were hired by the Alaska Redistricting Board, which is a nonpartisan board in Alaska to -- or I guess bipartisan. One never knows how to most accurately describe those. But we set up the software that they could use to let members of the public draw their own maps.

In many states like Michigan the software lets you either submit a districting plan or just draw your community.

And so you could take testimony like the testimony collected in Georgia but now ask people, "Show me where your neighborhood is. Show me what

you're talking about."

And then for four states, we provided a service where we aggregated the thousands of public submissions into clusters that you could use to be quantitative in your study of respect for communities of interest.

Q And the support that you provided, it wasn't drawing the redistricting maps necessarily, it was providing information to people who were drawing the maps; right?

A Oh, actually I would even say it -- when I say public mapping support, I mean we allowed members of the public to draw. That's what I mean by public mapping support.

Q Excellent. Thank you.

And it's probably obvious from the timing, but this was the -- 2021 was the first decennial redistricting cycle where this lab was in existence, right?

A Definitely. Like I said, this was only a twinkle in my eye in 2016.

Q And did the lab draw districts that can then be used in elections for jurisdictions?

A I can think of one example where we were thought we were drawing demonstrative maps, and that

map was enacted. And that happened in Jackson -- in Jackson, Tennessee, to our great surprise.

Q And was that a county commission or city council district?

A City council.

Q But the lab, at least so far, hasn't had a statewide map that it drew used in an election, right?

A Well, I as an individual, as I mentioned earlier, worked with the Massachusetts State Senate on its drawing process. But I try to be careful to distinguish -- you know, it's -- it's delicate, but I try to be careful to distinguish the lab as a research lab sitting at Tufts University from work as an individual when I do consulting projects.

And so I would say the lab -- you know, as a lab has not drawn maps that have been enacted anywhere.

Q And then we'll get to your work when we get to that part here in a minute so we can cover that at that point.

Now, one of the things that in program building you reference you worked with is the Voting Rights Data Institute in 2018 to 2019. Right?

A Right. I created it, that's correct.

Q I want to produce Exhibit 6 here. There we go. It should be showing up for you now.
A Okay. I have it.
Q And so this is the -- from the website you can see the 2019 papers and links from the VRDI. Is that right?
A VRDI, that's correct.
Q And you have a variety of publications. I'm assuming these are things that you gave to participants in this institute to study and learn about redistricting. Is that fair to say?
A Well, the design is that -- I wasn't the only one teaching at VRDI. And so I think the material on censuses, that -- that I chose, I selected those papers to share with participants.
But, for instance, the section on communities of interest, I didn't lead personally.
Q Okay. What about the legal overview of actual redistricting practices section there? Did you select The Realist's Guide to Redistricting as the tool for that?
A I did, yes.
Q Okay. So I want to take a look at that.
A Sure.
Q This may take another minute to load

here. I'll represent to you that this what I downloaded from the -- from the link here in Exhibit 6, clicking on that. I'm going to mark it as Exhibit 7.

A Okay. I believe you. It's still loading, but maybe you could go ahead with the question.

Q Sure. So what I wanted to ask, there's a-- when you get it loaded up, on Page 57, which is 30 -- Page 38 of the pdf. There's a statement in this book that says it could be difficult to demonstrate that race is the underlying cause of racial polarization, especially because minority voting patterns often track partisan voting.

And I just was curious. Is that a statement you agreed with in your work in the redistricting space?

A I do --

MR. CANTER: Bryan, can you -- I apologize, Moon. Could you point me to the page where that statement is made?

MR. TYSON: Yes, it's on Page 38 of the pdf. It's titled 57 at the top. And it begins at the very bottom of Page 57. It can be difficult. It goes over to the top of Page

58.
A Sure. Okay. I'll read this more carefully before I agree, but I --
Q Sure.
A I predict that I will agree. "It can be difficult to demonstrate that race is the underlying cause of racial polarization especially because minority voting patterns often track partisan voting."
That's the sentence you asked about, right?
Q Correct.
A Right. I would -- I would definitely agree that what we're talking about here -- just to be clear, what I this is saying is we're talking about the cause in terms of voter behavior. We're asking what causes a voter to vote one way rather than another way.
And I definitely agree that coming to any definitive conclusions about reasoning and voter behavior is extremely difficult when all you have is demographics, cast vote patterns, and sometimes, you know, auxillary did a late registration and so on.
Sometimes you have survey data. Sometimes you have polls. But generally you're

trying to cobble together a picture of voter motivation and voter psychologist from those kinds of artifacts. And that can be quite difficult to do. I would agree with that.

Q Let's move to the last page of your CV then, Selective Professional Service and Public Facing Work.

A Sure.

Q I see you filed an Amicus brief in the Rucho versus Common Cause case. And so I've marked as Exhibit 8 what I believe is that brief. I wanted to see if you could pull that up.

A Surely.

Q And is it fair to say that one of the purposes of this Amicus brief in the Rucho case was to urge the Supreme Court to find that there was a mathematical solution to partisan gerrymandering?

A Well, I think that might go a little far. But I was -- I was hoping that --

The brief argues that they're a manageable tool for assisting in adjudicating partisan gerrymandering cases. And so that's what I -- I would say my focus was in writing this brief.

Well, as you know, there's a number of amici on the brief, but the principal writing was

done by myself and Guy-Uriel Charles.

Q And going to Page 21 of the pdf, which is titled Page 15 at the top, so to make it confusing.

A Yes?

Q There's a statement there towards the end of that paragraph that takes up most of the page that says, "We must, therefore, create a benchmark understanding of neutral districting plans in a state-specific setting. Once we have such a benchmark, we can compare it to the challenged district plan to determine whether, in the light of evidence, an intent to discriminate is the best explanation for a district's design."

Did I read that right?

A You read that right.

Q Okay. And that benchmark of understanding for neutral plans in a state-specific setting in this brief was your method ensemble by creating this tens of thousands or millions of plans, right?

A That's right. What this is advocating for is an ensemble analysis for partisan gerrymandering. And I want to specify since I think it's important to understand the intent here is to

1 describe, as I said before a kind of manageable tool
2 and a manageable standard, not a one-size fits all
3 tool that you need to use for everything.
4 I have quite a body of scholarship
5 looking at ways that ensembles can be used and
6 sometimes shouldn't be used. So this doesn't mean
7 to propose that there's one approach that works for
8 every kind of redistricting analysis.
9 Q And you've written a book recently
10 called Political Geometry, right?
11 A Well, I'm an editor.
12 Q Okay.
13 A So it's an edited volume within --
14 Q And I'm sorry.
15 A I did write large chunks of it indeed.
16 And, boy, that project took a long time. But I'm an
17 editor and there are many contributors.
18 Q And one of those contributors Professor
19 Jonathan Rodden, right?
20 A Right. I think it's pronounced Rodden,
21 yes.
22 Q Rodden. I'm sorry. And one of the
23 contributors is Kristen Clarke?
24 A That's right.
25 Q And one contributor is Ellen Katz?

A Yes, exactly.
Q Do you personally believe that the Voting Rights Act has been weakened in recent times?
A Oh, certainly.
Q And how so?
A Well, for instance, in the Shelby County decision, the preclearance list was effectively emptied, and so -- this is just my understanding of the history. I'm not speaking here with any legal authority, to be clear. But my understanding of the history is that Section 2 and Section 5 were both operational and much used up to 2013, and since then the pre-clearance list is essentially empty. I think there's one example of a bail-in locality. And other than that, only Section 2 is now available for litigation.
Q And when I was reading the different interviews you've done over time, I ran into your description of a Massachusetts in several places and being a Republican in Massachusetts. Can you just kind of briefly recap what that description involves?
A Sure. And I'm honored that you've read so much and listened to so much of my work. So thank you.

Yes, so Massachusetts I find to be an absolutely fascinating example. It's my home state and when I'm not here in New Zealand. And one of the things I think is interesting about Massachusetts is that it has a distinctive political geography that makes it difficult and often impossible to achieve anything like proportionality, for example.

I could sort of explain that more. But let me know if you have a particular question.

Q Well -- and my main question is that you have, for example -- I think you gave an example that if Republicans get a third of the notes, they're still going to zero seats, and it looks like it's a partisan gerrymander, but I really has to do more with the geographic distribution of Republicans in the state. Is that right?

A That's exactly right. It's the most --

Q Let me ask a few questions that --

A Sure.

Q Go ahead.

A It's just -- it's the most uniform political geography I've seen anywhere where -- in many elections you find that Republicans have about a third of the vote statewide and about a third in

every county and about a third in every town and often not too far from a third in every precinct.

So even though you have a third of the vote, you have no areas, at least in a certain string of elections that -- where a Republican won.

Q Let me move to the last section here for your expert work in redistricting litigation. So I just want to understand. You reference series of cases and states. So first can I just ask: Have you drawn redistricting maps that were statewide that were adopted by any commission or legislature and have been used in an election?

A Well, I had a role in drawing the Massachusetts Senate map I keep mentioning. I wouldn't say I was the only -- far from the only person who had a drawing role in that. And in the rest of these --

Let me look at these quickly. I drew demonstrative maps in several of these, but they were -- they were demonstrative fo litigation.

I had an interesting role with the Advisory Commission in Wisconsin, the People's Maps Commission in Wisconsin where they asked me to use ensemble methods to show them examples of maps with different properties, and they ultimately ended up

proposing maps to the legislature -- this is the People's Maps Commission created by the governor in Wisconsin.

So based on my examples, they ended up modifying them substantially and proposing maps to the legislature that met their various criteria. But the legislature then ignored those maps and proposed different ones and it ultimately ended up in state court.

Q So what I wanted to do then was just for the list of states just ask you kind of what you've done, report, deposition, and/or trial testimony.

A Sure.

Q Wisconsin, which of those did you provide?

A A report. In Wisconsin the state Supreme Court never heard expert testimony.

Q How about in North Carolina?

A That was a very extensive project. I think I filed four reports and testified in State Court.

Q In State Court. Okay.

A Yes.

Q How about in Alabama?

A In Alabama that was a district court,

three-judge panel. That's the Milligan case that, no doubt, you might have heard a mention or two. And so in that case I was the -- I still am since the case is technically ongoing -- the Gingles 1 expert for LDF.

Q And in Pennsylvania what was -- what type work did you do in those cases?

A So in Pennsylvania I have an expert for the governor, Governor Wolf, the former governor. And that was -- it was a very complicated one. Being a split control state, there wasn't an enacted map to challenge.

So instead there was a one-judge State Court or Commonwealth Court hearing in which I think it was 12 different parties had the right to propose up to two maps.

And the way the timing was set up, we experts were supposed to analyze those many, many maps in under 48 hours. So I would call that the wildest of the cases listed here.

Ultimately in that case it was Jonathan Rodden's map. He have an expert for a different plaintiffs' group, and it was his map that was ultimately selected for adoption at the Congressional level.

Q And then that what kind of work have you done in South Carolina in the expert space?

A South Carolina is another state where I was an expert for LDF. And in that I was an expert in two different cases, one challenging the House districts and one challenging the Congressional districts. There was no challenge to the Senate districts.

The House case was settled. The Congressional case was decided recently but there's an appeal to the supreme court, and we're waiting to find out if that appeal for a stay will be taken up.

Q And that was a federal three-judge panel as well; right?

A Federal three-judge panel. Although, notably -- let me think about this for a second.

Actually, I'm not totally sure. There are a number of these, as you see. I'm not totally sure whether that was federal -- it was federal. That's correct. The reason I'm not completely certain is that notably, unlike Alabama, it's no a VRA case. The case in South Carolina is constitutional only.

Q And then in Texas, what kind of percent work did you do there?

A In Texas I am working on behalf of the NAA -- Texas NAACP. Those are the plaintiffs. And I'm working with the Lawyers Committee. And that is just an omnibus case with some of everything. So there are VRA claims, there are constitutional claims, there are challenges to all three levels of restricting, and that's very much ongoing.

Q And then Georgia, I'm assuming, refers to these cases, right?

A That's right. And I didn't -- it looks like I didn't have the case caption to list. And I'll mention that since this CV was handed over, I've also filed an affidavit in a challenge to the Boston City Council Districts. This time on behalf of the defendants to the voting rights challenge.

Q So in the boston City Council you're representing the defendants in a case against the challenge brought by plaintiffs under the Voting Rights Acts?

A That's right, on -- the VRA challenge is on behalf of black voters in Boston.

MR. TYSON: Can we go off the record for just a second.

THE VIDEOGRAPHER: We are going off the record at 7:58.

(Recess.)

THE VIDEOGRAPHER: We are on the record at 7:59.

MR. TYSON: Well, Dr. Duchin, I really appreciate your time today. That's all the questions I have for you and I hope you have a great rest of the day and look forward to seeing you soon.

THE WITNESS: Thanks. I hope you have a great day, too.

THE VIDEOGRAPHER: Does anyone else have any more witness?

MR. CANTER: No questions from the Georgia NAACP plaintiffs.

THE VIDEOGRAPHER: So for myself and Ms. Carla, the court reporter does anyone want the -- you know what? Let's just do this in chat. That way it doesn't take so long. Ask what you want and how you want it, and if you want video and how you want that and we'll get it to Veritext and get it right to you all.

And is this expedited for anyone?

MR. CANTER: We can do it through chat. That's just fine, Scott.

THE VIDEOGRAPHER: Okay. So we're going

to go ahead and go off the record now.

Thank you, ma'am. You've done a grat job.

THE WITNESS: All right.

THE VIDEOGRAPHER: We are going off the record -- off the record at 8 o'clock.

(Deposition concluded.)

E R R A T A S H E E T

Pursuant to Rule 30(e) of the Federal Rules of Civil Procedure and/or Official Code of Georgia Annotated 9-11-30(e), any changes in form or substance which you desire to make to your deposition testimony shall be entered upon the deposition with a statement of the reasons given for making them.

To assist you in making any such corrections, please use the form below. If supplemental or additional pages are necessary, please furnish same and attach them to this errata sheet.

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I, the undersigned, MOON DUCHIN, PhD, do hereby certify that I have read the foregoing deposition and that to the best of my knowledge said deposition is true and accurate (with the exception of the following corrections listed below).

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MOON DUCHIN, PhD

Sworn to and subscribed
before me this _____ day
of _____, 2023.

Notary Public:_____
My Commission Expires:_____

DISCLOSURE

STATE OF GEORGIA DEPONENT: MOON DUCHIN, PhD
COUNTY OF FULTON

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March 22, 2023.

C E R T I F I C A T E

STATE OF GEORGIA:

COUNTY OF FULTON:

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CARLA J. HOPSON, RPR
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B-1816

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& 4:3 6:17 7:5

0

0.00007. 237:18
00090 1:11 5:20
03 199:24
055 142:17

1

1 2:3 14:11 20:16,19 21:8 21:16,19 25:18 26:7,11 28:22 28:23 29:3,12 37:8 41:17 44:14,16 47:12 47:15 51:9 60:7,25 61:20 62:23 63:10,14 63:22 66:2,19 68:19 71:20,21 72:23 76:13 80:20,23 81:2 95:19 101:19 107:12,17 113:19,19,24 114:3,5 122:3 123:13 124:4 124:24 126:18 126:24 127:12 127:18,21 128:22 129:7 129:15 130:15 130:18 132:2 133:25 134:7 135:19 136:25 137:2,23 139:22 140:2,3 140:10,11,15 140:23 141:11 142:22 145:18 154:15 159:5 172:9,13 207:23 208:23 210:13,15,17 229:17 237:6 262:4
1-1-1-1 236:11
1-1-1-1-1 236:20
1.1 27:8
1.16 28:3
1.2 32:22 209:19
1.3 213:18 216:10 217:19
10 39:20,24 110:7 165:8 167:14,17,23 200:22 222:21 235:20 236:10
10,000 236:16
10.1 165:4 166:3
10.2 165:5 166:9
10.3 165:6 166:13,14 205:24 206:14
10.b 269:4
100,000 213:21
101 192:12
11 56:17 58:1 58:13,14 157:11,22 171:3,10 200:1 216:22 222:19 222:22 229:24 230:5 236:18 237:17,18
110 223:5
111 223:7
12 59:8 123:25 229:24 236:23 236:25 262:15
120 232:8
13 60:9 61:14 61:24 64:24 123:25 202:12 202:17
13th 24:16 218:15 220:15 220:17
14 43:25 51:13 51:13 52:1,2 92:8,16 93:7 169:13 171:3 171:10,14,16 171:17 174:16 175:14 176:3 177:18 178:17 178:25 179:10 182:16,21 205:25 206:8 227:15
140 248:21,23
15 10:3 75:12 100:23 101:2 256:3
16 78:21 121:18 152:2,2 237:2
161 142:9,9,12
168 2:5
17 94:7 137:4 182:1,22
172 97:13
18 134:7 137:5 137:5
18/18/18 134:2
180 97:8 232:7
1816 1:24 269:17 270:24
19 134:8 139:21 236:22 237:2
1951 248:6
1:07 1:18 5:4
1:21 1:6 5:18
1:22 1:11 5:20
1:34 27:22
1:39 27:25

2

2 2:4 5:4 14:11 21:10,16,19 26:3,8,10 38:1 48:10,12,13 49:20 60:25 61:21 68:19

71:20,22 72:23 92:14 94:18 95:19 101:19 104:13 107:13 107:17 113:19 113:19,25 114:5 117:13 124:8 125:21 126:9,17 127:3 127:12,12,14 127:18,19,20 127:24 128:3,5 128:5,16,18 133:25 134:8 137:6,25 139:5 139:9 140:3,11 140:16 141:13 159:5 187:18 192:15,17,18 193:22 194:18 207:12 210:14 210:17 229:21 237:6 243:13 258:11,15
2.1 220:8
2.2 235:1
20 2:3 28:9 100:24 134:7 141:10 202:20
2010 48:10,11
2013 258:12
2016 85:2 241:17,21 250:21
2017 20:10 241:22,24 242:10,16,19
2018 88:19 89:17,25 242:7 251:24
2019 2:8 48:10 48:11 242:8 251:24 252:5
2020 2:5 18:1,7 94:6 169:8 170:2,2,19 219:7 222:15 248:22
2021 28:10 52:2,9 85:6 246:11,13,13 250:17
2022 13:7 39:2 39:6 93:18 95:22 244:9 270:20
2023 1:17 5:4 30:7 149:5 268:21 269:18
20th 247:10
21 203:9 256:2
21133 269:16 270:21
22 159:15 203:9 269:18
22nd 270:20
24 118:9 129:24
240 2:6
244 2:7
25 120:13 134:23 135:3
250 99:14
252 2:8
253 2:10
255 2:11
25th 228:10
26 2:4 121:14 128:5
27 1:17 153:23
27th 5:4
28 127:9 128:5 223:4,9 232:4
2:34 68:3
2:41 68:6
2:53 77:16
2nd 37:23

3

3 2:5 10:3 21:12,16,19 38:2 40:16 41:4 44:12 57:1,15,22 58:23,24 59:3 59:5,6 61:9,24 68:19 71:20,22 72:23 84:24 94:18 95:19 101:19 107:12 107:18 113:23 114:5 120:8 133:6 145:19 145:21 147:8 147:25 152:17 152:20 153:13 153:17,20 155:9 157:11 158:19 160:13 160:21 161:23 161:23 168:23 169:4 170:17 210:14 211:25 214:2 215:9 217:2 229:21 243:13
30 129:4 202:25 253:10 267:2
30,000 187:9
300 15:19
31 174:20,25
32 159:19,22 160:20 187:2
33 37:4,9,9 188:2,11 190:2
34 124:5 137:4 153:25 193:15 196:5
35 223:4
36,000 169:14 170:19
37 94:4 140:10
37,000 171:4
38 253:10,22
39 124:8 125:20
3:15 77:19

3rd 37:24

4

4 2:6 39:23 44:9 57:22 77:5 95:14,19 178:25 200:22 212:1,16 220:23 221:1,4 222:11 224:7 226:11 227:5 240:24
40 92:9,23 93:7 188:4 189:4
400 14:15 15:15,20
42 76:17 77:2 92:9,23 93:7 200:11
43 162:25 163:2
46 92:2,21 145:16
47 203:18
47.89 89:10
48 182:1,22 262:19
49 156:12
4:43 144:19
4:54 144:22
4th 237:18

5

5 2:7 41:21 42:23 51:13,15 52:1,4 74:10 77:21 89:7 91:7,10 92:14 95:19 96:17 99:3 111:23 112:8 113:2 157:20 163:2 212:1 214:2 221:3 226:23 227:24 231:7 233:16,25 246:3 258:11
5.2 90:21 91:23
5.2. 94:7,10
50 41:16 42:19 47:19,21 48:4 52:13 57:19 66:19 76:13 80:20 81:1 87:8 124:23 125:9,19,22 146:11,16 154:15 158:18 158:22 161:12 161:13,15,18 161:20 220:2 230:7,12
50/50 231:1 232:15 235:2
53 39:3,8 97:12
53/47 39:17
5338 1:6 5:18
54 136:10 192:20
55 220:1
56 97:5 179:10 182:1,21 232:3
57 138:1 228:15 253:9 253:23,24
57.1 120:7
58 162:9 254:1
59,511 187:12
5a 199:23
5th 207:17

6

6 2:8 28:17,19 39:23 40:2,3 43:25 44:9 51:13,15 52:1 52:4,8,12 53:23 57:20 62:9 79:11 92:8,15,16 93:7,11 94:4 99:10 113:25 119:2,11 120:3 120:7,24 147:2 167:25 168:1 170:5 171:8,14 171:16,16,18 171:25 172:18 173:8,12,14 178:17 182:16 182:21 187:18 200:1,15 205:25 227:21 227:23 229:10 229:11 233:16 234:1 236:19 237:7 252:1 253:3
6.1 118:8
6.3. 106:7
6.5 115:7
6.5. 114:14
60 118:20 232:8
60,000 187:11
62.9 89:9
63 88:24 89:9
66 156:18
68 172:9,14 228:20,23,24
6:17 207:7
6:43 207:10
6a 199:24
6th 229:15

7

7 2:9 47:10 75:12,20 91:11 101:13 133:4 143:24,24 170:23 171:11 179:11 182:1 222:19,22 229:10,11,22 248:20 253:4
7.1. 120:2
7.2 120:14
700 170:6 192:8
71 135:1 188:2 188:12 189:5 192:18

72 191:16 193:18 198:7
72.2 124:5
74 136:9
75 136:5,6,24
75th 228:10
76 89:11,11
76.8 153:24 154:6
765,136 170:1
78 228:15
7:58 264:25
7:59 265:3

8

8 2:11 3:4 47:11 48:6 57:23 91:8,10 91:11,11 92:14 92:24 96:17 98:10 104:25 112:8 113:2 117:6 144:14 145:2,10 157:20 160:13 163:2 187:18 192:15,20 193:22 194:18 212:1 222:22 229:10,11,23 255:11 266:6
8,000 47:6
80 137:24 156:13 162:2
84 92:1,20,21
84.8. 156:19
86.5 124:8 126:8
88 154:6
8s 98:12

9

9 10:3 107:8 117:6 145:16 145:17,22 164:10 222:14 229:10,12 236:20
9-11-28 269:10
9-11-30 267:3
9.1 151:20
9.1. 149:17
90 137:25 138:23 232:9
92 57:8,19
93.1 162:8
94 223:7
94,000 170:24
95 223:5
98 228:13,13
99th 228:12
9th 229:16

a

ability 9:3 67:12 90:19 95:2 126:5 131:12,15,20
able 34:15 45:21 55:1 67:17,22 121:4 131:8 132:17 143:20 154:2 173:7 199:11 200:5 204:24 244:17 249:13
abotu 170:13 191:20
above 62:23 125:19,22 156:18 158:18 223:5 229:14 230:6 235:4,6 235:13 270:11
abrams 196:25
absolute 168:14
absolutely 13:22 18:23 47:1,1 48:18 73:20 87:12 106:14 128:6 161:17 163:6 166:25 190:12 217:9 227:6 228:3 238:8 259:2
abstract 70:15
accept 26:12 39:10 59:13 156:8 225:13
acceptance 225:21
accepted 115:20
accepting 170:11
accident 211:10
accomplish 195:20
accomplished 62:1 120:15,19 127:2
account 62:16 65:20 70:9 89:24 96:11 99:20,23 158:1 173:22 189:23 190:1,5 209:13 225:18
accurate 114:18 267:10
accurately 249:17
achieve 34:7,10 54:16,21 55:4 55:12,17,20 56:2,10 76:14 124:17,18 127:6 138:11 146:4 154:7 167:2 183:6 184:4,13,17,21 196:12 198:1 233:15 238:24 239:2 259:7
achieved 53:14 183:1 185:6 226:18 233:12

acknowledge 166:25 194:21
acknowledged 194:24
acknowledging 220:19
acs 46:3,7,11 47:2 111:12
act 29:1 99:13 123:8 211:12 213:12,14,15 258:3
acted 55:1
acting 54:9,11
action 6:3 270:19
active 108:6
acts 160:22 264:19
actual 51:18 93:18 95:21 202:9 252:19
actually 38:23 52:19 57:7,10 79:13 87:5 88:2 97:17 109:18 115:4 133:25 134:11 168:25 176:16 180:7 190:17 190:17 191:23 217:5 237:22 244:15,24 245:3,17,20 250:11 263:17
add 87:22,24 110:18 151:14 157:8 168:6
added 156:25
adding 158:17
addition 95:24 237:23
additional 29:5 29:7,20 126:5 140:15 142:10 156:25 157:2 217:23 218:23 267:7
address 10:20 37:8 184:25 185:18
addressed 185:5
addresses 114:16
adds 111:20
adjudicating 255:21
adjusted 46:15 46:16
adjusting 108:19
administer 6:2
administrative 109:23
admittedly 30:19 118:20
adopted 28:9 50:6 100:16 260:11
adoption 262:24
adults 45:1
advance 10:2
advanced 84:8
advantage 218:9,10 220:1 220:10 222:18 230:11 231:4,8 231:9 232:18 232:19 233:13 233:15,23,24 234:5,19,22 235:15
advise 82:5 100:21
advised 82:10
advisory 260:22
advocating 256:22
aerial 48:23
affect 224:9
affected 41:16
affidavit 264:13
affiliations 6:10
afro 93:11 110:19
afternoon 5:3 6:12 7:1 8:9
age 22:9,11,13 46:6 47:9 110:9,11,15 111:16,19 125:11 152:22 153:25
agency 269:12
aggregate 193:12
aggregated 250:3
aggregates 208:11
aggressive 137:16,20 232:20 233:20 233:20,22 235:14
aggressively 235:5
ago 12:24 15:18 109:12 143:10 194:21 194:25 199:6 203:7 205:2 232:15 235:11
agree 5:12 39:10 40:2,5 49:20 50:17 55:23,25 58:19 59:4 64:21 91:24 92:15,16 99:14,16 101:20 102:4 102:19 114:8 119:23 136:11 136:23 169:13 185:10 192:16

196:14 200:10 204:12 209:10 210:7 211:14 254:3,5,14,19 255:4
agreed 253:16
agreement 103:5 269:11
agrees 57:16
agricultural 45:19
ahead 9:2 10:2 25:24 84:14 94:1 142:8,11 167:12 173:13 193:2 253:6 259:21 266:1
aiming 163:7
al 1:4,7,10 5:16 5:19
alabama 261:24,25 263:21
alaska 249:4,14 249:16
albany 45:3 139:11,14
alford's 26:17
algorithm 73:7 155:22
algorithmic 19:4,8,12 63:19 65:4 208:8
algorithms 156:5
aligned 59:2 90:23 91:1,7 157:12,19 159:22 160:1 160:12 180:11
aligning 149:14
allow 34:12 153:13
allowable 216:23
allowed 250:12
allows 175:12
alpha 7:17,18
alt 21:7,10,12 21:16,16,19 56:20 57:9 58:1,3,18 59:5 59:8 60:7,25 60:25 61:9,20 61:24 62:22 63:10,14,18,22 68:19 75:8 105:11,13 107:12,12,13 107:17,17 113:18,24,25 114:3 120:6 122:3 124:4,8 125:20 126:9 126:17,18,24 127:3,11,11,12 127:12,14,18 127:18,19,20 127:21,24 128:3,5,16,18 128:22 129:7 129:15 130:15 132:1,14 133:6 133:25,25 134:7,8,18 135:19 136:25 137:2,6,22,23 137:25 139:10 139:22 140:2,3 140:11,11,15 140:16,19,23 141:11,13,20 145:6,19,21 147:8,25 153:17 155:9 158:19 160:21 161:23 210:13 210:15,17
altered 52:14
alternate 18:19
alternative 20:23 21:1,18 31:21 41:2,12 47:12 48:1 57:15 60:11 61:2 66:1 77:6 77:12 78:10 79:1 101:15,19 101:21,25 102:1 103:11 103:19 104:17 105:17,22 107:12,18 118:12 120:2 121:4 122:22 124:1 131:6,13 136:20 153:10 153:20 157:11 171:20 186:12 208:5,16,20 209:9 227:12 235:18 243:17
alternatives 19:8 21:7,8,11 64:13 65:12 72:2 76:11 83:2 125:14 128:8 135:9,13 178:11 208:10 208:22 210:18 227:2 236:12 236:23 237:1
altman 208:24
alts 114:5 142:17
amber 221:17
american 46:3 80:10 148:11 149:4
amici 255:25
amicus 2:11 255:9,15
amount 24:20 73:11,12 219:11 230:15
amounts 25:4 82:25

analyses 244:23
analysis 18:16 46:12 51:4 54:2 68:20 69:19 73:9 76:10 85:12,14 86:9 87:22,23 88:10 90:4 96:1 98:18 99:6,9 131:12 131:16,21 149:6 153:4,7 167:17,18 168:11 181:23 185:10 186:19 189:21 192:2 198:23 199:3 204:21 207:24 208:2,6,25 209:19 215:25 216:9,19 219:4 219:4 220:14 222:8 224:9,9 226:24 227:4 244:13,21 256:23 257:8
analysts 116:13
analytic 93:21
analytics 17:12 96:2 186:6
analyze 208:18 225:3 262:18
analyzing 167:6 195:23
animus 55:1
annotated 267:3
answer 8:22 9:1,2,3,4 12:2 51:21 67:4,20 67:22 111:5 116:15 139:25 142:19 159:2 160:1 170:12 184:3 217:12
answered 9:22 35:20,23 36:7 74:2 94:8
answers 163:11 163:14 270:7
anticipated 34:17
anticipating 40:25
anybody 11:4 11:16 16:18
anyway 10:10 211:11
ap 110:15
apart 18:5,8 188:20
apb 44:21
apbvap 44:14
apologize 27:21 131:4 253:20
appeal 263:11 263:12
appearance 6:7 6:9
appearances 4:1
appendices 207:19
appendix 46:19 167:11,18,21 183:8,9,18 191:19,20 192:12 196:24 200:3 214:18 214:18,19 216:1,15 240:13
applied 169:8
apply 47:8
appreciate 265:5
approach 25:13 60:6,10 78:4,8 132:8 132:21 204:18 209:5,6 257:7
approaches 181:21
approaching 212:17
approximately 13:3 14:21,25
apt 165:20
arbitrary 219:17
area 23:15 41:4 49:18,23 62:25 64:16 67:2 73:18 83:16 125:4,7 127:10 127:13 133:23 134:6 139:12 141:1 152:24 153:13 156:23 157:6 158:15 159:1,21 161:24 162:8 162:18 176:12 177:5,9 195:2
areas 45:19 52:25 72:15 75:13,14,19,20 75:21 76:3 125:7 133:17 142:22 155:10 163:16,16,23 172:19 174:21 175:25 177:13 197:11,16,17 201:1 205:14 206:17 260:4
arguably 128:13
argued 102:14
argues 255:20
armanios 4:14 4:16
arrive 56:13 183:16 184:11
arrow 247:11 247:13 248:4
art 23:15 165:17

article 269:4
articulated 119:23
artifacts 255:3
ascertains 91:17
ascribe 82:9
asian 49:11 148:11 149:3
aside 144:3
asked 9:5 35:19 36:6 58:16 67:3 214:25 254:10 260:23
asking 9:11 12:6 13:12 29:12 31:5,6 58:22 79:23,23 149:8 183:21 184:4 185:23 233:19 243:4 254:17
aspects 20:3 122:24 183:13
assembled 181:13
assembling 181:11
assembly 50:6 232:25
assess 31:6 94:24 98:16 175:12 176:14
assessed 30:21
assessing 98:20 176:9
assessment 31:9 32:19 62:7 77:23 147:14 181:3
assigned 28:7 71:23 187:10
assigning 156:5
assignment 28:4 66:19 116:8 117:4 136:16 146:10
assignments 19:21 67:18
assist 267:6
assistant 25:15
assistants 24:25 25:7,11
assisting 255:21
associated 142:15 221:13 238:10,18
assume 9:5 16:12
assuming 16:19 23:1 28:16 32:17 87:8 148:13 203:1 243:1 252:9 264:8
assure 138:8
atl 21:16 61:20 72:23 128:5 210:17
atlanta 1:2 40:19 49:14,23 121:14,22 125:5 127:17 128:11 129:3 133:18,23,24 140:3 152:24 153:13,20 161:24 175:15 197:11
atoms 116:3
attach 267:7
attached 93:9 242:7 270:16
attainable 149:22
attempt 100:3 138:14 151:14 204:8 206:20 235:24
attempted 205:16
attempting 78:7 113:6
attention 71:1 156:21
attorney 6:11 12:18 270:18
attorneys 7:21 11:23 12:6
attributes 143:12,17 209:17
au 180:4
audio 5:10 27:11 28:2
augusta 45:10 59:9 129:10 132:1 140:19 158:15
auspices 270:14
authority 258:10
authorized 6:2
auxillary 254:23
available 20:13 34:16 46:6 85:24 175:17 180:17 186:9 192:10 258:15
average 103:21
avoid 71:7 103:6 159:7
avoided 149:19 150:21
avoiding 107:23
avoids 100:3
aware 12:22 16:24 38:5 39:1,6 50:13 51:4 67:12 80:3 89:18 94:16 107:25 109:25 110:3 118:1 119:3

179:2 186:2 188:21 190:6 220:18,20 225:6
awful 238:20
axiom 247:16
axiomatic 247:11
axioms 247:14 247:20
axis 215:23

b

b 15:8 46:5 73:21 214:19 269:17 270:24
back 28:3 45:17 58:1,13 58:14 62:22 63:2 69:20 77:4 78:4 93:13 94:7 99:2 109:2 148:5 150:8 152:16 163:25 171:13 172:9 172:13 191:2 193:14 211:14 216:8 217:3 218:17 226:2 237:13 248:14
background 10:12 13:24 240:23 241:10
backup 192:3,6 192:11 199:7 199:16 217:7
bail 258:14
baked 70:2
balance 40:7 66:8 101:12 124:22 135:18 141:16 143:2 177:22 194:13 227:1
balanced 122:13 218:20
balances 178:13
balancing 66:11 99:12 121:6,8 143:17
ballot 38:12 83:24 84:2,5 84:10 86:3 96:12
bare 179:7
barest 91:12
bartlett 47:19 47:23,24 80:23 81:5
based 14:2 19:18 23:23 33:21 72:15 103:2 108:21 114:16 116:8 125:25 137:7 140:1 147:19 148:13 189:5 199:14 204:7 208:16 214:14 220:24 261:4
baseline 166:24
basically 8:13 73:19 133:16 184:18 191:1 207:16
basis 22:22 23:7 37:1,13 39:18 120:18 120:18 156:6 186:3
bear 13:16
beat 238:3
began 168:2 241:24 242:19
beginning 6:10 50:4 164:14 223:19,20
begins 62:25 253:24
behalf 6:14 29:13,21,21 84:8 264:1,14 264:21
behavior 34:14 96:3,4 254:16 254:21
beige 129:17,19
believe 7:19 13:2 44:6 53:19 54:3 57:3 58:16 61:5 93:11 95:21 109:4 136:4,6 187:7 197:1 204:4 253:5 255:11 258:2
belong 106:25
belonging 106:17
belt 45:10,14 45:22 60:15 64:23 73:17,18 73:23 129:5 131:10,11 133:19 140:10 157:6 158:19 164:5
benchmark 51:10,24 52:11 115:15 116:1 152:18 169:9 171:21 256:8 256:11,17
benefit 87:22
berry 4:2 7:5,5
best 8:19 9:3 31:20 43:9,18 79:24 80:1,5,6 102:13,15 109:23 125:1 256:13 267:10
bet 98:4 152:5
better 65:19 78:13,20,20,23 79:4,9 106:15 117:20 120:22 120:25 137:14 202:22 205:18

214:23 221:11 221:24
beyond 31:14 84:7 100:8 138:10 155:1 162:10 186:17 205:21 226:22 244:21
bh 142:5,6,10
bhbvap 113:12
bhcvap 111:11 113:16,19 120:15 127:1 134:4 145:7 209:23 211:16
bhvap 110:14 110:20 113:12 113:16,19 120:9,14 127:1 134:4 145:7 154:6 158:19 209:22 225:23
bhvaps 211:16
bibb 59:10 130:7,12 191:16 192:13 192:17,18,20 194:17 196:5 198:10 201:13
biden 87:7,17 87:18,19 192:19 196:24 222:15 233:8
big 104:5,14 117:24 133:24 181:18
billed 15:1
bills 15:6
bipartisan 249:16
bit 9:18 11:13 13:24 18:10 23:14 25:1 30:4 37:5 50:10 59:15 84:6,21,21 109:8 115:20 116:11 126:19 138:21 164:10 169:1 173:12 175:4 192:19 197:13 199:6 214:12 216:2 223:10 227:19 232:1,11,23 242:17 248:15
black 22:6,9,10 22:15 23:24 24:1 29:8,21 29:25 30:6 31:24 36:25 37:5,10,12,18 37:20 38:10,15 41:5 42:2,5 44:21,22 45:1 45:10,14,22 47:4,13 48:9 49:12,21 50:15 51:12,25 52:17 52:20 53:2 55:11,16 56:1 56:9 57:20,21 60:15 64:23 73:17,18,23 79:7 88:20 89:18,24 90:5 90:9,18,24 91:1 96:13 110:11,15,18 110:23,23,24 111:7,9,15,19 120:9 125:11 126:1,2 129:5 131:10,11 133:18 136:1,4 136:7 137:24 138:1,23 140:9 146:19 148:10 148:14 149:3 149:14 153:24 156:24 157:6 158:19 159:22 160:15 162:16 164:5 172:17 173:2,6,15 175:6 177:17 179:22 180:12 200:15 211:1 212:22 213:2 213:19 217:23 225:16,18 264:21
blacker 176:8
blacks 31:3
blank 64:2,6,9
blanket 37:16 104:4
blind 150:18 210:25 212:23 240:9
block 19:21 46:14,16 47:9 51:4 67:18 91:15 111:13 116:7 176:17 176:25 177:3
blocks 116:2,12 176:22,25 177:3
blow 88:23 89:2
blue 122:2 215:16 217:1 221:25
board 66:9 249:15,15 269:4
body 167:22 257:4
bombshell 248:6
book 253:11 257:9
border 139:13 139:14,15 157:24 194:18
boston 246:17 264:14,16,21

bottom 41:21 47:10 227:21 229:15 246:13 253:24
boundaries 72:16 106:6 110:2 116:6,8 178:19 193:21 193:24 200:23 201:2
boundary 72:19 195:4,9 195:12
bourne 94:6
box 111:8 227:25 228:9 228:10,17,18
boy 257:16
brad 1:12 5:19
break 9:19,22 9:24 10:3,9 31:7 67:3 68:8 74:9 144:13 199:13
breaking 117:10
breaks 9:21
brian 27:14,20
bridwell 5:23
brief 2:11 255:9,11,15,20 255:23,25 256:19
briefly 10:12 11:25 28:23 44:15 46:15 106:10 219:22 258:21
bright 32:5 80:23 89:6 126:13
bring 13:16 125:13 139:1
bringing 172:18
broader 85:18 187:23
broadly 45:10 132:10
broken 21:18 187:15
brought 264:18
brunt 203:8
bryan 4:17 6:14 8:10 78:19 123:16 253:19 269:8
btyson 4:18
building 99:5 154:25 242:15 251:23
built 46:14 90:22 247:11
bullet 33:2 36:24 41:20,22 42:22,23 98:18
bullets 36:23 41:13
bureau 116:2
button 68:12 106:3 240:1
bvap 22:9,10 22:12 29:9,17 44:20 110:8,10 113:11,15,19 113:23,24,24 113:25 114:4,6 120:14 124:5,9 126:25 134:3,7 134:8 140:11 140:13 141:21 154:6 156:13 156:18 158:19 162:2,9 163:11 209:22 210:8 210:11 225:23 227:10,17,18 227:22 228:1,5 228:16,16,20 228:23,24 229:1,2,7,13,17 229:22,25 230:14,15,19 232:14,17 234:9
bvaps 134:8

c

c 46:10 73:21 103:1 167:13 167:18,21 183:8,9,18 192:12 196:24 200:3 240:13 269:10 270:1,1
calculate 214:16 215:2 217:9
calculated 214:11
calculation 116:14 237:12
calculations 237:19 245:4
call 18:25 19:3 21:5 22:8 60:1 67:23 74:8 93:8,15 103:25 107:7 117:9 121:19 139:19 143:10 146:6 150:13 154:5 155:12 177:13 180:22 192:13 193:13 197:12 205:18 244:19 247:9 262:19
called 15:7 17:2 20:1 21:7,10 29:2 44:17 45:10 48:22 66:17 106:15 106:18 148:23 152:6,17 155:2 165:5 197:13 222:16 223:14 231:23 240:3 247:21 257:10
calling 81:12 196:1,3

calls 30:16 80:16 152:16
cambridge 10:21
camera 5:7
campaign 160:16
candidate 30:18 38:15 42:2,5,8,12,18 57:2 80:8 83:24 84:3,5 85:3 86:3 89:19,25 90:4 90:11 95:22 96:13 157:20 160:15 163:2 173:8
candidates 23:18 24:11 29:25 30:7 36:24 37:11,14 37:19 38:9 51:12 52:1 53:8,9 57:21 78:17 79:21 82:8 84:18,23 86:22 88:20 89:22,24 91:18 94:11,14,15 112:7 148:11 148:15 149:3,5 173:2 180:11 187:17 238:13
canter 4:2 6:16 6:16 11:25 27:14,18 35:19 36:6 78:19 81:11 92:18,22 100:12 123:16 123:18 253:19 265:13,23
canter's 15:10 15:12
caption 264:11 270:6
care 170:9
careful 34:11 35:10 81:13 227:19 251:11 251:13
carefully 80:22 151:8 254:3
carla 1:24 5:25 144:24 265:16 269:17 270:23
carolina 261:18 263:2,3,22
carroll 134:16
carved 64:10
carving 135:3
case 1:6,11 5:18,20 6:15 6:15,18,20,24 6:24 7:4,7,18 9:16 10:13 11:23 13:12,17 13:19 14:11,14 14:23 15:1,23 16:13 17:21 18:3,5,8,12 20:20 21:21 23:1,22 25:21 26:9,14,18 27:12 28:5 29:15 37:25 38:4 42:9 44:20 45:20 49:8 50:21 61:5 70:17,19 94:17,19 105:10 109:21 117:20 132:7 144:1 151:16 175:1 212:7 221:8 227:15 236:8 237:7 240:2 244:14 255:10,15 262:1,3,4,21 263:9,10,22,22 264:4,11,17 269:12,12,14
cases 7:15 12:19,21 13:4 13:10 15:17 18:24 29:16 31:22 33:12 36:19 45:17 142:16 228:5 237:20 255:22 260:9 262:7,20 263:5 264:9
cast 199:14 254:22
categories 111:19 139:6,9 140:15 209:22
categorize 18:17 104:25
category 87:2 97:12 187:16
cause 5:19 6:15 6:24 7:9 218:12 253:12 254:7,16 255:10
causes 254:17
cberry 4:4
ccr 1:24 269:17
cd 43:25,25 44:9,9 57:9,15 105:11,11,13 120:6 172:18 173:12,14 174:15 177:18 200:1,14,22 205:25,25 206:8
cells 160:3
census 2:5 18:1 18:7 22:15 44:22 46:2 47:5 49:10 108:6 109:14 109:17,20 110:11,16 111:8 116:2,7

169:8 170:2,20 175:6 176:15 176:22,25 186:14 243:14 243:16 248:22
censuses 245:15 252:14
center 4:9 7:10 7:12 139:12 232:2,4,9 235:13
centered 129:9 231:25 232:5
century 247:10
certain 66:3 69:24 72:9 80:14 83:9 122:24 124:17 127:4 132:5 138:11 145:14 155:10 164:20 178:23 202:7 203:3 204:6 205:6 206:13 209:15 260:4 263:21
certainly 10:6 24:18 34:25 36:18 50:21 51:22 54:1 68:23 70:24 81:18 82:10 83:14 84:19 94:11 105:10 105:19 112:24 127:16 138:6 145:25 154:8 157:9 169:21 188:17 189:18 194:11 197:10 204:15 217:3 240:16 242:8 258:4
certainty 148:12
certification 270:11
certified 269:6 270:15,23
certify 267:9 270:5,17
cetera 210:3
chain 19:4 213:20 214:9 216:9 221:5,10 221:21 223:14 223:16 233:19 234:2 236:14 236:15,17
chains 245:21 245:22,23,24
chairs 244:18 244:18
challenge 28:22 28:24 29:13 262:12 263:7 264:13,15,18 264:20
challenged 256:11
challenges 264:6
challenging 70:6 263:5,6
chance 56:14 108:9 160:17 198:2 230:23
change 48:9,24 51:23 67:18 77:3 110:1 116:18 134:25 135:4 141:22 156:10 168:5 174:2,2 219:24 225:8,12,13 239:12 240:14 267:14,16,18 267:20,22,24 268:1,3,5,7,9 268:11,13,15
changed 52:12 58:16 60:24 61:7 75:15 76:21,25 133:6 135:8,9 156:8 239:8
changes 40:1 44:9 51:10 52:12 58:2 61:9,21 75:19 116:2 162:24 167:8 168:7,14 168:20 171:23 172:5 174:1,15 188:3,14 205:25 223:15 223:16,20,23 267:3
changing 116:12
character 40:16 166:11 182:9 206:7
characterize 119:19 135:13
characterized 179:6
characterizing 205:20
charge 269:13
charging 15:19
charles 256:1
chart 162:24 169:12,19 170:13,15,17 170:21,25 171:2,17 209:20
charts 231:17 233:16
chat 265:18,23
chatham 159:3 201:13
check 13:25 57:4 67:12 68:10,15 93:15 109:2 117:17 117:20 118:12 142:8 170:8,9 170:14 226:20

checked 111:15 117:22
checking 100:11
checks 111:8 219:16
chicago 241:13
choice 2:7 23:18 24:11 30:1,7,18 38:15 57:21 60:19 78:18 90:5 95:22 112:7 148:11 149:3 157:20 160:15 173:8 197:2 219:23 238:14 243:18 245:11 246:5 246:10,16,22 246:25 247:9 247:22 248:8
choices 56:12 69:24 166:7,16 205:4 208:12 220:4
choose 143:3 195:2 248:1
choosing 143:5
choropleth 44:18,18 48:17 48:21 49:15 152:6
chose 85:24 86:20 108:5 152:2 196:24 232:12 233:1 252:14
chosen 49:8 73:8 221:8,13
chunks 257:15
circulating 224:5
cite 248:19
cities 45:3,5 108:13,20 109:5
citizen 46:5,10
citizens 111:16 111:18 249:3
citizenship 47:3,8 111:12
city 10:18,20 251:3,5 264:14 264:16
civil 4:5 7:2 45:17 267:3
claim 55:1 84:8 124:19 159:8 161:1 186:1,2 201:20
claimed 50:14 168:17
claiming 138:22
claims 23:23 29:19 264:5,6
clarification 110:17 137:19
clarified 47:24
clarify 84:12,17 92:15 193:1,3
clarke 201:14 257:23
class 246:19
classes 8:17
classification 245:14
clause 7:22
clayton 49:23 58:20 121:20 121:23 135:20 135:21
clear 8:15 24:24 34:11 37:22 64:6 65:16 66:13 79:22 85:16 90:17 112:5 143:24 173:21 174:21 176:21 188:7 194:4 196:7 199:17 212:11 254:15 258:10
clearance 258:13
clearly 34:7 115:8 217:24
click 161:22 223:5
clicking 253:3
clinton 85:1,17
close 59:1 86:8 168:1 227:23 230:12,16
closeness 171:24
closer 39:18 197:11
cloud 221:18 223:25
cloudy 224:6
cluster 60:5 78:8
clusters 60:9 64:7 73:1 76:9 76:23 77:2 128:24 134:23 250:4
coalition 23:19 23:21,24,25 29:18,22 47:13 47:16,22 56:22 57:17 131:5,7 139:6 140:14 141:22 142:2 146:19 152:21 153:14 156:25 173:15 211:10 213:3
coalition's 152:10
coarse 168:21
coastal 159:1
coastlines 104:11

cobb 142:20 162:8 174:16 174:21 175:15 176:12 177:17 198:9 201:13
cobble 255:1
code 267:3
cognizant 71:1
coin 225:12,17
coincidence 238:19
collapse 179:3
collapsed 119:5 119:8
collected 132:20 249:24
collection 64:14 65:11 73:5 149:2 153:5 162:1 167:23 208:4,5 208:8,11,22 235:17 247:13
collections 70:1
collective 242:2 242:13
collects 21:8,10
college 246:17
colloquies 270:7
color 49:9 50:18 51:6 53:3 55:6 75:14 84:2,5 85:2,5,16 94:12,15 95:18 96:12,22
colored 49:6,10 135:20
coloring 44:23 160:3
colors 48:21 63:12 141:1 153:3,3 160:6
columbus 45:9 157:23 158:7
column 107:7 110:10 111:21 112:10,22 113:23 209:23 209:23 227:21 228:4,4
columns 110:8
combinations 73:8
combined 195:8
come 16:9 66:8 115:6 123:7 144:7 150:8 155:19 185:1 190:9 227:12
comes 12:1 43:10 56:11 116:12 247:10
comfortable 105:8 175:19 182:18
coming 9:16 35:14 254:19
command 68:16,17
comment 69:8 205:11
comments 68:20 188:21
commission 219:9 249:3 251:3 260:11 260:22,23 261:2 268:23
commissions 100:22
committee 4:5 7:2 264:3
common 5:19 6:15,24 7:9,22 67:2 115:20 177:9 190:18 206:17 255:10
commonwealth 262:14
communicate 85:13 140:7
communication 33:8,9,14
communities 43:7,10,14,19 43:21 44:10 70:9,11,18 79:16 132:16 143:13 148:7 174:23 188:20 188:22,24 249:8,11 250:6 252:17
community 43:2,4 44:2 46:3 70:13 122:24 132:12 135:23 157:25 158:6 159:13 163:24 165:7 165:25 166:14 166:15 177:6 204:10 206:1 206:15 249:22
community's 203:12
compact 102:20,21,24 103:6,12,20 104:18,21 105:6,9,11,13 126:20,20 128:19 135:15 189:14 215:20 215:21,24 222:2,5 223:21 223:24 226:15
compactment 175:16
compactness 65:23 66:3,5 69:12,14,15 102:3,4,15 103:9 105:2,15 105:22 106:2 120:21 127:6 135:17 138:24

147:13,18 148:1,7 174:23 175:12,16,20 188:8 214:1,3 214:7,21,22 215:6 217:24 218:4 221:9,13 221:24 224:20 226:9,19
comparable 62:3 120:22 143:18 214:22 217:15 221:11 221:24
comparative 208:25
comparatively 102:13,16 208:12
compare 31:21 95:3 101:14 166:6 256:11
compared 58:1 93:17 107:17 140:12,16 167:15 244:25
compares 193:6
comparing 124:1
comparison 56:17 102:5 107:11 116:17 127:11,12 167:7 209:20 210:14 214:18 214:24 215:10
comparisons 107:4 237:24
compatible 79:6
compelling 128:23
compensated 14:15
competent 239:22
competition 209:2
competitive 159:22 160:13 231:3
competitively 38:24
competitiven... 59:16,20
complete 25:18 26:8 62:6 71:24 167:16 167:18 199:8
completely 79:6 97:14 119:8 194:24 197:20 263:20
complicated 99:12,15 121:2 141:16 236:5 262:10
comply 213:13 213:15
component 54:5,8
components 66:13 75:9
comprehensive 16:6,10 17:9 181:18,23 183:13 240:19
comprehensi... 80:12
computation 25:13 117:25 214:11
computational 18:25 25:12,15 209:6
computationa... 215:1
compute 226:3
computer 17:13 25:2,9 136:14 208:9 236:25
concede 195:18
concedes 69:23 218:21
concentrated 49:22 162:18
concentration 45:18 73:10,11 75:24,25 125:7 125:16 138:10 153:12
concept 81:8,9 208:18
concepts 52:6 81:7
conceptually 52:7
concerns 125:3 161:7 163:24 177:7,9
conclude 164:21 165:22 172:3 174:12 182:12 201:21 203:23
concluded 36:16 266:7
concluding 195:11 218:2
conclusion 36:3 36:5,9 54:1,16 56:5,7 81:13 81:19 93:1 118:8 151:2,9 151:18 174:7 182:15 183:16 184:12 196:11 218:4 231:12 231:15 232:24 234:21
conclusions 25:16 34:4 35:1,25 36:8 144:9 164:17 164:18 198:20 208:15 240:14 254:20

conclusive 56:15 180:23
conclusively 35:11 54:3 224:21
concomitant 185:6
concrete 249:11
condition 10:24 11:2 37:23
conditions 29:2
conducive 24:11
conduct 131:11 151:12 219:3 219:20
conducted 5:6 5:21 68:20 131:21 204:22 220:15,24 227:4
conducting 216:8
conference 1:4 5:16 6:18,20 6:23
confidence 201:4 220:5
confident 86:5
confidently 121:24 143:15 186:3
configuration 52:11 60:14 115:15 130:24 131:25 135:24 136:22,25 139:19 140:18 158:12 162:10 210:6
configurations 21:2 60:8 61:8 132:14 163:15
configure 155:23
configured 141:7 159:19 178:19
confirm 47:11 76:20
confirmed 47:18 85:15 86:4 217:13 221:10
confirming 224:3
confirms 226:17
conflate 98:24
conformance 28:13
confounding 86:23
confusing 256:4
congress 18:20 52:4 57:25,25 58:18 59:5 98:14 105:17 113:18 117:13 117:21,23 120:2 151:21 165:12 237:14
congressional 20:24 28:8 31:17 33:20 34:20 35:6,17 40:2,3,15 41:2 44:3 50:5 51:9 51:23 52:2 55:10 56:18,20 71:15,17 82:15 89:12 95:15,16 96:19 97:24 98:4 103:16,17 104:17 114:21 152:8 169:6,9 170:18 178:11 182:16,21 198:9 199:4,19 201:17 220:25 222:8,11,12,14 227:16 231:20 231:23 234:17 236:8 262:25 263:6,10
conjoinment 197:12
conjure 240:6
connected 17:21 74:4 132:5 139:12
connecting 163:16
connection 5:8 218:4
connects 58:19 59:8
connotations 137:16
connote 138:5
conscious 30:23 53:14 124:23 125:1 125:14,19 192:14 193:4 193:20 194:2 195:12 196:1,4 196:10,10 197:21 231:9 231:14 233:17 234:19,21
consequential 49:19
consider 43:10 108:4 124:11 131:19 166:10 166:20 180:18 201:7 225:4 236:12
consideration 16:4 79:15 122:12 147:16 154:16,24 163:18 165:3 172:5 180:20
considerations 148:4 154:20 157:25 164:2

167:1,3 172:7 181:15 209:11 218:5
considered 43:18 66:15 84:21 86:7 108:19 146:14 146:14 174:3 219:19
considering 70:12 72:11 122:19 137:13 178:11 238:1
considers 227:9
consistent 34:5 34:14 40:14 54:23 55:3 56:5,7 88:5 119:9 181:2 195:13 198:14 198:18 200:13 200:17 201:18 203:2 235:14 238:23 239:4,6
consonant 18:23 177:12
conspicuous 150:13 198:2
conspicuously 38:18,20 39:13 149:20 150:21
constantly 67:18
constituency 187:14
constitution 160:21
constitutional 161:7 165:17 263:23 264:5
constraint 70:4 194:11,23
constraints 190:6 194:8
construct 41:3
constructed 21:20 111:7 146:15 163:9 228:14,22
constructing 48:1 95:8
constructions 34:13
consulting 251:15
contacted 12:23,25 269:8
contain 41:4 191:21 217:7
contained 17:24 52:25 106:20 199:6 200:2
contains 22:14 143:25 210:17 217:5
contend 136:12
content 185:3
contents 38:7
contest 86:12
contested 231:2
contests 30:17 38:9 83:20,22 84:18 90:8 187:19
context 23:25 79:1,3 83:20 87:21 104:13 154:4,14 172:1 179:20 208:6 245:17
contextural 80:25
contiguous 190:14 199:24
continue 5:11 34:13
contour 103:2 194:1
contours 214:14
contract 269:9 269:11
contraction 33:22
contractor 269:7
contrast 153:1 236:21
contributed 83:16
contributes 107:1,2
contributor 257:25
contributors 257:17,18,23
control 80:11 193:24 262:11
controlling 32:11 235:7
convention 116:25
conventional 67:1
conversation 60:7 152:16
converse 32:7
conversely 104:16,20 164:25
converting 135:11
cooperative 35:22
coordinates 15:13
copy 58:6
core 114:10 115:8,11,13 117:19 118:13 118:25 119:19 164:25 168:12 168:16 172:4
correct 13:8 14:9,12 27:13 29:10,19 32:24 32:25 34:2

46:9 52:6,15 54:8 57:14 58:2 59:19 60:9 72:12 74:21 78:23 83:25 85:4,7 87:12 90:12 91:5 93:10 95:18,20 97:1 102:2,7 107:15 111:1 113:21 120:11 121:16 134:4,5 139:24 141:13 145:4 145:12,13,23 153:21 168:3 171:18 172:20 179:12 185:4 199:20 206:2 222:3 229:8 238:18 240:20 251:25 252:7 254:12 263:20 270:9
corrected 85:4 109:6
correction 207:19 240:11 240:12
corrections 267:6,11
correctly 72:22 79:2 86:17 134:24
correlate 96:7 153:2
correlates 224:14
correlation 95:13
correlations 236:5
correspond 75:21 95:11 153:15 229:11
corresponding 33:7,8 184:6 237:19
corroborating 237:24
corroboration 95:9
corroborative 153:6
cosmetic 187:13
council 251:4,5 264:14,16 269:5
counsel 4:1 5:15 6:8 8:23 11:16 16:2,11 38:6 85:13 86:4 90:3 109:16 114:11 115:5 269:12
count 20:23 76:18 107:22 108:20 110:21 140:22 141:1 185:17 202:10 212:10
counted 110:19 137:23 162:2 163:4
counter 240:7
counteract 138:15
counties 45:22 58:20,21 69:20 70:22 71:2 106:15,16 107:6,14 121:21 139:22 175:10 181:19 191:5 196:16 198:11 201:15 201:22 202:3,6 202:25 203:8 216:11,25 218:13,24 226:16
counting 156:16
countries 189:13
country 80:4 80:13 177:13
counts 106:22 126:21
county 49:23 58:21 59:9,10 59:10,12 63:3 65:21 69:17,19 69:22 70:2,5 73:17,22 74:4 74:6 106:11,12 106:13,14,17 106:21,21,24 107:1,2,5,13,19 121:21 122:1,2 129:12,16 130:8,12 132:1 132:2,8 134:15 134:16,21 135:5 137:7 138:25 139:14 141:11 159:3,7 159:11 174:16 175:8 185:19 188:9 191:6,8 191:10,16,21 192:13,17,18 192:20 194:17 196:6 197:22 201:9,10 202:1 216:13,16 217:14,16 251:3 258:6 260:1 269:3 270:3
couple 31:1 46:5 170:15
course 16:8 18:2 25:16 51:2 54:24 55:4 73:24 76:9 93:9,20 122:15 130:23

138:14 172:6 186:5 229:20 232:3,6 233:7 237:5 245:18 245:21
courses 245:8 245:13
court 1:1 5:25 8:1,18 13:21 27:17 35:9,24 36:3,9 72:7 128:10 129:2 140:8 151:18 169:10 255:16 261:9,17,21,22 261:25 262:14 262:14 263:11 265:16 269:4,6 269:8 270:15
courts 151:2
cover 76:23 145:3 251:20 269:13
covered 25:19 244:3
crack 238:16 238:21
cracking 31:2 32:7,8,9 73:12 73:15 76:1,4 151:24 152:3 152:15 153:2 166:12 198:15 198:17 224:25 232:17 234:8 235:3 238:10 238:18
craft 30:10
create 59:24 76:6,7,12 79:19 82:19 128:17 133:12 153:12 256:8
created 72:20 123:11 125:21 205:12 251:25 261:2
creating 121:4 126:2 138:16 159:21 220:19 256:20
creation 34:19 63:18,24 147:8 155:4 182:1 204:1 217:25
crept 105:5
crinesh 4:2 7:5
criteria 99:22 101:7 165:21 165:23 261:6
criticism 83:1
criticize 83:3
criticizing 82:14,18
cross 72:19 136:2 175:9 194:19 196:20 197:14
crossover 41:6 148:10,23,23 149:2,9,10
crowell 4:3 6:17 7:5
crowell.com 4:3,4
culture 43:17
curated 85:21
curious 253:15
current 72:15 114:12 146:10 185:4 213:13
currently 16:15 242:20
curriculum 247:3
customary 269:14
customized 245:8
cut 105:8 137:7 214:2,10 215:21 222:5
cv 1:6,11 2:6 5:18,20 13:10 240:22,24 242:9 244:9 248:14 255:5 264:12
cvap 46:5,14 47:13 48:9 142:13 145:15 152:12 211:2
cycle 82:4 100:20 250:18
cycles 101:9

d

d 2:1 15:8 73:21 87:17
dark 122:2
data 16:3 17:1 17:7 19:20 33:25 34:16 46:2,2,4,7,7,10 47:5,7 49:10 56:25 66:11,14 66:21,23 85:21 87:4 89:3 110:11,16 111:12,13 114:12 115:2 132:23 142:14 144:6,11 145:12 151:13 154:21,25 155:5,6 167:7 167:7,15,15 183:3,14 198:18 217:8 219:13 220:11 221:19 225:3 225:20 239:10 239:14 248:22 251:24 254:24
database 85:20 114:11 115:2
dataset 42:8 57:5 87:3 187:19

date 114:18 233:22
david 243:5
day 139:20 265:7,10 268:20 270:20
dead 232:1 235:13 238:3
deal 110:4 206:11
dealing 121:1
decennial 116:4 118:4 250:18
dechert 4:14 7:21
dechert.com 4:15,15,16
decide 60:14 225:12
decided 17:17 108:21 263:10
deciding 17:15 109:8 122:9 195:7
decision 150:23 182:13 192:14 194:2 195:12 196:10 197:21 258:7
decisions 155:20 156:7 182:8,17 183:2 193:9,10,21 195:8 196:1,4 206:13,18 219:17
decrease 162:25 210:7
deep 153:3
deeply 241:18
default 30:12
defendant 1:13 5:15
defendants 1:8 2:2 6:14 264:15,17
deference 64:12 78:2,3,3 135:3
deficiency 244:22
define 31:10,11
defined 24:2 93:14 187:17
definitely 12:5 21:14 43:24 48:3 75:17 102:14 126:14 137:1,19 155:2 155:3 176:15 179:5 189:23 192:10 201:19 201:21 210:11 217:22 231:13 233:2,11 244:8 250:20 254:13 254:19
definition 13:14 22:3,5 22:18 23:21 24:8 30:11,13 31:5,9 32:7 45:24,25 108:5 115:11 124:12 124:13,15 160:8,18,24 163:3,9 187:8 187:22
definitive 254:20
degrees 241:11
dekalb 49:22 74:2,4 133:2 142:20 163:10 201:12
delicate 124:22 154:14 251:12
demands 143:3 143:16
democrat 30:20 52:4 91:9,13 95:18 96:21,22 157:17
democratic 30:8,12 37:14 42:3,5 51:14 53:7 57:2 87:8 90:20 91:15,20 96:7,11,22 98:19 112:9,13 112:20 113:1,7 149:5 157:18 163:8 195:15 195:15 248:1
democrats 37:17,17 51:2 51:7 90:18 93:4 96:9 97:1 112:17 149:11
demographic 31:24 41:17 48:7 155:6 156:21 167:15 209:17 224:25
demographics 41:15 44:13 66:18 110:6 124:20 154:17 176:14 179:25 184:9 186:8 195:4 225:14 240:10 254:22
demonstrate 82:22 228:1 253:12 254:6
demonstrated 224:21
demonstrates 79:4 148:22 152:2
demonstrating 130:21
demonstration 28:21 29:5 61:3 120:1 122:16 126:15 133:10 144:1,4 148:17 178:8

demonstrations 139:18 161:3
demonstrative 76:8 123:4,14 133:18 164:19 250:25 260:19 260:20
demonstratives 72:3 133:14
denied 270:12
denies 53:10
denominator 87:18 240:18
dense 177:17 197:16
denser 176:7
densities 125:6
density 48:14 48:17 49:6,14 49:16 175:5,22 175:23,24 176:4,11,15,20 176:23 177:11 193:7
deny 53:12 195:17
denying 197:19
department 249:1
depending 84:7 126:21
depends 5:7 22:20 29:12 72:4 81:25 104:7 138:4 181:3
deponent 269:2
deposition 1:15 5:5,14,21 8:12 8:25 11:14,16 11:19 12:9 16:20 108:10 118:2 147:11 207:18 218:7 218:12,20 219:12 220:21 261:12 266:7 267:4,4,9,10 269:9,9,13 270:5
depositions 9:9 16:21,23
depressed 73:11 232:14
depressing 238:11
describe 18:21 21:4 34:24 44:15 45:13 46:25 48:16 50:11 127:25 128:3,13 143:15,18 151:8 177:9 179:19 197:5 216:14 249:17 257:1
described 63:25 71:9 98:18 111:18 112:4 128:16 128:19 150:10 161:11 164:13 181:7 204:11 216:22 219:2 224:16 225:11
describing 43:20 177:5 179:7 184:12 197:8
description 45:9 177:12 188:11 258:19 258:21
design 21:6 69:23 70:7 72:22 74:12 75:7,17 77:1,1 78:13,20,21,23 93:21 252:12 256:14
designate 22:15 23:3 165:15
designated 22:14 95:19 112:3
designation 176:16,22
designed 48:4 60:18 70:3 226:13
designing 98:15
designs 178:17 247:3
desirable 104:12
desire 267:4
detail 15:14 43:23
determination 35:9 181:7 198:13 213:8
determine 31:3 36:13 57:1 89:1 256:12
determines 111:14
determining 31:18 143:8
detriment 189:6
develop 246:19
developed 19:25 245:8
developer 248:20
development 225:5
deviation 101:20,20,25 216:3,5,6,18,22 216:23
deviations 169:8 216:2,19
devices 11:8
dial 127:4
differ 71:14
difference 48:16 76:22

103:22,24 104:5,14 106:9 126:22 134:13 140:14 141:20 145:6
differences 46:1 104:24 105:1 113:17 179:11 184:8
different 8:24 19:9 20:3 21:2 21:17 38:1 47:3 48:7 50:19 56:12,17 60:8,21 62:10 63:11,19,20 66:12 67:9 68:8 72:13 74:23 77:24 83:20 88:4 99:19,22 103:3 113:4,8 116:1 116:13,14,20 118:9 121:10 126:15 127:12 127:15,20,21 129:1 130:24 137:13 140:25 141:15 143:12 145:18 152:9 153:19 160:4 161:3 170:3 181:4 191:11 191:12,13 197:2,2 204:19 205:13 206:7 210:1 213:22 219:20,23 220:4 225:2 231:21 243:22 244:3 258:17 260:25 261:8 262:15,22 263:5
differential 184:18,19,22 184:23 185:6,7
differently 18:17
difficult 90:16 163:12 236:3 253:11,25 254:6,21 255:3 259:6
dilute 138:5
dilution 173:5
dilutive 138:8 172:23,25 173:20 174:8 174:13,14
diminish 200:14
diminishes 32:15
dip 89:10
direction 104:23 270:8
directly 27:5 185:5,14 245:10
director 108:10 118:1 147:11 179:2 215:3 239:18
disassembly 270:12,13
disavows 215:6
discern 34:16 55:2
discerning 34:25
disciplined 200:20
disclosure 269:1,5
discount 15:22 269:14
discover 204:25
discretion 102:10
discriminate 256:13
discriminatory 35:7,18 36:16
discuss 17:11 17:16,18 26:14 46:1 65:3 100:6 186:19
discussed 21:17 37:22 51:17 66:17 67:13 79:14 83:18 100:5 122:14 122:23,25 128:12 147:2 148:5 151:1 199:18 206:23 207:2 213:3 214:23 235:4 236:9
discussing 16:8 29:4 62:9 135:17 150:7 172:9,10 176:5 191:5 196:16 231:19
discussion 27:4 30:4 46:18 83:12 85:21 98:19 106:7 119:21 144:7 148:2 159:2 166:19 187:1 231:7 235:16
dismantled 187:4
dismantling 117:10
disoriented 155:2
disparities 201:11
disparity 195:3 200:13 202:13 202:17,20 203:20
dispersal 32:10
displacement 117:8 118:16

118:20 165:1,4 165:24 166:21
displacement's 166:5
display 106:1 154:21
displayed 66:11,21,23 227:5
disposal 180:10 186:8
dispute 179:7
disputes 51:5
disregard 55:5
disrupt 40:6
disrupted 166:6
disruption 165:5,24 166:22
dissonant 43:1 43:3
distinct 52:7 81:7,9 91:20 166:11
distinction 20:5 106:11 112:15 195:25
distinctive 173:3,23 182:17 183:2 184:5,6 189:9 203:24 259:5
distinguish 40:12 80:23 81:4 95:25 96:3,5 97:21 117:8 183:4 251:12,13
distinguishes 91:19 96:7,15
distinguishing 97:25 149:24 196:4
distort 220:6
distortion 27:11
distributed 153:11
distribution 237:15 259:16
district 1:1,2 22:6,12,24 23:2,3,9,13,16 23:16,19,21 24:3,6,10 25:3 31:3,13 32:2 32:19 39:23 40:2,3,7,8,9,12 40:15,20 41:3 41:4,7 42:1 47:22 50:5 52:8,9,12 53:15,18,20,23 57:1,20 58:2 58:22,23,24 59:3,5,6,8,17 60:14 62:23,24 63:5,13,14,15 64:11 65:25 72:16 76:24 78:13,20 81:8 81:10 89:16 90:23,25 91:14 91:19 92:8,8,8 92:9,15,16,16 93:11 96:21 97:13 101:19 102:20 103:1 106:17,19,20 107:11 111:21 111:22,24 114:20 116:8 116:19,21 117:3,15 118:9 120:3,4,5,7,8,8 120:9 121:6,17 121:19 124:8 125:20,25 126:2,9 129:9 129:17,22,24 130:15,20,21 131:5,8,11 134:7,18,25 135:21,25 136:5,6,16,19 136:24 137:25 138:1 140:15 141:5,21 142:10,12 147:14 152:17 152:20 153:13 153:23,25 155:24 156:12 156:19,25 157:1,4,10,11 157:22,22 158:18 160:8 160:14,20,24 161:1,2 162:9 162:25 163:2,5 165:24 166:22 167:25 168:1,5 168:8 170:5,18 170:23,24 171:3,8,18,25 171:25 172:8 173:1,8,15,24 174:2,22 175:7 175:9 176:3 178:17,25 179:10,10,11 180:19,21 182:1,21 187:10 192:14 192:15,16,18 192:20 195:14 195:16 200:22 201:24 209:12 210:9,9 227:10 227:23 228:5 228:16,20,22 228:24 229:11 229:11,11,12 229:16 251:4 256:12 261:25
district's 116:18 256:14
districted 88:1 88:16 154:1

233:9
districting 28:14 43:6 62:2,17 79:5 79:10 146:21 147:3,6 188:8 189:6,21 198:8 213:21 216:9 226:5 227:12 249:21 256:9
districtor 20:1
districts 28:9 29:6,8,9,17,18 29:23 30:5,8 31:19 32:13 39:19 40:19 41:15 47:13,16 48:2 51:12,15 51:25 52:3,17 56:22 58:16 60:17 61:6,10 61:17 62:21 63:11 64:14,18 64:19 65:1 70:1 72:19 73:5,9 74:13 74:16,25 75:14 76:12,17,19 77:2,23 78:5,7 78:10 79:1,19 79:20 80:8 82:4,15 89:10 89:13,13 92:23 93:6 94:3 95:17 96:20,25 97:4,6,8,9,11 97:12,14 98:6 98:16,17,19,21 99:15 106:23 107:1 112:3,6 112:9,13,21 113:1,11,12,13 114:4,6,21,23 115:15,17 116:6,24 117:1 117:10,11,24 118:2,7 119:4 119:8 120:15 123:10 124:5 124:12 125:10 125:19,22 126:6,10,18,25 127:7 128:12 128:16,18 131:21,25 132:6,11 134:23 135:8 137:23 138:2 138:16,19 140:19 141:22 142:2,9 145:7 145:8,14,15 146:18 147:16 148:19 149:19 149:20 150:11 150:18,25 151:23 152:8,9 154:2,11,18,23 155:4,16,25 156:14,17,23 156:24 158:17 158:22,23 159:5,19 162:2 162:4,9,12 166:5 169:13 171:7,23 173:18 174:5 175:13 178:25 179:3,15,17 181:19 182:16 187:3 188:3,15 188:23 189:3,4 189:22 190:1 191:2,11,12 193:21,22 202:4 210:8,12 211:1,10,16,22 212:5,7 213:5 213:6,19 217:23 219:6 220:1 221:16 221:22 222:1,7 222:14,19 223:1 224:19 225:1,16,18,23 225:24 226:6,7 226:9,15,18 227:15 229:4,5 229:8 230:12 230:16,20,21 231:2,3 232:4 232:7,12,21,22 233:4,6 234:10 235:4,7 236:19 236:22 238:12 250:22 263:6,7 263:8 264:14
dit's 98:23
diverge 92:1
divergence 92:6,11
dividing 159:3
division 1:2 203:20
doctor 95:12
doctoral 243:6
document 169:5
documents 12:8,11,14
doing 38:1 66:10 82:18 113:7 123:1 131:4 175:3 180:2 186:1,3 209:15 214:9 226:21 242:14
dominate 137:13 203:15
dominates 137:6,10
dong 64:6
dot 48:13,17 49:6,7,9,14,16 125:5 175:4,5 175:22 193:7 215:17,19,20 217:1 221:17 222:1,11

dots 176:6 194:14 215:10 215:16,18 221:25
double 110:19 110:21 170:8,9
doubt 262:2
douglas 49:25 134:15,21 198:10 201:13
downloaded 17:10,14 169:5 253:2
dozens 65:11
dps 82:24
dr 2:3 6:13 8:10 10:18 26:17 28:1 68:7 77:20 144:12 177:19 207:11 265:4
draft 152:19 178:10
drafting 24:15 105:22 224:10
draw 18:11 19:5,10,16 64:18,19 65:1 71:5 78:7 80:7 93:2 106:1 125:13,18 126:5 130:21 151:19 154:2 155:24 156:1 159:12 161:1 178:1 189:12 208:15 239:16 249:19,22 250:13,22
drawer 59:22 65:22 66:6 99:22 108:11 108:18 181:1 209:12
drawers 54:25 55:13 115:8 150:24 174:11
drawing 17:23 18:10 30:23 65:5,7 66:12 66:13,22,24,25 67:11 68:15,18 69:3,8 70:8,14 71:10,10,14 79:18 82:1,3,6 82:14 99:14,23 105:16 106:2 122:13,22 123:1 154:17 154:19 155:9 155:21 158:13 162:6 163:19 163:25 181:15 194:7 204:22 237:14 239:10 250:8,10,25 251:11 260:13 260:16
drawn 14:1 18:3,6,22 19:13 21:12,22 29:16,17 33:21 35:7,17 36:15 38:24 40:3,6 57:20 69:18 71:21 81:20 116:1 120:3 121:18 130:16 131:7 135:25 189:5,9 193:6 198:20 208:25 212:23 251:17 260:10
draws 65:17 208:15
drew 18:1 48:1 63:22 68:9 69:13 71:21 121:7 130:20 150:9 154:22 164:13 211:8 241:14,22 251:7 260:18
driven 156:9 159:4
drop 100:10 168:23
dropped 246:2
dublin 63:2 130:1
duchin 1:15 2:3 3:2 5:14 6:13 8:4,10 10:17 10:18 28:1 68:7 77:20 144:12 177:19 207:11 265:4 267:9 268:18 269:2
duly 8:5
duma 4:17
duncan 152:19 171:21 178:8
dynamics 88:2 88:13

e

e 2:1 3:1 73:21 267:1,1,1,2,3 270:1,1
earlier 24:4 37:22 43:11 57:10 60:7 64:1 79:14 102:25 111:13 111:18 113:5 121:9 122:23 129:8 134:1 139:17 151:1 152:6,16 187:1 202:21 203:15 213:4 249:10 251:10
early 224:4
easier 26:1 122:2 169:1
easily 126:7 132:22 149:22 210:16 240:21
east 60:15 64:23 73:16

129:4 131:10 133:18 134:18 135:12,14 140:9 157:6 158:19 164:5
eastern 8:9 62:24
easy 121:20
economics 43:17
economists 247:11
edges 105:8 137:7 214:3,10 215:21 222:5
edited 257:13
editor 257:11 257:17
een 54:17
eff 21:19 60:7 62:23 63:14
effect 52:6 54:20 55:10 150:17 195:8
effective 21:8 21:10 23:17 24:3,6,8,9 29:23 61:20,21 63:10,22 66:2 77:22 78:7,11 90:25 95:20 111:21,22 112:3,10,22 113:20 131:13 148:20 149:21 150:11 151:23 153:16 154:2 154:11 155:2,4 155:16,24 156:14,16 157:1,4,11 158:17,23,24 159:5 160:8,23 161:14,18 162:3,12 163:4 181:8,9 209:24 209:25 210:3 211:22,25,25 212:4,8 226:6 226:7
effectively 111:7 187:4 258:7
effectiveness 24:4 30:11,14 41:14,24 42:11 61:10 66:18,22 76:10,11 92:11 92:12 93:3,14 93:17 95:8,10 96:6,23 97:15 131:16,20 145:24,24 146:2,4,6,15 154:7,18,21,22 154:25 155:10 158:2,4,9,14 159:8,10,17,18 159:21 160:18 163:3 181:7 200:14 210:4 212:2
effects 60:19 224:8,12
efficiency 244:5,12,25 245:5 247:21
effort 181:22 200:14,16,18 200:19
eight 30:17 42:4,14 57:18 91:3 97:8 157:13
either 40:13 111:15 113:23 115:14 124:11 158:18 200:8 212:14 225:1 249:21
elb 1:7,11 5:18
elect 23:14,17 29:25 30:6,8 40:4 42:2,4 52:3 57:1 65:22 77:23 78:17 90:19 91:8 93:3 96:20,21,25 131:12,16,20 149:21 150:25 173:7 230:21 230:23 238:13
elected 24:13 36:25 37:12 91:13,18 112:18 114:23
electing 95:17 112:7
election 24:13 30:9,18 39:3,7 42:17 57:2,23 74:19 84:10 88:23 93:18 95:22 111:25 112:21 149:10 149:12 186:3 190:16 196:24 220:6 222:15 233:9 251:7 260:12
elections 37:15 42:4,14 50:18 81:21 83:4,10 83:18 84:22 85:15,20,22,23 86:1,7 88:1,2 88:16 91:4,8 96:18 112:2 157:13 159:23 180:8 187:20 196:23,25 197:3 219:20 219:22,24 243:19 247:12 248:5 250:23 259:24 260:5
electoral 32:12 32:15 41:9 51:18,19 55:21

78:11 79:6,20 80:7,10,21 81:2 82:7 84:4 88:13 95:20 124:19 133:12 200:14 212:23 243:17,23
electorally 90:23 91:1,7
elects 96:22
element 108:15
elements 135:18 165:8 238:1
elevated 73:10
elevation 124:14,16
elias 4:7 7:13
elias.law 4:8
eliminated 78:17
eliminates 32:15 238:13
ellen 257:25
elongated 136:24 138:16
email 4:3,4,6,8 4:10,12,15,15 4:16,18
emmanuel 63:2
emphasis 118:25 127:5
emphasize 109:19 123:3
emphatic 103:5
empirical 112:2
employee 270:18
employment 43:17
emptied 258:8
empty 258:13
enacted 28:8 31:16 33:19 43:1 50:2 51:9 58:1,3 59:6 60:16,25 61:19 62:3 64:3,4,11 64:12,14,16 69:24 70:1,21 78:2 82:1 92:2 95:15,16 98:4 98:5,17,21 99:11 101:15 101:18,22 102:1 103:13 103:20 104:18 105:11,13,16 107:11,16,19 113:11,15,18 114:7 120:23 124:1 127:18 127:19,20 129:12 130:4 134:2,6,17 135:4 136:21 136:24 137:3,6 139:23 140:12 140:20 141:12 141:20 149:18 151:24 152:3 152:19 156:17 157:15 171:20 177:16 178:15 210:10 211:2 211:16 215:10 217:17 220:13 221:12,18 222:13 226:25 228:2,8,25 229:7,25 236:11,12,18 236:25 237:1 238:9,16,24 239:3,10 251:1 251:17 262:11
enactive 38:17
encountered 180:6 221:20
encountering 213:1
ended 17:15 260:25 261:4,8
endorsed 180:8
endorsement 180:13
ends 34:6,7,9 34:10 86:23 197:22
engage 150:24
engaged 143:10 241:19
english 4:17
ensemble 207:24 208:1,4 208:7 225:7 229:22 230:1 237:23 256:19 256:23 260:24
ensembles 19:1 257:5
ensuring 146:20
entail 224:17
entailments 224:13
entered 267:4
enters 223:24
entire 60:10
entirely 99:25
entirety 145:10
entity 15:5
equal 84:20 184:9 211:2 230:17,22,25 232:16
equally 165:20 174:1
erosenberg 4:6
errata 267:7
errors 114:25
especially 38:11 49:2 100:7 162:16 185:23 221:23 230:5 234:14 253:13 254:7

esquire 4:2,2,5 4:7,9,11,13,13 4:14,17 269:8
esri 20:12
essentially 42:1 50:9,12 51:14 62:20 75:8 125:20 179:12 258:13
establishing 29:1
estimate 24:20 25:5 111:18 229:19
estimated 46:14
estimates 47:2
estimation 138:3
et 1:4,7,10 5:16 5:19 210:3,3
evaluating 208:13
everybody 10:22
evidence 14:4 24:10 34:14,24 35:8,12,24 36:18,18,20,21 119:18 151:9 151:10,16,17 166:3,3,14 167:3 178:22 180:20,22,23 180:23 181:11 181:14 182:8 183:5,7 186:22 200:17 203:25 204:5 231:14 233:4 234:20 234:24 239:4 256:13 270:10
evident 42:16
evocative 73:21
exact 75:1 168:10 170:7 192:3 229:20
exactly 11:24 21:4 33:15 42:21 48:11 60:18 62:19 63:25 75:6 85:24 110:13 111:17 112:15 117:1 130:18 133:20 141:9 145:9 155:14 157:3,5 190:5 210:2 212:3 215:23 258:1 259:18
examination 3:3 8:7
examine 28:7 65:12
examined 8:5
examining 224:8
example 31:4 60:15 61:17,21 64:23 69:12 70:13,20 71:4 73:16 85:1 88:24 89:25 112:6 122:9,20 124:4 125:20 128:20 132:1 133:2 138:16 141:7,14 147:15,20 157:21 160:20 160:22 167:11 168:10 180:3 191:16 192:7 194:14 208:23 221:14 223:3,9 245:17,22 249:1,4 250:24 258:14 259:2,8 259:12,12
examples 25:14 36:15 42:24 43:25 44:4 72:5,9 94:13 94:16,21 123:9 128:24 155:19 179:9 183:17 196:17 198:25 218:1 223:9 247:20 260:24 261:4
exceeds 202:9
excellent 250:15
except 64:6 72:18 115:4 148:6 219:10
exception 267:10
excessively 30:23
exclude 87:11
excluding 87:9
exclusive 196:9
exclusively 125:12
excuse 208:3 230:2
execute 219:11
executed 72:22 73:7 223:15
executing 155:21
exhibit 2:3,4,5 2:6,7,8,9,11 20:16,16,19 25:18 26:3,4,7 26:8,10,11 58:7 168:23 169:4 170:17 172:9,13 207:12 240:24 241:4 246:2,3 252:1 253:2,4 255:11
exhibits 2:2
existence 148:10 164:19 250:19

existing 40:7 78:5
expect 9:18 150:5 171:22 183:20,22,23 184:5,14,21 187:13 229:7 232:15,17 235:3,6
expectation 72:25
expected 230:1 234:9,12
expedited 265:22
expense 231:4
experience 36:12,14 103:22 116:13 118:18,21 242:25
experiment 215:13 220:9 220:24 223:11 225:15 226:14 234:4
expert 9:17 12:24 13:1,4,9 13:12,19,25 14:10 15:16 17:24 36:10 38:1 77:7 81:17 85:14 94:18 100:19 150:9 199:18 260:7 261:17 262:5,8,22 263:2,4,4
expertise 13:16
experts 262:18
expires 268:23
explain 18:13 28:23 40:22 106:10 114:13 115:22 152:1 159:24 187:5 188:22 208:1 227:3 235:11 259:9
explained 87:13 188:7 237:9
explaining 99:8
explains 42:25
explanation 46:21 56:8 135:24 139:16 166:21 186:16 233:25 248:12 256:14
explicit 122:12
exploration 19:12 65:4
exploratory 19:5 25:2 155:15 156:5
explore 19:7
expressed 206:20
expressing 206:12
expressly 270:11
extend 235:6
extended 61:3 69:3
extends 21:9,11 136:19
extensive 46:18 261:19
extent 81:12 119:16 145:13 162:16 164:17 179:19 233:10 244:17
extern 7:11
extra 210:3
extract 206:15 212:17
extraordinarily 93:22
extraordinary 190:10
extremal 234:6
extremely 17:8 98:8 99:12 125:10 151:22 162:18 240:16 254:21
exurban 52:22
eye 147:17 158:13 250:21
eyeball 117:23 143:12 148:1 175:17
ezra 4:5 7:1 9:8 13:2

f

f 270:1
face 66:6 209:15
facing 56:12 255:7
fact 67:16 124:20 148:14 153:15 173:1 173:22 179:8 187:14 196:11 239:4,14
factor 37:24
factors 29:3 43:16 83:21 99:19 166:20
facts 13:17 16:2 167:24 173:25 210:23
factual 240:7
failed 130:16
fair 12:6 25:9 29:18 32:20 33:24 35:4 50:22 56:23 58:15 69:5,10 72:8 78:5 82:16 87:23 88:20 95:3 99:23 128:6 136:1 145:19 167:19 191:8

208:19 243:12 252:11 255:14
fairly 61:20 98:8 135:14 245:15
fairness 244:10 244:13,16,20 247:14 248:10
fall 97:11
familiar 130:7 207:25
far 14:22 15:1 31:23 35:25 36:20 45:3 119:1 148:20 165:11 186:2 186:12,12 202:9 204:20 225:6 251:6 255:19 260:2 260:15
farther 136:19
fascinating 259:2
fashion 19:5 61:13
fast 35:1 210:5
faster 58:11,12
fastest 145:3
favor 60:1,3 215:8
favorable 65:15 66:8 222:2
favorably 233:17
favoring 219:5 219:6 221:6,16 221:22 222:6 222:19 224:19 226:9,15,18 233:3,6 235:17
fayette 122:1,2 122:6,10,20 135:22,22 198:9 201:14
feature 98:5 190:15
features 80:9 104:12 178:17 201:1 226:20
february 1:17 5:4
federal 263:13 263:15,19,19 267:2
feel 98:17 142:21
felt 143:8
fewer 107:13 126:17 141:13 175:25 187:9 210:11 211:15
fifth 209:23
figure 44:14,16 44:25 48:13 49:20 62:22 75:12,20 152:2 152:2 153:8 159:15 174:20 174:25 175:2 175:11 180:10 180:15 188:2 188:11 190:2 193:14 196:5 214:2 215:9 217:2 220:23 221:1,4 222:11 223:13 224:7 226:11,23 227:5,24 231:7 233:16,16,25 234:1
figure's 175:3
figured 162:11
figures 39:9 152:13 189:12 193:5 200:3,6 221:3,15 224:24
file 168:24 241:6
filed 255:9 261:20 264:13
filter 216:16
final 177:16
financial 269:14
financially 6:4 270:19
find 17:5 34:13 35:24 41:15 54:23 55:3 57:13 65:12 72:25 76:3 90:25 91:22 118:24 119:1 119:18 128:25 129:18 131:17 140:6 143:3,14 151:3,17 161:19,20 166:7,15,18 167:12 186:11 188:1 191:18 194:1 196:8,12 198:3 203:2 211:13 217:21 220:13 237:24 238:9 248:18 255:16 259:1 259:24 263:12
finding 114:22 151:10,13 167:16 213:8 221:22,23 222:19,21
findings 33:17 34:23 38:5 56:4,6 85:13 219:16,24 220:2,3,7 221:3
fine 58:8 123:20 265:24
finish 8:21 67:4 111:4 131:3 217:11

fired 243:3
firewall 40:16 41:8,9 152:17
firm 6:1 7:17 15:10,11,13
first 8:5 12:18 12:21 13:11 18:18 20:19 36:24,24 37:23 63:20 71:21 76:7 78:1 79:25 83:14 93:14 101:13 101:13 107:7 133:23 146:17 149:13 206:25 207:22 210:24 212:16 218:9 223:22 225:15 228:12 234:13 235:1 241:14 241:22 242:7 242:10 247:22 250:17 260:9
fit 213:8
fits 166:11 183:15 197:6 257:2
five 30:17 42:4 42:14 91:3 95:16,21 113:12,16 133:20 142:2,3 142:4 160:9 190:1
fixed 230:15
flip 57:3 142:8 142:11 167:12 171:13 225:17 238:2
flipped 240:17
flipping 225:12
florida 139:13 139:15 157:24
fluently 94:20
fly 192:23 197:6
fo 260:20
focus 61:10 76:2 88:6 158:3 179:18 228:3 243:10 243:10 255:23
focused 158:1
folder 26:5
folders 17:10
folks 10:4 143:10
follow 64:25 71:8 75:2 148:18 194:1 205:8
followed 63:23 164:5
following 34:14 65:5 83:22 104:11 161:7 267:11 269:5
follows 8:6
food 226:23
force 224:20,24
foregoing 267:9 270:5,8 270:13
foreground 41:14
forget 116:23
forgive 54:14 247:7
forgot 144:24
form 111:8 267:3,6
formed 15:8
former 262:9
forming 16:4 16:13
formulation 103:14
forward 133:14 133:17 265:7
found 70:20 72:5 86:17 90:23 114:17 118:14,19 121:9 126:1 128:8,24 129:2 129:19 130:20 130:24 138:13 138:17 140:4 141:24 150:19 181:21 211:9 213:7 220:3 223:1 246:3
four 42:13 47:3 56:17 57:17 91:2 112:8 113:16 137:23 142:3 157:12 157:12 158:22 160:12 162:1 237:17 250:2 261:20
fourth 33:2 41:20,22 55:9 94:10 209:23
fractions 240:17
frame 78:8 98:15
framed 67:21
framework 82:19 83:2 96:25 100:15 100:17 101:1 135:10 148:20 176:14
frameworks 100:21,23 247:12
framings 40:14
freehand 194:7
frequently 41:16 102:14 118:23 148:24 234:13
friends 242:1
fro 164:6

front 11:8 59:12 119:3 164:2 196:19 197:4
frustratingly 190:20
full 10:16 103:7 165:15 173:11 191:25 199:7 205:17
fully 10:24 35:22 114:17 172:6 219:14
fulton 49:22 58:19,24 122:5 122:10,21 163:17 198:10 201:12 203:9 269:3 270:3
function 161:4 162:15
functional 108:6
functions 108:8
fundamental 184:25
funny 160:1 190:7
furnish 267:7
furnished 31:22
further 43:23 137:2 186:19 239:5 270:17
furthermore 46:9 102:23
future 84:3

g

gained 163:22
galeo 180:7,8
gap 244:5,12 244:22,25
gaps 184:14 245:5
garnering 180:3
gauge 168:11
genberg 4:9 7:8 7:8
general 12:23 19:17 24:13 29:11,12 30:9 30:18 38:7,9 42:6,14 45:23 46:22 50:6,14 50:16,17 51:3 57:2,23 74:19 91:3,8 92:7,11 92:14,25 95:10 96:18 99:24 108:7 111:25 112:9,21 123:2 149:2,10,12 157:13 159:18 160:13 183:15 187:19 197:18 217:15 232:14 232:25
general's 87:3 98:9
generality 197:9
generally 13:17 16:24 18:21 23:15 24:5,9 28:17 32:9 34:23 38:5 40:12 46:25 51:5 59:21 61:1 63:18 70:14 75:21,23 76:5 84:1 102:7 105:6,9 105:13 114:13 115:13 119:23 120:21 122:23 130:10 197:15 198:4 201:3,6 209:10 223:4,4 231:18,22 243:19 254:25
generals 42:10 57:18 160:10 163:1 212:1
generate 208:9
generated 25:9 228:8 236:24
generation 19:4 25:3
geo 114:16
geographers 48:22
geographic 157:24 158:6 165:25 166:22 167:8 201:1 259:16
geographical 41:4 190:23
geographically 59:2 227:14
geography 44:18 109:24 115:14 126:3 138:13,15 162:15 240:5 259:6,23
geometry 242:1 257:10
geopandas 19:23
georgia 1:2,4,7 1:10 5:16,17 6:18,19,23 7:3 7:7 12:19 14:7 14:8 18:1,4,6 21:22 23:24 27:2 28:9 30:7 30:19 31:18 33:4,10 34:19 35:6 37:2,4,15 38:7,16,24 39:2 40:3,20 42:15,17 44:24 45:10,20,23 49:3,21 50:9 50:16,19 55:11

58:21,25 62:25 70:9 75:22 82:14,18 85:10 88:7,16 94:16 101:7 107:23 108:16 110:2,3 119:5,5 146:4 149:5 158:7 179:3,4 184:23 190:10 204:12 239:23 244:14 249:24 264:8 265:14 267:3 269:2,5,6 270:2
georgia's 35:16
georgian 51:5
georgians 43:9 146:19
gerrymander 164:24 165:15 259:15
gerrymander... 165:13
gerrymanderi... 79:4 161:6 164:23 165:3 165:10,16 242:2 244:6 255:17,22 256:24
getting 11:13 11:18 12:17 15:25 48:20 77:22 78:4 82:13 93:25 162:3 170:7 190:25
gingles 14:11 28:22,23 29:2 29:3,12 37:23 37:24 38:1 47:12,15 61:2 66:19 72:3 76:7,12 80:23 94:18 119:25 123:13 126:6 126:10 128:22 130:18,25 131:9 133:9,14 133:17 139:2 140:5 142:22 143:1,16 144:1 144:4 145:18 146:9 154:3,14 161:11 210:18 262:4
gis 20:4,6,7
give 25:14 46:22 64:22 73:20 74:10 83:2 95:9 178:22 179:9 185:12 187:7 208:23 218:18 235:24 236:6 247:19 249:6
given 24:12 28:4 51:20 87:25 114:12 135:2 159:2 183:17 194:9 196:17 198:25 208:13 216:2,2 230:13 267:5 269:14 270:10
gives 73:4 217:15
giving 15:21 27:12 78:1,3 115:10 141:7 160:22
gleaned 203:10
go 5:12 8:14 9:2 10:12 15:10 20:9 21:25 25:23 27:10 31:18 36:1 48:6 49:4 50:25 58:11,12 67:24 68:24 69:14 72:2 77:13 84:6,14 85:8 90:19 93:25 100:8 109:19 110:1,6 113:23 115:22 141:15 144:14 144:17 153:17 156:3 173:13 180:2 193:2 207:4 212:18 217:3,8 226:2 248:14,20 252:2 253:6 255:18 259:21 264:22 266:1,1
goal 8:13 9:14 27:9 53:6 54:17,20,22 55:17,20,23,25 56:1,3,10 59:21 60:1,2 73:13 76:7 82:9,11 83:1 105:24 124:17 125:18 145:18 146:3 159:20 180:25 182:22 182:24 183:1 184:17,21 197:20,23 201:18,19 203:3,4 247:18 247:24 248:1,3
goals 53:11,12 54:4 55:4 61:11 105:21 138:11 146:25 150:17 174:11 183:6 184:4,13 196:12 201:21 226:7 246:21 246:24 247:15 247:19 248:7 248:10
goes 72:8 89:11 129:9 156:17 195:6 228:10 253:25

going 5:3 9:19 10:11 13:23 17:25 20:17 21:15 24:2 26:2 27:9,22 28:2 30:3 32:4 40:23 42:23 45:17 55:24 66:2 67:14 77:4,15,21 81:11 84:3 87:5 90:6 95:9 98:20 101:14 104:23 109:3 112:16 113:23 117:7 123:16 123:18,20,23 132:2 139:21 140:19 142:11 143:6 144:12 144:18,21 145:1 153:9 156:22 164:2 166:3,6 170:8 174:18 177:24 207:6,12 209:5 213:18 230:14 230:19 237:13 253:3 256:2 259:14 264:24 265:25 266:5
gong 88:1
good 5:2,2 6:12 6:13,25 7:1 8:8 8:9,11 31:7 66:4 70:5 73:4 74:9 81:15 93:22 95:7 103:15 144:13 150:6 191:24 226:18,21 234:10
gotten 100:23
government 108:7
governor 261:2 262:9,9,9
grabbed 236:14,16
gradual 246:1
grass 180:11
grat 266:2
great 66:2 78:1 100:3 110:4 137:18 157:10 163:7 206:11 251:2 265:7,10
greater 79:6 137:24 184:9 210:25
greatly 32:14
green 44:25 130:4 134:16 134:25 160:5 194:14 232:5 232:10
greener 176:6
greg 7:15
ground 8:14 93:15
group 4:7 7:14 17:1 22:20,22 22:25 23:17 24:12 29:13 31:14 32:1,10 73:13 84:8,9 84:23 116:20 176:17 191:6,7 242:1,2 262:23
grouping 141:22 217:1
groupings 21:3 113:10
groups 47:3 86:6 96:8 177:1,3 179:22
guarantees 248:9
guess 5:17 26:22 32:6 42:15 55:7 82:13 99:16 101:12 103:11 104:16 129:9 129:23 153:18 155:16 163:11 167:20 177:4 184:15 185:15 186:6 191:9 195:10 219:4 223:5 226:4 240:13 249:16
guessing 97:18
guide 2:9 252:20
guidelines 80:12,13,16 100:1,2,8 108:1
guy 256:1
gwinnett 49:25 73:24,25 127:10,18,20 128:20 129:2 133:18 142:20 156:11 164:4 198:10 201:12 203:9

h

h 267:1
half 22:14,24 23:4 74:16,18 91:13 144:13 159:4 228:21 228:23
hall 201:14
hallmarks 220:12
hand 19:10,13 19:16 65:4,6 66:13 126:19 138:9 155:20 155:21 156:1 208:25
handed 33:14 192:4 195:2 226:2 264:12
handle 19:18 65:13,18 69:22

handled 115:18
handlings 121:10
hands 219:12
hang 169:16
hanson 4:21 7:10
happen 146:13 156:20 158:13
happened 162:11 173:23 187:2 211:5 251:1
happening 126:4 224:4
happens 9:12
happy 170:12 205:8
hard 8:20,21 26:21 30:10 35:1 40:11 67:20 93:20 135:4 192:9 194:11 216:17 216:23 239:20 239:24 240:6 246:20
hardest 70:7
harmonize 159:9
harms 78:12,14 78:16
harris 58:21 87:7
harvard 241:12
hd 74:1 133:23 139:8,21 140:2 140:3 141:18 142:20 162:8
head 184:25
heading 175:15
hear 12:18,21 27:15,19 43:19 96:8 177:19
heard 5:9 261:17 262:2
hearing 177:7 262:14
hearings 33:4 68:21
hearts 35:2
heavier 179:14
heavily 49:21 126:1 162:18 195:9,11 245:21
heavy 127:5 195:3 203:20
hello 6:25 10:4
help 13:16 19:20 35:24 36:3 94:24 98:2 141:23 223:12 246:20
helped 100:21
helpful 49:4 95:13 98:20,25 141:2 167:21 196:21 248:11
helps 133:15 153:9 183:15 224:14
high 34:3 38:13 39:3 75:24 89:11 118:16 125:7,10,15 126:2 133:8 138:12,22 155:3 162:14 162:22 163:11 194:9 219:15 220:5 230:6 238:2
higher 101:20 101:21,25 112:21 113:1,3 119:1 177:10 215:19,23 223:10 229:25 232:6
highest 84:11 227:18 228:5 228:16,20 229:2 230:19
highlight 161:10 232:13
highlighted 229:6 231:24 232:5,10 235:12
highlights 207:3
highly 29:24 56:5,6 127:3 146:21,22 147:7 190:6 227:1 231:9 239:6,22
highways 201:1
hired 249:1,14
hispanic 23:4 47:4,13 52:17 52:21 53:2 111:10 172:18 211:1
historically 45:20
history 45:18 186:4 258:9,11
hit 105:23 123:5 124:23 207:3
hitting 66:19
hmm 130:6 169:25
holistic 70:12 79:14 147:13 148:7 153:5
home 259:2
honored 258:23
hope 87:14 202:19 265:6,9
hoping 255:19
hopson 1:24 5:25 269:17 270:23
horizontal 228:18

horse 238:3
hour 14:15 15:15,19 123:19 144:13
hourly 15:16
hours 24:21 203:7 209:15 262:19
house 18:20 21:18 28:8 31:17 33:20 34:20 35:6,16 44:3 71:11,13 74:8,8,23,24 75:3,8 76:16 76:17 77:2 82:15 97:8,13 98:12 101:24 105:17 107:16 107:17,19 114:3 117:22 117:25 118:2 133:22 142:12 161:23 165:12 186:24 187:11 192:8 202:24 203:19 210:9 211:17 220:25 221:23 223:4 231:18 232:6 234:8,16 237:5 263:5,9
houston 59:9 59:10 201:13
human 126:3 138:15 162:15
humility 151:15
hundred 214:10 215:2 215:14,17 216:3,19 217:5 219:21 227:7 228:6,7 236:15
hundreds 18:3
hundredths 103:23 104:2
hvap 111:7 140:14 142:6
hypothesis 184:2 238:23
hypothesize 150:3
hypothetical 239:12

i

i.i.d. 237:16
idea 9:11 60:13 63:20 169:20 170:19
ideal 168:2,3 169:14 170:1,4 170:6,24 171:25 187:10
identical 61:20 163:14 227:9 243:23
identified 44:22 45:5 49:11 66:1 85:25 87:17 203:18 213:22
identify 45:21 96:25 110:24 136:14 158:5 202:15
identifying 83:5
identity 111:10
ignored 261:7
ignoring 211:12
illustrate 126:16 128:21 146:3 168:19 174:25
illustrated 72:5 72:10 128:9 140:6
illustration 133:7
illustrative 237:13
images 188:6
imbalance 183:19,23
imbalanced 179:14 180:18 180:24 183:18 183:24,25
impact 32:11 54:10,12 118:7 182:23,25 186:20 209:11 239:8
impacts 183:5
impede 126:5
imperfect 94:12
impermissible 53:14
implemented 75:18 216:14 216:15
implicit 119:22 144:9 145:14
implicitly 244:19
important 52:24 84:12,16 98:23 109:18 123:2 173:25 185:24 256:25
impose 216:17
impossible 90:16 143:1 208:14 230:23 236:4 246:21 259:7
imprecision 116:11
impression 38:6 213:2 239:21
impressions 48:25
improve 69:15 118:13 138:18 151:22 175:16

improved 174:4
improvement 131:1
improves 173:17
improving 131:9
inadequate 218:3
inbound 179:25
inch 176:1
incidentally 136:11 176:6
inclined 245:6
include 16:10 38:3 45:2 83:22 84:22 86:12 87:11 90:7 108:22 132:23 167:17 191:25 192:9
included 17:6 17:13 18:11 33:13 45:22 91:6 112:10 183:9,11,12 192:5 210:19 215:1
includes 30:14 30:15 74:5 121:20 122:5 149:7
including 6:8 43:17 164:6 195:19
inclusion 19:6
inclusions 217:20
increase 120:14 120:19 162:3
increased 146:18
increases 114:4 146:2 159:21
increasing 127:7 145:24
incredibly 121:1
incumbency 114:9
incumbent 114:11,15 115:2 179:20 188:15
incumbents 60:3 114:22
independent 249:3 269:7
independently 237:15
index 229:15 229:16
indexed 229:10 229:22,24 230:5 236:19
indicate 53:5 76:16 90:10 120:13
indicated 8:16 8:23 68:10 90:4 108:23 111:9 121:9 150:15
indicates 91:12 222:25
indicating 111:9 152:21
indication 31:20 94:24 163:7 205:3
indications 85:16 237:24 238:5
indicative 53:19
indicator 43:9 233:9
indicia 198:3
individual 39:19 88:12 105:5 251:9,15
individuals 49:5,21 110:24 111:14
ineffective 94:4
inefficient 214:15 215:2
infer 168:21 178:22 209:8
inference 46:10 86:5 90:15 159:13
inferred 27:4 119:9
inflected 182:13
influence 32:11 220:2
influenced 102:10 219:17
inform 205:4
informally 140:24 153:4
information 11:9 33:9 36:2 109:15 180:3 181:5 191:21 206:6 218:11 250:9
informative 48:19 84:21 89:15
informed 70:14
informs 81:16 163:24
initial 8:24 12:12 25:8 73:9 150:7 185:13 218:22 223:19
initially 244:4
input 33:11 42:24 204:11 204:13
insist 86:2
inspecting 41:11

instance 19:23 30:20 38:14 41:1 76:7 82:3 83:14 87:16 89:7 93:10 112:12 118:19 135:6 147:11 202:3 208:23 252:16 258:6
instant 11:8
institute 251:24 252:10
institutionali... 55:11
instruct 225:4
instruction 169:10
instrument 56:2
instrumentali... 55:16,19
intact 177:23
integrations 21:17
integrity 216:17 217:14
intellectually 241:18
intend 26:13 164:17
intended 77:11 139:17 144:10 153:6 238:16
intense 152:23
intensity 44:24
intent 34:25 35:7,10,18,25 36:4,16,20,21 53:16,20 54:10 54:11 122:18 138:5,8 150:22 151:3,4,6,10,13 209:8 256:13 256:25
intentional 150:23 151:12
intentionally 154:8
interaction 224:10 226:6
interest 43:2,4 43:7,10,14 70:9,11,18 79:16 132:12 132:16 143:13 148:8 159:14 166:16 174:24 179:22 188:20 188:22,24 206:1,15 248:4 249:9,12 250:6 252:17
interested 6:4 44:11 65:6 241:16 270:19
interesting 86:21 128:10 155:19 244:25 259:4 260:21
interests 44:3
internet 5:8 17:11
interpret 227:20
interpreted 165:18
interrupt 84:15 94:1
interruption 27:17
intersperses 69:2
interviews 258:18
introduction 77:11
intuition 235:24 236:6 237:13
intwined 197:7
investigate 30:22
investigation 54:18
invoices 15:9
involve 24:6 121:6 134:14
involved 25:2 88:20 90:22 121:3 135:3 212:5
involvement 10:13 88:3
involves 13:14 28:18 29:4 32:18 66:19 82:1 88:12 151:23 208:2 258:22
involving 12:19 25:8 169:7
ish 129:17
islam 180:4
issue 10:7 53:4 96:8
issues 26:17 162:6
issuing 242:14
items 215:12
iteration 217:1
iterations 155:25

j

j 1:24 269:17 270:23
jack 4:9 7:8
jack.genberg 4:10
jackson 251:1,2
jacob 4:2 6:16 9:8 78:24 100:9
jameson 7:23
jamieson 4:13
january 24:15 218:14 220:15 220:17

jcanter 4:3
job 95:7 226:21 266:3
joe 4:11 7:16
joe.zabel 4:12
john 12:13 150:9
jonathan 257:19 262:21
jones 4:7 7:13 7:13
judge 262:1,13 263:13,15
judicial 269:5
jump 10:13
jurisdiction 18:6 106:8 110:1
jurisdictions 81:21 250:23
justification 44:10 166:8,16 175:20 189:17 206:1
justified 174:22

k

katz 257:25
keep 10:24 43:20 98:7 123:20,23 131:4 135:17 139:3 194:6,22 234:2 260:14
keeping 71:5 177:23
keeps 178:12
ken 247:10
kennedy 152:19 171:21 178:8
kept 117:1 129:12
key 116:22
keyed 67:7
keyword 204:17,21 205:12,15,19
keywords 204:19
kicked 248:4
kind 8:14,23 10:12 18:17 21:2 22:22,24 25:8 27:8,10 31:9 32:6 35:11 36:22 42:16 45:23 46:11,24 53:6 53:17,25 54:2 55:20 59:17 62:25 63:1,20 68:8 70:12,24 71:22 73:4 74:2 77:4 79:14 83:19 86:23 87:5 89:2 91:25 94:5 95:3 98:6 99:5 102:25 103:10 106:10 108:4 109:9 110:7 113:9 128:25 129:8 130:25 134:17 135:20 138:5 139:11 141:22 145:18 148:1 150:15,22,24 151:14 152:15 153:4 159:13 166:11 168:11 168:21 181:3 186:16 187:7 188:20 194:10 195:1 197:7 198:18 199:3 200:11,18,22 201:9 204:17 204:18,21 205:11 206:6 207:25 208:17 212:12 216:15 221:19 222:16 223:13,17 235:25 238:18 240:6,9 242:5 242:10 243:8,8 244:10 245:10 247:16 248:6 249:12 257:1,8 258:21 261:11 263:1,24
kinds 19:7 34:23 67:9 104:11 123:3 153:7 161:3 181:4 198:20 198:21 214:21 221:10 255:2
knew 105:15,19 168:16 239:9 239:14
know 8:10,17 9:9,12,20 12:22 13:10 16:15,22 18:15 20:22 21:24 22:1,17 24:2 25:12 26:1 27:3 30:3 34:15 35:21 38:14 43:16 48:5 50:10 52:8,24 63:17 63:19 64:7 67:1,4 73:21 88:22,23 100:5 100:23 104:5 106:8 107:23 110:22 115:1,4 121:2 122:11 124:21 128:19 132:24 136:11 137:15 138:24 139:19,25 142:19 143:9 147:10 151:1 153:24 154:13 155:11 156:12 159:1 165:14

176:1 179:21 180:9 181:18 185:3 188:14 188:19 194:21 198:3 199:23 201:4 202:6 203:6,9 204:20 206:11,21 211:23 212:25 215:12 222:24 223:8 225:22 225:25 226:1 226:12 230:8 239:15,25 240:4,5,8,9 241:2 243:7 251:12,16 254:23 255:24 259:10 265:17
knowing 88:12 188:18
knowledge 163:20,22 168:18 188:24 239:21,23 267:10
known 38:14
knows 65:17 239:17 240:7 249:16
kristen 257:23

l

lab 10:5 15:8 15:10 19:25 241:23 242:6,7 242:10,17,18 245:14 248:16 248:19 250:18 250:22 251:6 251:13,14,16 251:17
label 93:9,9,17 95:8,10 96:6 112:3,16,19 121:24 136:22 181:9,9
labeled 148:20 158:23 210:3
labeling 94:25 136:13,14,17
labels 116:23 117:9
lack 59:15,20 166:3,8,13 205:25 206:13
land 115:19
landed 191:10
language 150:22 200:12 200:20
laptop 11:11
large 49:3 148:19 190:8 190:11 202:3,7 203:7 242:15 257:15
largely 120:24
larger 202:4
largest 45:6
late 254:23
latino 23:24 24:1 29:25 30:6 31:4,24 36:25 37:12,18 37:20 38:10,15 41:5 42:2,6 49:12 50:15 51:12,25 55:12 55:16 56:2,9 57:21 79:7 90:5,18,24 91:2 93:11 96:13 110:15 110:18,19,25 111:7,10,15,19 146:19 148:11 148:14 149:3 149:15 159:23 160:16 162:16 173:3,6,15 179:22 180:12 212:22 213:2
launched 29:14
laurens 129:12 129:14,15,15 132:2
law 4:5,7,9 7:2 7:10,12,14,16 15:10,11,13 81:3,7,8,10 123:6 146:11
lawsuit 29:1
lawyers 4:5 7:1 264:3
lawyerscom... 4:6
ldf 262:5 263:4
lead 197:22 252:17
leading 245:24
leads 25:17 114:24
leaking 225:20
learn 189:1 252:10
leat 87:13
leave 12:4 60:21
led 54:18 75:25
left 56:21 135:1 153:10 193:10 243:1
leftover 125:21
legal 5:23 6:1 7:11 13:13 17:21 36:9 81:12,19 165:17 230:8 252:18 258:9 269:7,7,9,11,13 270:15
legislative 21:22 78:2 114:21 169:5 248:24
legislators 34:19 35:2 54:25 82:6 178:9

legislature 34:9 53:16 54:9 56:9 79:18 80:6 100:16 123:10 153:18 178:19 204:20 204:25 231:13 233:14 260:11 261:1,6,7
legislatures 100:22
legitimate 147:18
legitimately 240:9
lend 132:21
length 104:9 181:8 224:5
lesser 162:16
letting 161:12
level 34:3 46:14 46:16 47:5,7,9 49:4 64:7 80:11 84:11 89:16 100:15 118:23 149:22 176:17 178:1 185:24 189:17 194:9 196:21 199:14 208:4 221:23 228:19 229:1,1,13 246:1 262:25
levels 31:23 118:24 156:21 264:6
light 153:3 164:13 207:18 256:12
lighter 152:21
likely 29:24 53:1,20 54:2 54:15 59:7 70:23 91:8 93:3 96:25 98:19 112:13 112:18,20,25 125:9 156:10 222:18 230:24
likes 102:24
limit 60:18 216:13,17,23
limitation 150:14 213:4 234:17
limitations 216:10
limited 118:20 118:21 149:20 150:21 151:22 188:25 219:11 232:20 243:19
limiting 150:25
limits 216:18
line 30:23 32:5 55:13 66:6,20 68:17 80:20,23 81:2 89:6 115:7 146:16 155:17 161:21 193:6 194:15 228:18 230:8 230:12 267:13 267:15,17,19 267:21,23,25 268:2,4,6,8,10 268:12,14
lines 70:5 126:13 135:5 155:13 175:8,9 188:9 192:8 193:10 215:11 215:12,16
link 158:6 253:2
links 2:8 252:5
list 16:3 19:24 32:22 33:17 100:11 135:17 171:9 180:6 242:25 258:7 258:13 261:11 264:11
listed 109:14 189:4 202:25 243:25 262:20 267:11
listened 258:24
listing 16:7
lists 27:11 28:4
literal 175:23
literally 217:22 218:16 223:14
literature 83:11,15 93:16
litigation 258:16 260:7 260:20 269:15
little 9:18 11:13 13:24 18:9 22:8 35:15 37:5 41:25 50:10 58:6 59:15 70:15 84:6 109:8 116:11 122:2 159:24 160:2 164:10 168:25 173:11 175:4 192:19 197:13 199:6 206:22 216:2 223:10 227:19 232:1,6 232:11,22 242:17 255:18
live 10:21 156:20 162:17
lived 114:22
lives 206:10
living 114:20 248:13
llc 15:7,8
llp 4:11,14,17 7:21
load 26:11 246:6 252:25
loaded 204:18 241:7 246:8 253:9

loading 241:3 253:6
local 47:8 58:6 80:11 88:4 187:8,21 239:23
localities 80:14 118:25 248:22 248:23
locality 258:14
located 41:11 114:16
locking 55:14
long 55:13 69:4 219:21 257:16 265:18
longer 15:18
look 20:3,22 21:25 39:9 49:5 56:16 66:16 78:25 89:9 108:20 113:10 117:19 121:13 127:9 127:22 135:14 140:18,20,25 142:12 147:16 147:17 151:20 165:2 166:4,9 179:24 188:19 191:10,11,14 191:15,17 193:14 196:18 197:1 198:2 199:11 200:4 200:25 201:3,8 208:10,22 214:20 215:11 215:15 219:22 225:14 229:20 236:8,21 244:18 252:23 260:18 265:7
looked 45:4 56:25 63:19 69:14 86:3 101:2,7 108:2 118:22 120:23 122:12 162:5 180:15 190:3 201:5 204:19 209:21 219:25
looking 29:20 31:16 41:19 48:8 52:20 57:8,19,25 58:18 62:21 63:10 64:18 65:2 67:19 69:11 73:8 75:12 76:3 77:25 84:24 88:18 89:6 91:25 92:5,13 94:7 99:2 101:11,18 102:3 103:9 107:3,10 112:25 113:9 116:16,17,19 117:8,9 123:17 123:24 124:4 125:4,8 129:4 130:14 131:24 132:10,13 134:1,11 137:22 139:5 141:18 143:7 145:22 154:20 155:8,18 156:11 157:2 158:15,25 159:15 161:23 162:5,21 163:10,18 164:24 168:20 169:12,20 172:1 174:20 175:12 188:1 188:10 189:14 190:2 192:12 197:23 198:7 198:24 205:9 211:14 215:9 225:16 226:8 226:25 228:5 245:7,9 257:5
looks 18:14 20:2 40:5 61:18,20 63:1 63:10,16 92:7 114:2 121:18 122:7 130:13 139:5 140:10 140:17 141:19 156:18 158:16 165:4,5,7 172:22 173:20 174:7 223:7,8 228:15,19 238:20 245:14 259:14 264:10
lot 8:17 15:3 20:22 22:2,2 46:23 55:24 80:11 90:14 98:22 125:5 134:12,17 175:3 181:19 181:19 194:14 197:10 204:15 206:19 227:20 232:25 238:20 245:15 249:7
lots 140:5 154:11 194:25 204:13
love 123:22 249:11
low 75:24 89:10 96:17 108:17 115:8 119:18 176:3 229:18,22 230:19 234:12 234:14
lower 31:23 56:21 113:3 152:21 153:10 229:7 234:9,12

lowered 136:9
lowering 232:17
lowest 227:17 230:21 236:19 236:22 237:1
lucy 40:7

m

m 3:1 48:22
ma'am 266:2
macon 59:10 130:7,12
madam 7:25
made 6:22 22:25 38:5 60:19 61:22 69:25 74:24 86:6 117:19 156:20 166:17 168:5,14,20 172:6 174:15 178:9 182:9,9 197:2 198:12 200:19 205:4 208:8,12 209:1 215:16 240:12 253:21 269:13
magnitude 184:11
main 172:13 179:23 259:11
maintaining 62:1,8,17 120:15,20
major 51:10 87:14 165:6 187:18
majority 22:6,8 22:9,12,17,18 22:23 23:2 29:5,7,8,9,9,16 37:1,13 41:15 52:8,10 56:22 64:17 81:8 82:14 91:12 110:8,8,10,10 110:14,15 111:11 113:11 113:12,15,16 113:16,23,24 113:24,25 114:4,6 120:4 120:4,9,14 126:5,17,25 127:1,7 128:18 134:3,3,4,7,8,8 135:25 136:3,7 138:18 139:6 140:11 141:21 142:5,10,13 145:7,7,15 146:5,18 148:16,21 149:19 156:24 177:17 209:22 209:22,22 210:8,11 211:1 211:10,15,16 213:5,19 217:23 225:16 225:17,23,23
make 6:21 22:3 26:21 27:19 32:19 35:1,9 46:4 53:20 54:6 58:11 65:18 69:24 79:2 104:12 112:16 120:3 122:1 134:12 145:4 151:9 155:7,12 159:5 168:7 169:23 171:10 177:2 188:6 210:20 210:22 219:16 219:18 237:8 256:3 267:4 269:5
maker 239:22
makers 237:25 238:5,6 239:9
makes 51:10 69:22 99:1 164:9 174:20 194:16 259:6
makeup 52:13 74:14 191:13 191:15 196:22
making 6:18 36:10 40:12 42:22 104:4 155:20 156:7 182:13,20 195:12 197:21 207:19 223:23 225:11 267:5,6
manageable 255:21 257:1,2
manipulate 19:21
manipulation 67:16
manner 224:16 231:14 238:12
mantra 54:17
map 14:1 17:23 18:10 20:2,3,9 20:24 44:13,14 44:18 49:14,15 54:25 56:20,21 57:1 59:21 60:22,23,24 61:9,25 62:22 64:2,6 65:18 65:22 69:3,13 70:14 97:24 98:5,5 99:22 108:11,18 119:10 123:1 128:22 131:9 133:10,16 141:11,16 143:7 145:18 145:19 150:24 156:13 157:11 158:19 163:25 164:1 171:13 171:20 174:11

180:21 181:1 198:9 204:2 208:13,19 209:9,12 223:19 234:15 237:25 238:5,6 239:9,22 241:15 251:1,7 260:14 262:12 262:22,23
mapper 142:25
mapping 132:21,23 149:23,25 150:4 164:3 209:2 240:1 248:21,25 249:2 250:12 250:14
maps 17:23,25 18:4,6,11,21 19:5,14,16,18 19:21 20:22 21:1,19 25:9 28:13,21 29:5 29:15 30:22 35:6 36:15 39:12 44:3,5 56:16,18 59:3 60:11 61:3 63:18 65:17 66:24 68:9 69:9 76:8 81:20 82:1,21 122:13,16 127:11 130:14 131:6 133:12 133:20 140:5 142:15,22 143:15,25 144:1,3,4,6,10 145:21 154:19 154:22 155:9 157:18 161:11 181:15 186:12 204:22 208:5 208:25 209:1 210:13 216:12 217:15 221:5 248:24 249:19 250:8,10,25 251:17 260:10 260:19,22,24 261:1,2,5,7 262:16,19
maptitude 20:8 20:10 67:2,7
march 269:18 270:20
margin 39:20 39:23,24
marietta 199:23,24
mark 9:10 25:24 26:2 168:23 253:3
marked 20:16 94:3 182:8 255:10
markov 245:21 245:24
massachusetts 10:21 15:8 82:3 251:10 258:19,20 259:1,5 260:14
master's 241:12
match 42:9 60:20 89:22
matching 183:24
material 199:7 252:14
materially 121:10 129:1
materials 16:7 32:23 33:14 85:21 192:3,6 192:11 199:16 217:4,7 226:2
math 2:7 243:10 246:5 246:10
mathematical 245:16,25 255:17
mathematician 36:11
mathematicia... 242:3,3 244:1
mathematics 241:11,13,20 242:21 245:11 246:4,20
matter 5:15 12:23 51:3 116:24 123:2 126:3,13 166:24 179:17 180:13 181:10 197:9 214:11 221:4 234:1
maup 48:22
maximization 80:2,17 157:18
maximize 79:19
maximized 233:23
maximizing 82:7 145:23,25 234:3
maximum 233:3
mcbath 40:8 53:21
mcbath's 40:9
mccain 85:1
mcdonald 208:24
mean 17:18 23:12 28:23 31:12 37:21 38:20,22 39:16 39:21,24 40:21 40:25 41:8 43:4 45:13 47:20 50:11,13

53:12 60:1 62:19 63:6 65:16 73:22 78:6,16 81:18 94:1 96:5 102:9 105:3 116:22 125:24 127:23 136:15 138:6,9 143:21 146:7,22 148:23 151:5,7 152:14 154:6 159:7 163:20 168:19 171:19 177:25 178:3 180:14 181:18 182:3 185:14 189:11 193:9 198:1 202:1 204:15,24 205:5,17 208:8 209:4,7 216:5 236:11 246:24 247:24 250:12 250:13 257:6
meaning 149:1 203:14,16 234:12 240:20
means 22:13 24:9 30:8 42:1 44:21,21 46:25 55:19 62:12 70:2 76:24 91:8 102:9 137:15 146:9 146:24 149:13 151:5 160:7 178:5 180:9 208:4 211:25 212:3 222:4,6 229:16 230:13 237:16 247:13 247:21
meant 84:14,19 95:5,7 101:4,4 202:20 209:6 222:17
measure 93:21 96:23 97:15 102:5 103:2 113:7 132:16 222:5
measured 103:8 147:25
measurement 38:3 82:20 102:6 115:21 115:23
measures 105:7 105:12 216:3,5
measuring 62:10 100:7 104:8 243:22 244:10
meat 10:14
mechanism 94:25 248:2
mechanisms 96:14
media 5:13
median 228:19 228:19 230:14
medical 10:24
medication 10:23 11:1
medium 234:12
meet 48:4 125:8,14 139:2 143:1,20 160:17 248:8 248:10
meeting 143:15
members 30:8 31:13 52:4 84:23 249:18 250:13
memory 89:22 109:1 200:5,7
mention 61:17 69:21 108:13 134:22 191:23 191:24 223:12 245:20 262:2 264:12
mentioned 24:4 25:3 43:11 203:6 249:10 251:9
mentioning 117:17 260:14
mere 56:14 183:5
merely 54:19 96:6 172:2,3
meriwether 58:20
messages 11:9
met 8:11 12:7 126:7,10 142:21 163:3 261:6
method 18:24 19:1 68:13,14 69:22 85:19 95:24 97:20 163:4 164:23 168:20 205:8 217:14 218:3 245:25 256:19
methodology 64:25 68:9,13 68:14 73:3,6 122:8 143:5 165:2
methods 66:3,5 68:9 165:6 198:21 260:24
metric 62:15 70:16 102:24 105:22 143:12 147:13,19 214:7 215:6 242:1 244:16 244:20
metrics 28:18 62:10,13,20 66:16 67:13,23 68:10,15 69:12 70:18 71:9

79:11,13 99:10 99:21 100:4,7 101:11,14 103:5 119:12 119:24 120:23 137:13 147:1,5 147:9,21,22 148:1 175:17 221:12 244:13
metrizable 148:6
metro 40:19 49:14,23 152:24 161:24
metropolitan 197:16
mggg 241:23 242:1
michael 208:24
michigan 243:5 249:1,3,20
microscopic 193:9
mid 247:10
middle 222:9 228:17 229:6 229:13 230:25 231:24,25 232:16,21 234:9 235:3,6 246:18
migration 243:25
mike 4:7 7:13 208:24
mill 199:24
milledgeville 132:3
milligan 262:1
million 117:13 118:8
millions 256:20
milliseconds 214:12
milton 163:16
mind 31:25 71:5 122:24 126:8 154:1 157:8 163:25 164:3 172:4 195:23 204:9 208:18 234:2 240:3,4 247:6
mindful 127:3
minds 34:12 35:2
mine 170:10
minimal 144:8 164:16
minimally 124:25 125:13 125:18
minimum 168:14
minor 240:17
minority 22:18 22:19,20,22,23 23:2,8,13,17 29:5,7 32:1 41:10 42:18,19 57:16 64:18 75:22 76:14 79:21 80:8 82:8,15 84:7 84:23 86:3 90:14 91:17,19 96:8 120:4 124:16 146:5 162:19 163:1 179:14,16 238:11,16,21 253:13 254:8
minus 113:25 141:21
minute 10:3 26:10 67:25 74:11 193:9,13 207:5 251:20 252:25
minutely 192:14 193:4 193:20
missing 77:8 168:6
mix 60:20
mjones 4:8
mode 247:8
models 245:16
modifiable 48:23
modify 60:16 64:3 69:15
modifying 261:5
modular 21:5 60:11 61:12 69:21 78:4
modularized 71:18
module 60:15 70:7 153:20 154:3
modules 69:25 70:3,10 71:10 153:19
moment 109:11 129:18 143:9 185:18 194:21 194:25 205:2 232:15 235:11 247:8
moment's 185:12
moniker 242:7
months 12:24 181:20
montoya 4:14 7:24
moon 1:15 3:2 5:14 8:4 10:17 123:19 253:20 267:9 268:18 269:2
morgan 12:13 12:15 150:9 207:23 208:15 209:11 212:24 213:1,22 235:18 236:24

morgan's 207:17 210:8 210:24,25 211:17 212:20 213:7,19 217:19 218:3
moring 4:3 6:17 7:6
morning 5:2 6:13,25 8:9
motivated 235:2
motivation 34:1 255:2
motivations 166:19
motives 195:18
mouthful 138:21
move 22:1 33:16 44:12 50:1 59:14 61:16 77:21 83:4 89:13 95:23 99:10 101:12 114:9 119:5,25 133:22 145:2 145:16 157:8 164:22 179:4 186:24 190:23 204:10 218:7 226:22 240:22 255:5 260:6
moved 116:19 187:3
movement 48:10 174:21
moves 89:2
moving 32:22 74:7 80:18 90:21 95:14 106:6 120:12 140:9 174:15 178:24 227:24 240:11
multi 137:12 143:11
multiple 89:24 117:11 142:16 219:21 248:10
municipalities 107:24 108:14 108:24
municipality 107:22 108:4 109:9
munis 108:20
muscogee 198:10 201:14
mute 235:10
muted 27:22
mutually 196:9

n

n 2:1 3:1,1
naa 264:2
naacp 1:4 5:16 6:15 7:4,7 264:2 265:14
name 5:22 8:10 10:16
named 242:11
names 59:12 73:20 89:21
naming 241:25
narrative 34:3 54:14 55:19 132:22 177:11 183:15 212:12
narratives 165:7,25 166:14 204:10
nathan 4:13 7:23
nathan.jamie... 4:15
nationally 110:5
nature 122:20 122:21 186:20 187:1
nearly 168:3
necessarily 29:8 42:7 62:16 65:19 123:11 132:4 139:18 151:15 224:17,20,24 227:22 250:8
necessary 31:14 86:18 108:22 124:17 138:17 139:1 154:7 159:13 177:18,22,25 178:3,5,14 201:24 202:2,5 202:9 224:14 267:7
necessity 178:2
need 9:19,21 10:4,19 76:13 138:22 157:19 160:9 161:11 161:18 174:12 193:18 240:4 245:3 249:12 257:3
needed 46:11 138:11 139:1 169:14
needs 43:15,20
neglect 88:15
neighborhood 172:18 223:6 249:25
neighborhoods 206:16
neighboring 174:5
neighbors 174:3
neil 4:13 7:23 9:8
neil.steiner 4:15
neutral 149:23 150:3,4,10,11 231:8 256:9,18

never 38:24,25 53:12 80:15,15 82:10 118:19 156:5,17 195:17 201:20 225:9 243:3 249:16 261:17
new 16:15 28:2 115:17 116:4,7 117:17 241:20 259:3
newly 51:8
newton 198:10 201:13
night 218:19
nine 126:25
nominate 90:19
nominated 24:12 91:18
non 14:19 23:4 52:9 127:23 154:3 173:18 180:17 190:14
noncontiguous 199:25
nonpartisan 249:15
norm 6:3
normal 15:22
north 119:5 134:17 135:12 137:2 163:17 179:4 261:18
northeast 63:7 63:8
northern 1:2
northwest 62:25 63:6 133:3 206:8
notable 158:21
notably 263:16 263:21
notary 268:22
note 5:5 36:24 52:24 72:2 88:9 150:6 168:1 172:16 190:9,22 199:10 201:11 203:5 211:20 221:1
noted 49:18 134:24 162:24 183:8 187:25 209:8 228:17
notes 259:13
notice 45:2 91:10 98:7,9 135:7 141:25
noticed 70:21 137:23 139:11
noticing 6:11
noting 67:4 211:3 212:6
notion 80:24,25 93:2
notions 245:1
november 24:17 86:12
number 5:18 5:20 21:8,11 46:6 49:7 51:11,25 52:3 59:17 71:2,2 71:23 79:19 87:9 95:14 106:7,12,16,22 107:5,6,18 111:11,14 112:20,22 114:4,6 116:18 124:9 127:7 134:24 135:1,7 137:7,24 138:1 138:18 140:25 142:6 146:18 148:19 149:20 150:14,17 151:22 156:23 162:25 168:14 182:25 190:10 190:14 202:8,9 203:13,14 210:8,25 211:2 211:21 213:5,5 216:10,13 217:16 221:16 221:25 223:1 225:17,23 227:13 232:7 234:14 238:2 255:24 263:18
numbering 117:17 118:13 187:14 227:13
numbers 32:13 32:14 48:8 51:1 71:25 98:9 106:12 116:23 117:2 117:15,19 118:13 119:1 138:12,22 142:16 160:1 162:14,20,22 170:7,9,12 233:3 235:19 236:7 237:4,6 237:9 238:11
numerator 240:18
numeric 31:25 32:18
numerical 25:5 32:5 105:24
numerous 118:22 201:22

o

o 3:1
o'clock 266:6
o.c.g.a 269:10
oath 6:2 8:6
object 8:24 12:1 81:11
objection 6:22 35:19 36:6
objections 6:5 6:19,21

objective 13:20 102:6,9,9,11 137:12 143:11
observation 40:14 235:25
observations 167:24 228:11
observe 34:5 229:2
observed 51:18 227:7
observing 75:23
obvious 38:12 90:6 250:16
obviously 95:25 241:11
occasions 185:20
occur 155:17 157:15 190:12 221:3
occurred 53:17 230:13
occurring 166:5 196:13 196:17
october 13:6,7 13:7 24:14,17
offer 83:2 133:9 206:23 248:9
offered 72:3,4 78:10 121:11 128:8
offering 26:9 26:25 33:19,24 33:25 34:4,18 35:5,8,16 36:2 36:4 44:1 56:8 99:4 119:13 144:4 145:11 160:10 164:11 178:18 181:24 182:5 198:6 205:10 207:1 211:4 212:6,20 213:12
office 169:6,7
offices 269:8
official 104:14 176:16 181:9 242:17 267:3
officially 104:6 178:10 242:11
offs 66:7
oh 10:6 48:3 49:16 58:15 78:22 81:6 82:17 84:16 94:2 95:5 104:3 109:1 127:23 129:25 130:17 132:8 178:3 188:17 190:19 217:10 240:16 246:13 250:11 258:4
okay 9:8 10:8 10:22 11:7,12 12:25 13:3 15:5,15 16:11 18:15 21:14 23:1,12 24:7 26:4,7 41:22 43:5 58:5,18 64:22 89:23 92:13 95:6,12 98:2,25 109:17 113:14,17 116:16 122:4 122:19 128:1 129:18,20 130:3 131:19 131:24 133:15 134:22 136:23 142:4 155:22 169:12,16,22 170:14 171:6 172:15,16 175:2 177:21 179:9 185:9 196:7 199:23 200:8,10 203:18 207:22 211:19 226:22 231:6 234:25 236:7 237:11 241:1,4,7 242:9 246:7,8 246:9 252:3,18 252:23 253:5 254:2 256:17 257:12 261:22 265:25
old 116:6
olive 135:20
omnibus 264:4
once 22:21 24:9 158:10 172:12 197:10 237:3 246:16 248:10 256:10
one's 129:14 138:22
ones 45:6 85:15 85:24 92:5,10 92:25 100:8 159:17 168:7 196:25 213:20 214:23 217:16 229:6,12,22 261:8
ongoing 262:4 264:7
online 33:9
onward 221:3
open 169:3 220:20 242:15
opened 58:5
operate 35:12
operational 258:12
operationaliz... 183:3
operationalized 237:25 238:4,6
operative 24:8
opined 14:1,4 27:5

opining 81:18 130:15 142:25
opinion 13:13 26:25 33:19 34:1,8 35:5,16 44:1 54:21 56:8 119:17,20 178:18 181:24 182:5 198:6 203:1 205:24 206:2,4 211:5 212:6,14,15,18 212:19,21 213:12 217:18 239:12
opinions 9:17 16:4,13 25:19 26:8,13 27:11 34:18 77:7 99:3 119:13,16 119:22 144:5,7 145:11,13 164:11 205:10 206:22,25 239:7
opportunities 79:7 150:25 204:13 205:2 231:2
opportunity 23:9,13,14 29:20,24 30:6 30:12 31:23 32:16 41:6,9 55:5,22 65:21 77:22 78:11,17 79:20 80:7,21 80:24 81:2,10 82:8,23 95:16 95:20 124:19 133:13 138:23 149:21 150:5 150:18 153:16 161:15,18,20 163:8 209:24 211:21,24 212:23 213:6 230:20,23 231:5 238:13 247:4
opposed 54:10 91:11 210:14 214:7
optimal 117:18 136:14,15
optimization 137:10,12
optimize 124:20
options 60:20 63:20 121:11 121:13
oral 33:3
orange 129:17
order 27:10 45:7 71:20 76:14 84:10 125:8 138:17 139:2 146:12 168:22
organization 180:11
orient 223:13
oriented 134:18,19 146:7,7
original 240:21 270:16
ossoff 85:6,17 86:13
outbound 179:25
outcome 6:4 39:20 55:14 93:18 238:24 239:2 270:19
outcomes 32:12 51:19,19 112:2
outlined 60:5 61:11
outlines 175:6
outputs 214:20
overall 50:23 55:10 59:17 74:14 138:19 147:13 205:18 218:19
overconcentr... 31:13 128:15
overlap 97:14 179:1,8
overlaps 136:21
overly 56:15
overpopulated 171:2,4
overstate 35:11 198:20
overview 46:23 50:2 77:11 252:18
own 25:16 36:3 58:6 102:18 109:8,22 143:7 143:20 243:1 249:19

p

p 48:22
p.m. 1:18 5:4 10:3 68:6
package 19:25
packages 19:19 19:20,24 20:2 20:4,6,6 67:9
packed 31:3,19 32:2 124:12 126:9,12 138:2 138:5,6,7 154:1,5,9
packing 31:2 31:10,12 32:17 73:11,14 76:1 76:4 124:13 128:15 151:24 152:3,15 153:1 166:12 198:14 198:17
page 2:2 3:2 28:12 41:21

42:23 47:10 48:6 56:17 57:8,19 58:1 58:13,14 60:9 61:14,24 64:24 75:12 78:21 85:25 87:13 89:7 92:1,19 92:20,21 94:7 95:23 118:9 120:13 121:14 127:9 128:5,5 129:4 136:7 137:4 140:10 141:10 142:1 145:16 153:22 156:12 163:10 169:24 172:8 172:12,14 188:2,12 189:4 191:16 192:12 193:18 198:7 200:21 208:23 210:23 212:13 212:16 214:2 216:22 222:24 231:17 234:25 235:20 236:9 248:20 253:9 253:10,21,22 253:24,25 255:5 256:2,3 256:7 267:13 267:15,17,19 267:21,23,25 268:2,4,6,8,10 268:12,14
pages 243:13 267:7
paid 14:22
panel 262:1 263:13,15
paper 208:24 243:24 244:15
papers 2:8 242:14 243:21 252:5,15
paragraph 27:8 51:9 55:9 78:9 94:10 120:13 146:17 148:9 149:17 172:22 174:19 177:14 202:21 212:16 213:10 235:1,20,22 236:9 237:23 256:7
paragraphs 212:18
parallel 69:7 71:12
pareto 247:21
part 16:4 30:15 30:16 34:10 44:21 52:20 57:3 59:1 60:19 61:19 72:11 73:23 74:14 79:3 106:19,24 108:23,24 110:9,10,18,23 116:13 119:6 122:5 126:7 129:22,23 130:2 134:16 144:5 158:6,7 164:9 171:8 175:14,21 176:11 183:7 183:21 189:21 191:10 204:25 213:9 224:4 225:19 233:24 240:13 251:20
participants 5:8 252:10,15
participating 10:25
participation 82:2 88:15
particles 116:3
particular 31:14,19 32:1 34:1 36:11 43:25 45:4,21 53:18 64:25 65:2 72:10 73:2 86:11 90:11 93:24 94:3 98:7 104:10 122:8 123:3,4 124:18 130:15,20 131:5 132:4 134:20 135:23 136:3 139:13 139:19 140:7 141:5 147:12 154:3,16 155:24 157:24 158:5,11 159:3 159:11 162:10 163:15 179:21 184:10 191:2 201:6 206:16 209:1 214:6 215:5,8 216:11 217:1 219:10 223:2 230:8 259:10
particularly 37:17 49:18 69:22 70:22 109:21 178:7 203:25 206:8
parties 5:12 50:20 60:4 87:9,11 220:18 262:15 269:14
partisan 34:6,9 34:10 53:11,12 54:9,12,17,20 54:22 55:4,17 56:1,3,10 59:21,25 60:1 96:3 150:16 167:1 183:6 184:4,13,17,18

184:21,22 185:5 186:20 195:18 196:9 196:12 197:20 218:8,10,25 220:9 226:7 227:1 231:8,9 232:18,19,25 233:12,15,23 233:23 234:5 234:19,22 235:2,15 238:24 239:2 244:5,10,13,19 245:1 253:14 254:8 255:17 255:22 256:23 259:15
partisanship 26:25 27:2 149:25 150:2 184:20 196:14 211:8 220:11 220:20 224:8 224:10,15 225:20 231:13 235:5 239:8
partly 85:11 135:2
parts 19:9 40:17 49:25 50:24 58:19 60:23 61:6 70:7 106:16,25 121:20 132:5 153:5 161:16 161:17 162:17 163:17 191:12 206:7 215:13 245:12
party 6:3 27:5 59:18 60:2 86:24 87:14,21 88:3,6,15 91:21 95:25 96:15 97:14,21 97:25 98:24 150:4 186:16 187:18 196:22 197:7,17 199:12,13 235:7 269:12 269:15 270:18
passing 185:21
past 83:9 88:6 124:16
pat 154:7
patrick 4:21 7:10
pattern 156:20 197:7 224:25 232:14
patterns 75:24 166:4,12 198:14 240:9 244:1 253:14 254:8,22
pause 62:5,6
pay 71:1
paying 156:21
pdf 58:9 253:10 253:23 256:2
pdm 180:15
peer 83:15
penalize 104:10
pence 85:2 87:7
pendergrass 7:15
pending 9:23
pennsylvania 262:6,8
people 22:14,14 22:25 23:3 24:21 47:6 49:7 51:6 53:3 53:3,4 55:5,20 56:12 82:2 85:16 102:16 115:17,19,21 116:20,23 118:8 136:15 156:6,20 162:17 163:23 168:6 169:14 170:6,19,24 171:4 177:7 190:20 193:22 193:24 205:13 208:6 248:5 249:24 250:9
people's 260:22 261:2
pepper 66:3 104:10
percent 37:5,9 39:4,8 41:17 42:19 47:19,22 48:4 52:13 66:19 76:13 80:20 81:1 88:25 89:9 118:20 120:7 124:5,9,24 125:9,19,22 126:9 136:10 136:10 137:24 137:25 138:23 146:12,16 153:24 154:6,6 154:15 156:13 156:18 158:18 161:12,14,16 161:18,21 162:2,9 192:18 192:21 220:1,2 228:13,13,15 228:16,20,23 228:24 229:17 229:21 230:7 230:12 263:24
percentage 37:6 39:3,14 44:25 48:12 104:1,14 126:3 179:16,17
percentages 87:6 145:6 163:12

percentile 228:11 234:13
perdue 85:6 86:13
perfect 93:20 93:21 98:13 233:8
perfectly 173:21
perform 85:12 85:14 95:21
performance 52:14 59:17 79:5,9 95:11 113:7 163:8
performed 93:14
performing 51:11,16,25 111:24 112:2 173:14,18,24
performs 57:5
period 85:10 144:25
persist 102:16
person 19:18 49:9,11 84:2,5 84:9 85:2,5 95:17 96:12,22 175:5 179:21 247:22 260:16
personal 13:13 102:10 143:2
personally 18:11 252:17 258:2
perspective 89:4 184:16
persuasive 34:24 84:22
phase 155:21
phd 1:15 3:2 5:14 8:4 241:13 267:9 268:18 269:2
phi 7:17
photocopying 270:12,14
phrase 36:17 44:7 56:23 66:13 79:2 97:17 167:20 209:14 247:10
phrases 204:20
phrasing 55:18 56:15 96:15 247:7
physical 115:14
pick 113:1 121:23 207:12
picked 64:14 196:23
pickens 177:23 178:13
picking 176:7
picture 48:20 48:25 67:19 255:1
piece 77:9 135:20
pieces 8:24 17:1 18:16 20:18 46:5 55:20 60:6 70:23 71:3 106:8,13,21 107:2 170:15 201:23 202:8,9 203:9 206:5 225:2 241:10 243:11
pipper 103:18
place 5:11 149:13 155:3 172:10 182:6 239:13 242:8
placed 115:8
placement 222:10
places 23:20 42:17 48:7 63:21 105:5 108:6 184:14 194:12 234:14 258:19
plainly 172:22 172:24 173:20 174:8,10
plaintiff's 16:2 16:11
plaintiffs 1:5 1:11 6:17,19 6:23 7:3,6,9,14 7:18,22 15:22 16:19,20,23 23:23 37:25 179:22 262:23 264:2,18 265:14
plan 10:2 21:22 34:2 39:25 41:2,12 50:5 51:9,15,24 52:3 55:13 57:9,16 58:1,2 58:3,4 59:8,14 59:16,21 60:16 60:25 61:19 62:4 63:24 64:3,4,11,12 69:15,18,24 70:1,21 71:8 71:11,15,18,21 71:22 72:9 74:14,23,24 75:3,5,9 78:2 92:3 95:15,16 96:19 97:5 98:9,13 99:11 99:23 101:15 101:22 102:1 103:11,13,19 103:20 104:17 104:18,18 105:6,14 107:12,16,17 107:19 113:11 113:15,18,18 113:22 114:7 116:1,9 119:4

120:3,6,23
121:17 129:7
129:13 130:5
134:7,17
136:20,24
137:6,22
139:10,23
140:12 141:12
141:20 145:6
146:12 149:18
150:10,11
151:25 152:4
152:18,19,19
153:10 156:17
161:23 169:9
171:20,21,21
177:16 178:8
178:10,12
199:4,19
201:17 202:16
202:24 203:19
208:16 210:24
210:25 211:2
211:11,17,17
212:2,8,22,23
213:7,11,13
215:10,17,21
217:17 220:19
221:12,18
222:12,14
223:2 225:5,9
226:5,25 228:8
228:25 229:25
230:1 231:20
231:23,25
235:2,18
236:11,12,18
236:22,24
237:1 238:1,10
238:16 239:10
239:16 241:22
249:21 256:12
plans 12:20
17:1,2,3,10
18:19 21:16
31:16,21 33:20
34:5,21 35:17
38:17 43:1
47:12 48:1
50:2 68:19
71:20 72:20
75:8,15 77:7
77:12 79:18
81:24 82:7,16
95:3 99:15
101:16,21,25
103:24 104:25
105:16,17,22
106:1,3 107:17
107:18 117:14
119:15 120:1
120:12 121:4
122:22 123:4,7
123:14 124:1,2
126:15 129:11
130:11 131:13
131:17 134:18
135:4 140:19
140:20 141:20
146:7 147:8,25
153:17 157:15
163:19 164:13
164:19 165:12
210:9,10,10
212:15,20
213:21 216:9
217:6 219:5,5
220:10,13
222:9 224:11
227:7,8,12,16
228:2,2,6,13,22
229:17 230:10
235:17 236:15
236:25 238:25
239:3 244:14
256:9,18,21
plast 71:22
plausible 54:4
play 53:11,13
167:1,4 172:7
181:10
played 25:7
playing 55:20
plays 161:9
226:12
please 5:5 6:6
8:1 10:16 12:1
12:2 40:23
48:16 92:18
114:13 267:6,7
pleasing 147:17
pleasure
245:25 247:2
plenty 9:9
74:10
plot 48:14,17
49:6 175:5,22
223:18 226:19
227:8,25
plots 49:16
175:10
plug 60:16
plump 135:14
plus 39:24
41:17 47:19,22
48:4 66:20
76:13 80:20
81:2 87:19
110:15 113:18
113:19,19,19
113:23,24
114:5 124:24
139:5,9 140:10
154:15 228:8
poc 83:23
point 9:20 31:7
39:20,23,24
42:21 65:10
67:14,23 68:11
69:13,18 74:9
81:13 98:15
100:13 103:23
109:18 113:4
119:13,24
125:18 132:18
132:19 133:7
136:19 144:14
154:9 160:6
174:18 185:22
191:24 202:8

202:20 203:12 223:19 251:21 253:20
pointed 194:25 205:12
pointing 171:23,24 178:16 179:12 211:4 213:14
points 8:24 17:14 48:11,12 66:21 98:18 104:1,1,3,14 175:23,24,25 210:21 221:19
polarization 26:17 38:4,7 50:9,12 85:12 85:14 90:3 94:18,21 253:13 254:7
polarized 37:25
political 40:7 50:19 52:14 53:6 56:25 59:18 60:2,3 106:6 154:21 154:24 155:5 166:19 167:7 167:14 174:10 174:14 182:22 182:24 183:1 191:15 197:12 197:23 257:10 259:5,23
politically 183:19,25 184:6 196:3 222:2
politics 53:22 166:20
poll 47:2
polls 254:25
polsby 66:3 102:20 103:1 103:12,13,18 103:20,23 104:10,21 105:7 214:4,13
poor 117:3
popper 102:20 103:1,12,13,20 103:23 104:21 105:7 214:4,13
populated 170:23 175:25
population 2:5 22:9,11,13,22 22:23,25 23:5 23:6 31:24 32:20 37:5,6,9 41:5 42:19 46:2,6 47:9 48:9 59:5 75:22 76:14 101:12 110:9 110:11,15 115:16 116:6 124:16 125:11 125:21 136:21 138:10,23 139:11 145:5 146:5 152:22 153:11,25 165:1 169:7,15 170:3 173:4,23 175:23 176:4,8 176:10 177:11 177:23 178:13 179:1,15,16 180:19,25 183:18,19,24 183:25 195:14 195:15 216:5 216:21,23 224:25
populous 70:22 230:17
portal 33:9
portion 74:6 88:25 130:1 191:6,8 192:16 192:18,20 199:17
portions 193:17 199:25
position 236:10 237:9 239:18 239:19 242:21 243:2
positions 243:4 243:5,6
possibilities 178:6
possibility 30:22 164:18 178:4 202:2
possible 10:2 16:8 19:9 23:10 27:1 36:13 41:3 54:24,25 56:13 82:22 91:12 105:4 115:16 115:17 122:16 130:21 132:10 136:16 139:18 144:8 146:4 155:15 162:20 164:20 166:19 189:17 197:25 209:7 219:15 233:5,15 247:15
possibly 160:23
post 243:6
potential 73:14
potentially 53:11 76:25
poverty 4:9 7:10,11
power 172:23 172:25 173:5 173:20
powerful 178:7
practice 80:6 88:6
practices 43:19 79:24 80:1,5

252:19
pre 45:17 258:13
precinct 109:13 109:15 110:1 185:21,23 186:17 189:20 190:11 191:25 192:1,2 194:9 195:3,6 196:21 198:22 199:12 199:14,19 200:22 201:9 203:13,24 204:7 260:2
precincts 44:24 49:3 109:22 152:7 185:24 186:1,8,10,12 186:14,23 190:7,11,15 194:5,6,11,17 194:22,25 197:6 198:25 199:1,4,8,25 202:1,12,16 203:19 218:13 238:2
precise 22:10 24:7 51:21 149:1 170:9 247:6
precisely 46:18 67:21 148:18 176:4 177:6
precision 100:3
preclearance 258:7
predict 88:1 254:5
predicting 93:23
prediction 94:5
predictive 93:17,21 112:18 186:5
predictor 80:20 81:2
predicts 112:17
predominance 14:5 165:21 180:20 204:5
predominate 125:2 161:12 165:19
predominated 181:25 182:3 182:13,18 198:7 204:1,6
predominates 165:22 182:12
preference 86:6 90:10,18,24 159:23 199:13
preferences 30:14,16 31:15 50:14,16 53:1 57:16 91:1,20 91:21 92:1 96:8,9 149:14 206:19
preferred 36:25 37:12,18 37:20 38:9 42:2,12,18 51:12 52:1 79:21 80:8 82:8 91:17 94:12,14 96:13 96:20 148:14 148:14 157:16 157:17 163:2 173:2
prefers 216:16
preliminary 221:4
preparation 11:21 32:23 141:25
prepare 85:19
prepared 197:5
presence 148:22 195:17
present 4:20 6:8 31:23 143:6 144:10 167:23 196:25 219:14
presentation 13:20
presented 170:11 205:21
presenting 77:6 122:18 142:19 143:25 144:3 145:12 164:12 182:7
preserve 190:7
preserving 115:14
president 192:19,21
presidential 219:6,8
presumably 44:8
pretending 34:15
pretty 152:24 220:5 239:17 247:25
prevail 31:15
preview 132:20
previous 85:25 87:13 148:4 179:1 227:8
previously 116:21 136:7 173:7
primaries 42:9 42:13 57:18,22 74:20 88:18 90:15,20 91:3 91:7 96:16 111:24 112:8 149:7,13 157:12 160:9 160:12 212:1
primarily 9:15 10:19 14:1,3

33:21 65:6 135:12,12,14 176:10 179:13 189:5,8 191:6 191:7 243:15
primary 24:12 30:14,15 42:3 42:5 76:2 89:18 90:1,8 90:10 92:6,11 92:14,24 96:11 108:7 134:13 159:18,23 186:7 218:2
primary's 87:3
principal 255:25
principle 43:6 108:3 109:12 115:11
principles 14:5 28:14 62:2,11 62:18 79:5,10 79:15 85:25 99:24 100:6,7 100:16 101:8 108:25 109:5 120:16,20 121:5,7 122:14 127:3,4 146:14 146:21,23 147:3,7,24 182:10 188:8 189:6,22 198:8 204:1 221:7
prior 21:21 101:8 127:10 169:9 209:25
priorities 168:11 178:23 218:19
prioritize 121:5
prioritized 86:1,2,7
prioritizes 107:23
prioritizing 55:21 217:14
priority 65:22 108:17 115:8 119:18 135:16 155:4 168:13 168:17,21 224:19
privileged 12:3
probabilistic 156:9
probability 237:11,16
probably 10:9 18:3 22:7 26:10 30:4 36:17 54:13 55:24 57:12 86:21 94:20 100:23 103:4 109:7 115:20 144:13 151:2 152:11,12 163:24 189:7 205:18 230:22 236:3 241:21 242:7 250:16
probative 57:6 83:4,10,18,22 84:3 187:19
probativity 84:11
problem 48:23 123:12,15,15
procedure 267:3
proceed 219:3
proceeding 6:6
process 18:10 18:21 19:11,11 28:16 31:9 46:25 47:1 63:17,23 64:25 65:9 66:10 67:1,12 71:9 71:12,15 75:2 83:5 99:13 109:25 111:18 119:6 143:11 149:23,25 150:4,18,24 155:20 158:16 162:3 163:22 164:3,5,9 178:10 194:2 204:14,25 208:8 227:4 228:14 251:11
processes 69:6
produce 131:8 252:1
produced 19:1 190:6 229:17
producing 221:5
production 29:4
products 20:7 20:13
professional 242:24 255:6
professionally 241:18
professor 242:21 247:8 257:18
profile 38:13
profoundly 55:12
program 19:15 105:25 242:15 248:20 251:22
prohibited 269:10
project 257:16 261:19
projected 51:19
projects 251:15
prong 14:11 28:22,24
pronounce 180:7

pronounced 194:16 257:20
properties 19:22 65:13 127:25 224:17 238:10,17 260:25
property 247:17 248:2
proportionality 244:16 259:7
proposal 225:11,21
propose 165:6 225:8 257:7 262:15
proposed 61:2 98:16,21 156:8 227:11 261:8
proposing 56:21 99:8 261:1,5
prospects 173:17 174:4
protect 132:13
proud 249:7
provide 9:4 11:8 16:2 29:24 30:5 33:10 151:16 203:24 226:6 261:15 269:8 269:11
provided 16:7 18:20 33:3,10 33:15 114:11 114:15 115:2,5 127:17 192:3 204:12 205:2 217:4 240:25 248:19,21 250:2,7
provides 57:20 176:16
providing 77:7 82:21 95:2 108:7 144:6 149:21 151:8 250:9
proving 248:5
provisions 165:18
proxy 198:5 233:10,11
psychologist 255:2
public 33:4 42:24 43:12 68:20,21,25 69:8 70:25 180:14 188:21 203:11 204:11 204:13 205:6 205:11 206:12 219:8 248:21 248:25 249:2 249:19 250:3 250:12,13,14 255:6 268:22
publications 32:4 83:17 243:7,12,13 244:7 252:8
publicly 180:17 225:7
pull 255:12
pure 243:10
purple 63:15 129:9,16,19 130:2 152:24
purples 152:23
purpose 76:10 108:7
purposes 23:22 62:16 109:9 124:15 185:9 186:18 187:22 207:16 255:15
pursuant 267:2 269:4
pursue 143:4 232:21
pursued 34:9 231:13 235:5
pursues 232:18
pursuing 213:18 233:22
pursuit 34:6 218:10 220:20 224:15 231:8,9 232:19 234:4 234:19,21 235:14
push 106:3
pushing 68:12
put 24:21 46:11 62:15 83:19 116:24 122:9 132:13 133:14 155:13 173:24 216:22 248:7
putting 133:17 139:14 195:13
puzzle 77:9 121:2
python 19:18 19:19,19,24 20:6

q

qualified 198:12
qualifying 140:5 146:12
quality 5:6,7 219:15
quantifiable 79:15
quantitative 44:20 132:16 179:24 181:21 250:5
question 8:22 9:2,4,10,13,23 9:23 10:23 27:6 34:17 35:13,15,22 39:5 40:24 46:13 51:21,22

53:4 67:5,11 67:21 74:1,3 85:18 87:6 90:7 94:9 97:2 99:18 102:12 116:22 119:3 127:19 128:7 135:11 136:12 140:1 143:14 150:16 167:1 184:25 185:5 189:2,25 190:12 195:20 195:21,22,22 205:20,22,23 209:18 218:16 226:8 230:18 233:18 241:25 253:7 259:10 259:11
questions 12:2 25:25 27:19 36:22 77:24 170:12 240:24 244:6 259:19 265:6,13 270:7
quick 200:4
quicker 168:25
quickly 57:7 92:17 142:8,11 157:8 191:23 241:5 260:18
quite 15:3 24:18 25:1 27:15 30:4,10 32:3 38:23 46:17 59:7 67:1,8 68:22 69:3 70:6 71:12 77:10 88:4 95:24 108:17 109:6 125:6 126:7 128:22 133:8 133:24 135:4 141:17,24 144:2 158:21 159:25 164:8 176:3,3 181:23 182:7 189:9 190:17 191:12 194:1,16 198:4 206:9 209:3 211:9 219:11 233:5 234:14 240:19 255:3 257:4
quoted 99:24 100:1
quotes 31:2

r

r 267:1,1 270:1
race 14:2,5 26:25 27:1,4 30:23 33:21,25 34:6,9 39:17 39:22 53:14 54:16,21 55:4 84:1 85:1,3 87:7,16,17 88:24 89:14,19 95:25 96:15 97:13,21,25 98:24 110:23 111:12 124:23 124:25 125:2,8 125:18 149:22 149:25 150:3 154:10,15 157:2 161:12 162:21 165:19 165:21 181:25 182:12,13 183:2,3,6 184:4,13,17 186:16 189:5 192:13 193:4 193:20 195:9 195:11,12,20 196:1,10,11,15 196:22 197:7 197:17,21 198:5,7 199:11 199:12 203:25 204:6 209:12 210:25 211:8 219:8,9 220:11 224:10 225:8 225:20 226:8 231:7,9,14 233:17 234:19 234:21 237:25 238:4,6,23 239:2,8,14 240:1,5 253:12 254:6
raced 167:2
racer 125:14
races 38:12,13 84:25 85:9,9 88:3 165:22
racial 38:4 48:13,17 49:14 50:8,12 52:13 54:4,7,10,11,20 55:1 66:23 79:4 96:3 110:6 123:4 154:17,20 161:6 162:5 164:22,24 165:3,10,12,15 165:16 167:3,7 180:20,25 181:14 182:9 182:23,25 183:1,23 184:8 184:18,22 185:7 186:20 191:1,6,7,13 192:14 195:4 197:23 198:3 200:13 201:11 201:18,19 202:12,17 203:3,4,20 204:5 209:11 218:5 220:12 225:3,14 227:1 239:9 253:13

254:7
racially 35:7,18 36:16 37:24 166:11 173:3 173:23 179:13 180:18,24 182:17 183:2 183:17,24 184:5 189:9 194:2,2 203:2 203:24 218:14 218:14
radically 48:24
raffensperger 1:12 5:19
ran 17:13 20:9 69:13,19 118:12 213:20 215:13 258:18
random 225:11 235:17
range 36:19 222:25 230:25 231:24 232:16 234:9 235:3,6 235:12 238:12
rate 14:18 15:16,20,22
rates 269:14
rather 41:1 51:19 55:21 82:17 86:16 102:8 104:1 121:11 125:24 152:12 190:20 211:13 220:1 222:22 231:8 254:17
ratio 47:3
ratios 47:8
raw 217:4
reach 35:24 36:3 58:25 69:13,18 87:9 173:2,24 217:18 218:3
reached 36:8
reaches 32:1 137:1
reaching 182:15
reaction 147:25
read 11:14 26:20 46:21 70:24 71:6 102:17 119:7 144:24 160:11 173:11 202:25 205:16 207:15 215:3 220:21 235:9 237:4 243:8 245:2 254:2 256:15 256:16 258:23 267:9,13,15,17 267:19,21,23 267:25 268:2,4 268:6,8,10,12 268:14
readable 192:10
readers 189:12
readily 41:3 127:2 146:3
reading 34:12 137:20,21 177:6 204:9 215:4 258:17
ready 11:18,20 12:8
real 194:22
realist's 2:9 252:20
realize 190:19
really 8:20 9:15 15:2,4 39:10 40:18 46:17 76:2,20 77:5 87:21 89:3 94:15 97:24 98:25 104:7 108:3,17 113:6 132:10 140:6 153:8 154:16 158:1 159:4 161:2 162:22 164:15 168:9 180:9 181:3 185:14 188:25 190:19 195:24 198:2 199:12 211:9,24 212:21 226:4 230:5 231:24 234:13 240:5 245:10 247:16 248:4 249:6,7 259:15 265:4
realtime 201:5
reapportionm... 169:6
reason 17:6 49:13 53:23 86:11 109:7 114:19 136:18 139:13 159:3 159:14 162:10 177:5 179:6 197:1 210:14 214:6 215:8 219:7,10 223:17 232:12 263:20 267:14 267:16,18,20 267:22,24 268:1,3,5,7,9 268:11,13,15
reasonable 182:11 234:4 247:25
reasoning 34:19 109:19 132:4 134:20 206:1 254:20
reasons 80:19 86:21 90:13 158:6 194:12 218:25 267:5

reassigned 117:13
reassigning 115:16
rebuttal 2:4 12:13 19:1 25:24 26:2,12 108:9 150:8 156:4 185:1,8 185:11 207:12 245:23
recall 13:3,5 14:21,25 24:15 45:7 86:17 190:4 219:1
recap 258:21
received 17:1
recent 37:15 86:1 244:9,15 258:3
recently 15:19 50:21 51:6 240:2 241:17 257:9 263:10
recess 27:23 68:4 77:17 144:20 207:8 265:1
recognize 172:6
recollection 118:11
reconfiguration 53:23 142:20 188:23
reconfigured 134:21 153:14
reconfiguring 132:11 133:12
reconsider 218:12
record 5:3,12 6:10 10:16 27:22,24 32:3 67:24 68:2,5 68:23,25 77:14 77:16,18 93:20 144:17,19,22 145:3 180:14 189:1,19 199:8 205:7 207:5,7 207:9 208:1 264:22,25 265:2 266:1,6 266:6 270:9
recorded 5:10 5:14
recording 5:6 5:11
records 43:11 180:16
recovering 242:3
red 62:23 63:14
redistricting 2:10 12:20 15:7,10 18:25 20:8,13 22:2 33:5 36:12,14 43:19 46:2,7 49:19 55:10 56:11 63:24 65:14 79:18 87:20 99:12 100:15,17 101:8,9 105:25 108:16,25 109:24 116:3,9 116:10 121:2 124:21 146:23 147:24 168:2 206:17 208:6 208:19 224:11 241:15,16,19 241:23 242:4 243:9,14,16,20 244:11 245:11 245:12,17,21 248:15 249:15 250:8,18 252:11,19,20 253:17 257:8 260:7,10
redraw 52:9 118:4 136:12
redrawn 188:16
reduce 114:5 128:17 150:17 162:20 195:3
reduced 55:5 78:16 270:7
reduces 51:11 51:24 52:3 238:12
reduction 51:14 202:1
redux 246:14
reelect 53:21
reelection 180:16
refer 23:2 99:11 147:1 176:18,21
reference 25:23 28:17,18 37:11 40:1,15,17 42:24 43:8 45:8 51:8 52:16 53:15,16 53:17 55:7 78:1,9 80:5 83:21 94:9 97:4 100:14 101:1 109:4 111:22 114:10 115:7 121:20 136:2 148:9 149:9 175:9 178:25 194:19 196:20 198:23 202:11 212:4 212:14 234:7 242:9 251:23 260:8
referenced 21:24 48:5 88:23 102:25 108:1 199:6,10 219:9

references 179:11 188:2
referencing 37:14 42:16 43:5 78:15 79:9 213:11
referral 269:13
referred 111:13 202:21 239:9
referring 11:22 39:13 47:17 74:17,18 78:3 79:10 80:21 83:12 93:6 100:25 115:12 117:12,14 134:3 148:5 165:17 173:6 178:2 187:6 193:8 201:24 234:8
refers 23:15 24:1 51:18 59:16 74:13 110:10,14 115:13 150:1 202:2 264:8
reflect 109:23 138:12 233:17
reflected 26:14 44:5,15 147:4 147:8
reflective 6:22
reflects 135:16 181:22
refrain 36:10
regard 146:16 211:8
regarded 194:10
regarding 231:19
region 45:11,14 64:10,24 65:2 73:18,23 121:15 125:5 127:17 130:9 133:4 139:4,4 140:3,5 141:12 156:14 163:12 164:7 223:24 224:6
regional 45:24 45:25 72:19 86:9 135:10 213:20
regionalized 71:19
regionally 47:2
regions 60:21 64:13 72:13,14 73:3,7 74:22 74:23 75:3,4 126:1 132:25 133:1,21 161:20 164:6 206:16 213:22
registration 254:23
regression 96:1
regular 15:16
regulations 269:4
reiterate 163:21
relabeled 187:3
relabeling 187:13
relate 37:24 145:23 244:18
related 6:3 7:18 28:5 91:20 145:22 241:6 243:14,23 245:10,15
relates 243:17
relation 25:7 118:18
relationship 26:24 102:5 118:17
relationships 209:16
relative 119:17 184:11 236:10 237:9 270:17
relatively 241:17
relay 94:20
release 46:3,8 116:4 146:16
released 178:10 225:7 248:22
relevance 230:9
relevant 17:10 88:7 108:4,16 109:9,21 183:14
reliably 209:8
relied 16:12 90:2 176:23
relieving 151:24 152:3 152:14
rely 80:20
relying 81:1 83:11 176:10 176:19
remain 145:14
remaining 64:19
remains 120:4
remarkable 39:18 210:23
remarkably 168:1
remediable 76:1,4 123:15
remedial 123:6
remediate 73:14
remedied 78:13
remedy 139:20
remember 17:2 89:21 115:25 117:6 149:6

remind 92:18
reminder 81:15
remote 1:20
remotely 5:22 6:9
removed 52:17 52:25 243:2
removing 52:20 53:6
renumbered 118:3
renumbering 117:18 118:7
reock 66:5 103:2 104:17 104:19,21 105:7 214:3,13
repeat 39:5 51:20 55:24 71:7 139:16
repeatedly 166:7
repeating 54:14 64:8
repetitiveness 54:15
rephrase 9:12 97:17 128:2
replaced 52:18
replacing 52:21
replication 217:8
report 2:3,4 10:14 12:12,13 16:1,1,3 17:5,7 17:16,18 18:16 18:18 19:2 20:16,20 23:11 23:20 24:1,8 24:16,22,23,24 25:17,24,25 26:2,12,17 27:10 28:3,17 29:16 32:24 33:19 43:24 44:2,8 49:17 49:19 50:25 57:4 58:6,9,10 59:13 62:9 66:15 68:13 77:5,21 79:12 82:12 92:1 99:3,4 108:9 109:10 111:23 117:7 118:10 119:11,24 124:15 131:18 133:4,11 144:5 145:5 150:7,9 156:4 160:25 164:11,12 166:15,25 167:6 172:14 181:13,25 183:8 185:1,4 185:8,9,11,14 186:18 191:4 192:1,5,9 198:7 199:17 205:10 206:21 206:23 207:1 207:13,15,17 207:18 208:16 213:1 218:15 218:22 219:2 220:15,18 240:11,12,14 240:21 244:17 245:5 261:12 261:16
reported 1:24 119:12 185:25
reporter 5:25 8:1 27:17 169:10 199:18 265:16 269:6 269:12 270:23
reporter's 8:18
reporters 270:15
reporting 119:14 269:4,8 269:11,12
reports 9:15 12:13,15 16:5 17:24 18:12 25:20 26:7,15 69:14 245:23 261:20
represent 7:17 49:7 169:2,4 253:1
representation 39:10 43:15 49:8
representatio... 173:17
representative 43:22 93:12 180:4
represented 40:8
representing 5:23 6:17 7:3,6 7:8,14,22 136:5 180:12 242:18 264:17
represents 175:5 221:17
republican 40:4,13 51:6 53:9 90:8,10 90:14 94:11,14 157:17 179:15 195:14,14 258:20 260:5
republicans 39:2,7 195:13 259:13,16,24
request 9:21
requests 188:15
require 76:13 91:14 161:15
required 125:2 158:12 160:21 161:2
requirement 80:3 114:20 125:15

requirements 79:23,25
requires 46:9 81:19
research 24:25 25:6,11,14 251:14
reserved 1:16 240:18
reside 10:19
residence 117:11
resident 24:1
residential 45:18 240:10
residentially 162:17
residents 110:19 117:13 162:19 177:12 187:9
resist 104:4,15
resists 130:25
resources 180:17
respect 43:6 70:5 73:1 79:16 146:22 174:23 188:9 250:5
respected 146:21
respectful 82:23 135:5 221:7
respecting 147:2,7 154:12 226:16
respond 26:21
responding 26:16 207:16
response 22:16 207:23
responsibilities 19:13
responsible 88:11 219:13 220:18
responsive 127:24
rest 49:17 60:22 61:4 133:11 223:25 260:17 265:7
restricted 138:10
restricting 22:19 264:7
result 188:15
results 89:16
retain 12:25 136:16
retained 12:24 13:4,5
retaining 40:16
retention 114:10 115:9 115:11,13 117:3,19 118:13 119:1,1 119:19 164:25 165:4,23 166:21 168:12 168:16 172:4
returns 203:6 244:9
reused 76:9
reveal 12:3
reversals 189:13
review 12:8 50:5 108:9 156:1 166:14 169:19 189:20 218:12
reviewed 28:13 82:21 83:15 100:18,20 101:5 105:19 122:25 200:21 218:17
reviewing 69:6 69:8 120:1
richmond 132:1 201:14
right 8:8 10:11 11:3,10,24 14:7,16,17 15:23 16:16,21 20:15,24,25 21:3,19 23:5,6 25:21 26:18,19 27:12 28:1,5 28:10,14,19 29:11 30:1,24 31:12 34:22 35:7,18,21 36:5 37:2,7,15 39:4,8,11 40:4 42:6,20,21 44:6 46:8 48:11,12 49:23 49:24 50:1,6 50:20 51:15 52:4,14,20 53:24 54:7,22 56:10 57:12,14 57:23,24 58:4 58:13,21 59:11 59:18,19 60:10 60:17 61:11,12 62:12,18 63:15 67:17 69:9 71:25 72:16,17 72:24 73:19,25 74:5,7,14,15,20 74:25 75:1,10 75:11,16,22 76:4,21,22 77:8,10,20 79:7,8,12 83:24 84:6 85:3,6 86:23 87:10 89:20 91:4,9,22 92:19 93:8,24 95:1 96:24 97:2,3,6,7,9,10 98:10 99:2,7 99:17 100:12

101:16,17,22
102:22,23
103:14,19
104:19,20,22
105:18 106:4,5
107:8,14,20,21
109:7 110:12
110:16,17
111:16,17,25
112:1,11,12,23
112:24 113:12
113:14,20
114:1,2,7,15
115:3 116:22
117:15,16
118:4,11 119:6
119:15 120:5,6
120:10,25
121:15,22,25
122:6,22
123:24 124:2,3
124:6,9,10
129:13 130:5
130:12 131:14
131:22 132:6,7
133:19 134:9
134:10 135:7
136:8,25 137:1
137:8 139:7,23
140:9,12,13,20
140:21 141:3,9
141:12,17
142:6,7,18,23
142:24 144:1,2
144:24 145:1,8
145:9,17
148:16 149:8
149:11 150:25
153:20,21
154:12 156:1,2
156:14,15,16
157:4,5,5
158:10,20,21
159:6 160:22
160:25 162:6
162:13 163:5,6
163:13,19,20
164:7,18
165:13 166:1
167:8 168:2,8
169:15 170:20
170:25 171:1,5
171:8,12,15,19
172:1,2,19
173:10 174:13
176:8,23,24
177:4 178:4,20
179:23 181:16
182:23 183:8
183:20 184:1
185:11 186:21
186:22 187:8
187:20,21
188:9,16,23
190:22,24
191:9 192:6,7
192:21,24
193:11 194:7
196:20 197:5
197:24 198:19
199:2,19
200:18,19
201:19,20
202:2,13,17,18
203:4,5,21,22
204:7,8,23
205:22 207:11
207:20,21
209:13 210:10
211:6,17 212:2
212:8,9,19,24
212:25 213:16
213:23,24
214:4,5 215:14
215:15,22,23
216:4 217:2
218:5 222:6
225:25 226:1
226:10 228:4,7
228:25 229:9
230:1,2,7,9
231:10,15
232:11 234:23
235:9 236:16
238:7,19 239:4
241:8,24
242:13,22,23
243:2 244:7,14
244:23 247:25
250:10,19
251:8,24,25
252:6 254:11
254:13 256:15
256:16,21,22
257:10,19,20
257:24 259:17
259:18 262:15
263:14 264:9
264:10,20
265:21 266:4
rightly 141:24
rights 4:5 7:2
29:1 83:8,8,13
123:8 211:12
213:11,14,15
251:24 258:3
264:15,19
rigorous
208:18 236:1
ripple 60:19
robinson 88:24
89:14
robinson's 89:8
robust 220:3,3
robustness
219:16
rodden 257:19
257:20,22
rodden's
262:22
role 13:11,15
13:18 25:6
36:1,10 81:8
82:2,5 87:25
123:13 151:8
151:15 161:9
226:13 260:13
260:16,21
roles 25:13

room 8:20 11:4 11:6 100:6
roots 180:11
rope 154:14
rosenberg 4:5 6:25 7:1 13:2
rosenberg's 15:11
roswell 163:17
rotors 149:15
roughly 13:6 88:25 232:15 248:21
row 237:17
rpr 1:24 270:23
rucho 255:10 255:15
rule 53:22,25 54:2 174:9,12 182:22 192:25 267:2
ruled 56:14
rules 8:15 110:4 187:14 267:2 269:4
run 9:13 136:13 160:16 214:19 219:6 221:20 222:16 222:22 223:8 223:14 224:4,5 236:14,15,17
running 68:12 68:16 69:6 160:6 213:25 242:15
runoff 85:6 86:14,21 87:1 87:3
runoffs 87:2
runs 19:4 63:14 135:21 155:15 157:23 192:8 217:6 219:21 221:5,10,22 233:19 234:2
rural 52:23 58:21,25 121:21 122:20 135:22 174:23 175:21,24 176:3,10,14,17

s

s 3:1 207:15 267:1
sacrificing 65:19
safe 59:24 60:2
sake 8:18
salient 206:17
sample 157:10
samples 140:6
satisfied 247:17
satisfy 47:12 248:2
save 112:1
saved 247:5
saw 85:20 100:9 125:5 126:13 128:11 152:6 159:17 198:24 205:24 213:3 233:4
saying 35:23 40:18 50:8 51:14 52:2 54:10 73:17 74:4 81:3,4 83:7 98:8 103:6,14 105:8 120:19 132:8 138:21 141:5,6 150:23 151:11 151:12 160:20 165:11 168:4 172:2 175:19 176:11 178:4 182:19 184:10 184:11 185:16 187:12 189:4 193:20,25 198:16,17 200:16,17 201:16,17 203:23 204:6 209:4 213:17 228:12,21 234:18,20 238:4,5,15,17 239:1,3,11,11 240:3 254:15
says 78:20 79:3 94:10,23 134:2 139:17 150:2 162:15 173:12 210:2 222:13 235:2 246:13 253:11 256:8
scanning 92:17
scatter 223:18 227:8
scg 1:7
scholarly 13:15 32:4 83:15
scholarship 257:4
school 89:17
scientific 208:21 209:5
scientifically 208:17
scientist 219:14
scientists 197:12
scj 1:11 5:18
score 66:2,4,18 66:22 102:20 103:13 104:19 106:4 154:25 156:6,9 214:3 214:10
scored 65:23
scores 62:1,8 62:12,17,19 69:14,15 90:22 102:15 103:2 103:10 104:10 105:2,15 106:2 120:21 131:14 131:16,20

154:22 155:10 214:1,14,21,22 215:22
scott 5:23 144:23 265:24
scrambling 155:17
screen 5:10 168:24 169:3 169:11
script 136:14
scripts 17:14
sd 60:7,15 64:23 73:16,24 94:4 121:14 127:10,17,20 129:4 131:10 153:19 156:11 158:25 159:22
sdg 1:7,11 5:18
se 75:25 83:1,3
sea 160:5
seal 270:16
search 205:19
searching 205:16
seat 244:18
seat's 60:2
seating 95:22
seats 39:14 59:18,24 245:2 259:14
second 18:16 25:24 40:19 91:23 99:7 120:13 134:15 169:16,20 175:21 191:3 214:13 216:8 225:19 230:3 236:9 237:3 263:16 264:23
section 14:11 28:3,17,18 44:7,12 47:11 50:1 57:11 62:9 74:8,10 76:16 77:5,6,8 77:21 79:11 80:18 82:13,20 90:21 93:13 94:10 99:2,4 99:10,21 111:23 114:14 117:6,7 119:2 119:11,24 120:2,24 133:4 142:12 143:24 143:24 144:8 144:10,14 145:2,3,5,10,16 145:17,22 147:2 151:20 154:9 158:3 161:4,7 164:10 164:12,14,16 164:21,23,25 165:8,10,20 166:18 167:6,9 167:10,13,17 167:21,22,22 177:15 178:16 179:13 181:25 190:25 191:4 198:23 199:21 203:23 205:9 205:23,23,24 206:3,6,14 207:23 209:19 216:10,15 217:19 218:20 237:22 252:16 252:19 258:11 258:11,15 260:6
section's 77:10
sections 31:8 148:4 243:9
see 8:11 10:10 13:11 20:1 26:6 28:2 33:15 38:18 41:2,11,17,23 45:11 50:25 52:18 61:16 65:25 66:14 67:3 73:14 75:18 76:18 84:9 87:2 89:8 89:15 91:21 92:5,10,25 93:19,24 94:2 98:11 108:6 118:12 120:16 122:12 125:10 125:15 126:24 133:1,11 136:3 139:9 142:1,9 147:10 152:18 152:20 153:2 153:10 162:14 162:22 167:10 167:14,18 168:13 171:9 175:2,10,13,22 176:2,5 180:5 183:5,20,23 184:5,8,14,18 184:22 188:9 188:13 189:12 191:11,17 193:4 194:13 196:23 197:13 197:17 198:14 199:7 200:1,2 200:8,25 204:2 205:3 212:13 221:15,16,21 223:17,25 224:3,21,23 225:10 226:11 228:25 229:8,9 229:14 230:14 230:24 232:1 232:17,23 233:18 235:8 244:8 248:18 252:5 255:9,12 263:18

seeing 126:23 152:9 169:23 175:8 189:16 215:17 221:18 224:18 231:1 232:13 233:3 233:25 265:8
seeking 219:25 229:3 230:11 233:3
seem 43:24 241:6
seemed 73:9
seems 58:17 59:7 65:13,14 134:13 156:15 170:21 190:24 245:9
seen 5:9 30:19 36:14,19 38:24 38:25 65:11 80:13,15,15 100:2 101:6 115:18 225:9 259:23
segment 177:17
segregated 125:6
segregation 243:22
select 73:3,7 214:19 222:17 222:18 252:20
selected 60:21 72:9,15 74:22 75:3,4 86:16 88:19 133:1,13 144:6 210:15 210:17 219:7 220:11 252:15 262:24
selecting 85:8 85:19 127:21
selection 83:18 166:2 220:6,8
selective 255:6
self 42:16
semester 246:14
senate 18:20 21:1 28:8 31:17 33:20 34:20 35:6,17 44:3 59:14 60:14,24 62:22 68:19 71:13 74:24 75:4,9 76:19,23 82:4 82:16 92:2,2,7 92:8,8 94:3 97:5,5,12 98:12 101:18 105:17 107:10 112:6 113:22 117:14,21,25 119:4 120:12 121:4 125:25 131:11 133:16 156:22 160:20 165:12 178:24 179:10,10,10 182:21 189:3 202:4,16 210:9 210:25 212:22 212:24 213:11 213:13 220:25 223:3,8 231:18 231:25 232:3 234:8,15,16 236:21 251:10 260:14 263:7
senates 201:8
senator 42:16 86:13,13 180:4 180:4
send 15:5
sending 15:12
sense 19:8,12 64:12 73:6 89:6 99:1 102:11 117:9 117:10,18 134:12 155:16 177:2 187:24 218:19 237:8
sentence 33:2 55:8 61:25 62:6 79:3 91:16,23 94:23 149:17 150:1 173:11 177:15 187:9 202:23 235:1 238:22 254:10
separate 27:1
separates 59:9
september 207:17
sequence 201:10 223:15 223:20 235:19 237:4
sequential 72:1
series 260:8
seriously 146:24 205:1
served 13:9,25 14:10
service 150:16 219:8 249:8 250:3 255:6
services 269:8 269:11
session 10:5 141:25
sessions 11:21
set 72:10 80:16 87:4 127:11 161:5 216:18 228:11 249:17 262:17
setting 221:2 222:17,23 226:13,23 256:10,19
settled 263:9
setup 114:10
seven 100:19 132:11 198:25

199:18,22
several 32:13 45:15 83:21 101:13 122:17 137:12 167:10 185:20 258:19 260:19
sewill 199:24
shade 152:21 160:4
shaded 44:19
shading 152:10
shape 147:14 209:17
shaped 103:1 190:7
shapes 175:13 189:20 190:2 194:23 209:12
share 20:17 26:5 39:7 53:1 87:8,15,17 152:10,21 153:14 168:24 168:24 169:3 227:17,18,22 228:1,6 241:4 252:15
shared 43:1,3 43:15,20 44:2 44:14 106:23 163:23 227:10
sheet 267:7
shelby 258:6
shift 177:16 179:14 180:25
shifted 232:1 232:10,22 235:12
shifting 48:25 145:17 179:14 179:15
shifts 179:25 180:1 187:2 188:7 191:1
short 189:8 245:24
shorter 100:2 164:10
shortest 101:6
shorthand 270:23
shortly 21:6 161:8
show 31:22 49:16 57:15 73:10 117:2 122:16 123:11 123:14,15 154:9 155:15 175:7,25 193:5 214:20 231:18 231:22 239:25 249:25,25 260:24
showcase 78:11
showed 49:13 183:19
showing 87:14 148:18 149:13 158:12 170:2,5 191:1 200:12 226:13 228:9 252:2
shown 23:16 29:24 127:2 217:25 226:19 232:7
shows 44:23,25 49:20 78:12 127:4 140:11 145:5 146:13 158:3 161:13 164:19 170:17 175:11,24 176:7 178:13 182:8 220:24 221:4,19 234:18
shutdown 246:12
sic 44:10 113:12
side 62:24 77:2 130:8 134:14 194:14
sides 59:25
sign 59:21,24
signature 1:16 234:7 269:16 270:16,21
signed 15:18
significance 236:1
significant 74:6 103:24 104:6 105:1,4 200:13 201:11 202:12 202:17,20 239:23
significantly 42:19 137:2 138:18 153:14
similar 63:12 71:8 74:1 75:2 75:6 76:18 86:18 120:24 120:25 201:9,9 209:20 219:4 227:9 239:19
similarly 21:20 114:3 135:19
simple 37:13 53:2 248:7
simplest 210:20
simplist 208:3
simply 30:11 37:1 110:18 230:11
simultaneously 69:6,7 146:20 248:9
sincerely 198:1
single 49:9 63:5 76:24 110:23 158:17 187:10 208:16 221:9

247:21
singling 44:4
sir 63:6
sit 86:15
sitting 68:24 153:24 190:4 251:14
situation 160:19
six 56:22 157:13
sixth 227:21
size 125:25 168:2,3 169:15 170:19,24 171:25 187:11 241:6 257:2
skim 205:19
skipping 41:13
slate 64:9
slightly 32:13 32:14 103:3,12 160:3 198:12 222:21
slip 142:1
slipping 247:7
slow 58:7
slowly 241:5
small 49:9 172:5
smaller 89:13
sneeze 230:3
social 2:7 243:18 245:11 245:16 246:5 246:10,16,22 246:25 247:9 248:8
softer 80:24
software 19:15 19:25 58:7 67:2,7 116:14 240:1 242:16 249:18,21
sole 53:23
solely 226:8
solution 255:17
solutions 5:24 6:1 269:7,7,9 269:11,13 270:15
someone's 67:3
something's 178:4
somewhat 58:3 86:8 183:4 235:6,13 243:21
soon 265:8
sorry 7:20 27:14,16 39:5 58:5 61:15 63:8 68:14 74:17 78:22 84:13,14 90:24 93:25 100:9 104:3,22 109:6 110:9 111:3,4 111:5 112:14 113:13,15 127:14,23 129:21 131:2 133:3 137:9 140:23 142:5 147:22,23 157:7 169:18 171:17 172:8 172:13 177:2 177:21 182:2 183:21 184:2 192:17 205:23 215:20 216:7 217:10,11 223:11,12 230:2 235:22 246:9 257:14 257:22
sort 11:7 16:24 69:19 75:14 84:11 96:1 100:6 102:12 122:12 131:12 137:16 153:3 160:5 161:10 163:7,21 166:15 180:9 195:8 206:12 226:12 228:17 232:20 236:1 259:9
sorted 195:9,11 218:14 227:14 227:16
sorting 195:6 198:4 203:2 220:12
sought 231:4
sound 140:20
sounds 39:11 91:22 103:15 150:21 171:12 246:13 247:25
source 115:1,4 242:16
south 49:22,22 58:19 61:18 119:5 121:21 122:5,9,21 133:24,24 134:17 135:12 136:19 137:2 158:7 176:12 179:3 263:2,3 263:22
southeast 133:3 141:18 158:25 164:7
southern 4:9 7:9,11 45:15 122:20 129:23
southernmost 121:19
southwest 40:20 61:19 133:3 139:4,8 139:22 140:2 152:25 156:22 164:4
space 253:17 263:2

spaced 236:13 236:17
spalding 135:23
span 69:1 242:6
spatial 19:20
speak 80:12 185:17
speaking 24:5 197:15 258:9
speaks 185:14
special 203:14 245:4
specific 35:15 47:2 103:7 110:3 113:10 161:1 178:18 188:22 216:3 256:10,18
specifically 33:1,18 63:23 65:3 149:8 165:11 167:5 189:25
specified 22:21 22:21 152:11 202:23
specify 22:7 23:7 256:24
specifying 100:4
spent 110:4
sphere 83:9,13
spirit 184:3
splcenter.org 4:10
splint 216:11
split 69:19 70:23,23 71:2 71:3 106:7,15 106:18 107:6 107:14 108:20 129:11,16 130:11 132:2 139:22 141:11 142:15 159:11 167:13 185:17 186:8,9,11,23 191:15 194:11 194:17 195:1,3 195:7,7 196:5 197:22,23 198:22,25 199:8 200:23 201:2,23 202:5 202:7,12,16 203:19 216:25 262:11
splits 65:21 69:17,23,24 70:2 106:8,11 106:12,14 107:2,5,13,19 107:23,24 109:13 137:7 159:8 166:9 185:19,21,23 186:17,19 191:22,25 192:1,2 196:15 198:9 199:9,12 199:19 201:6 201:10,12,18 201:19 202:1,5 203:2,14,24 204:7 216:14 217:16 218:13 218:23
splitting 120:21 138:25 165:5 165:24 166:22 185:25 190:11 190:23 191:5 191:19,20 192:8 194:10 194:20 203:8
spoken 16:18
spot 133:24
spread 32:12
square 176:1
staff 35:3
stage 65:4,7 123:7 225:21
stand 102:12 109:6,11 114:13
standard 47:12 47:15,22 126:6 133:9 139:2 142:22 143:1,7 257:2
standards 143:21
stands 48:23
stark 213:4
start 18:18 20:17 27:8 31:8 50:8 64:2 64:3,5,9,10,16 83:7 107:4 119:13 120:1 167:25 176:5 236:8
started 13:6 24:14,15 242:1 242:11,14,16
starting 103:17 153:19
startling 187:2
starts 135:21 157:23
state 1:4,7,10 5:16,17 6:6,9 6:18,20,23 10:16,19,20 19:9 21:13 28:8,8 31:17 31:17 33:20,20 34:20,20 40:17 43:13 44:24 45:9,16 49:3 49:24 50:24,25 59:2 60:20 61:4,7,19 62:22,24 64:15 64:17 70:24 72:11 74:7,8 75:13,19 76:24

80:11 81:3,6 82:4 88:7 95:23 97:5 100:3,15 112:6 117:14 118:23 118:24 126:7 126:19 127:8 130:16,19,23 131:7 132:20 133:13,22 146:11 147:12 148:15 149:18 150:20 152:7 154:8 161:16 161:17,22 162:17 178:24 181:19 186:11 186:13,24 187:11 197:10 201:8 202:12 202:24 203:19 206:7 211:11 215:5 227:23 230:16 231:1 232:15 233:20 233:21 235:3 239:17 240:5,7 248:24 249:2 251:10 256:10 256:18 259:2 259:17 261:9 261:16,20,22 262:11,13 263:3 269:2 270:2
state's 88:13 100:1 109:22 115:7 120:22 150:9,12 212:21 220:19 238:24 239:3
stated 28:12 270:6
statement 25:18 26:8 50:23 95:4 182:20 210:22 253:10,16,21 256:6 267:5
statements 104:5
states 1:1 14:6 14:8 38:23 45:15 70:17 80:14 88:14 94:17 100:17 100:20,21,24 101:3 108:3 118:19,23,24 119:18 132:17 206:8 248:23 249:20 250:2 260:9 261:11
statewide 21:9 21:12,22 37:1 37:13,15 38:10 39:2,4,7,14,18 39:22 49:15 51:3 53:8 61:7 64:9 81:23 85:9 87:25 88:3,25 89:9 148:15 251:7 259:25 260:10
statistical 86:5 93:16 96:2 236:1 244:23
statistics 119:14 193:12 208:11 229:21
stats 126:24 199:9
status 17:21 108:6 146:5 247:18 248:3
stay 263:12
stayed 156:24
stays 142:13 223:25
steiner 4:13 7:23
step 191:2 214:16 216:7 219:21 227:3
steps 213:21 215:14 216:4 216:20,25 223:23 225:4 225:24 236:16
stop 103:7 165:15 189:7
story 162:13
strategy 32:10 198:15,17,18
streak 98:13
stretch 157:19
strickland 47:19
strike 124:22
striking 203:14 203:15 211:9 211:13
string 260:5
stringent 143:16
strong 53:25 64:12 152:24 160:16 198:4 203:25 204:5 206:9
stronger 36:18 36:19 143:19
strongest 143:8 186:22
struck 9:1 203:17
student 209:1
studied 38:22
studies 241:12
study 41:1 70:21 94:21 119:10 220:22 242:14 243:18 250:5 252:10
studying 247:12 248:5
stuff 13:24
sub 118:24

subject 48:22 211:11
submerging 177:17
submissions 43:12 250:4
submit 249:21
submitted 20:20 25:20
subsample 214:19
subscribed 268:20
subsection 167:14 187:22
subsequent 99:8 224:23
substance 12:3 67:11 267:4
substantial 15:3 24:19 25:4 51:1 126:21
substantially 126:20 261:5
substantive 67:22
substantively 11:17
subtle 160:2
subtract 110:20,24
subtraction 192:23
suburban 52:22 172:19
succeed 221:5
success 37:14 37:16 57:22 84:4 96:7,18 233:9
successful 234:5
successfully 75:18 163:1
succinct 210:20
sufficient 90:9 217:5
suggest 53:13 151:17 231:7
suggested 210:17 220:22
suggesting 131:6 158:11
suggestive 151:3,4,5,17 180:22,23,25 186:15 194:1 198:5 234:23 239:6
suggests 48:24 233:4
summarize 138:20 206:20 234:10
summary 33:16 33:17 36:23 205:12 212:12 238:9
summer 242:15
superintendent 89:17 90:1
superior 62:3
supervision 25:1
supplemental 207:13 240:13 267:6
supplementing 207:17
supply 28:21
support 25:12 25:15 41:6 51:6,7 148:10 148:23 149:2,9 149:10 151:13 206:13,13 231:15 234:21 248:21,25 249:2 250:7,12 250:14
supported 85:17,17 167:10
supporting 51:2 149:11
supports 151:10,13 167:13 174:6 183:10,12
suppose 109:1 117:16 156:3 244:19
supposed 213:15 236:5 262:18
suppressed 32:13,14
supreme 255:16 261:17 263:11
sure 14:3 21:6 22:3 25:11 27:19 43:5 44:17 45:15 46:4 54:6 65:3 65:8,10 68:1 69:2 79:2 80:2 97:19 100:10 105:3 106:14 114:17 115:25 121:23 132:19 135:13 145:4 152:5 155:7 159:25,25 161:8 165:14 169:23 170:7 171:10 180:7 180:14 181:20 182:18 185:1 190:3 193:16 194:3 195:17 204:15 208:3 211:20 215:5 217:13 219:16 225:22 234:11 235:21 252:24 253:8 254:2,4

255:8 258:23 259:20 261:13 263:17,19
surely 255:13
surprise 251:2
surprised 230:7
surprising 125:15
surrounding 32:20
survey 46:3 254:24
suspect 114:12
suspected 218:22
swap 53:3
swapped 117:2
swaps 172:17 173:3,23 174:4
swatch 45:16
swath 45:9
swear 8:1
swingy 187:16
sworn 8:5 268:20
syllabus 246:4 246:10
symmetry 245:1
sympathize 53:7,9
synonymous 62:20
system 80:10 247:15 248:9
systematic 208:21
systems 243:18 246:21,25 247:17

t

t 3:1 99:7 267:1 267:1 270:1,1
table 37:8 48:9 57:19 84:24 89:7 92:2,21 95:14 101:13 104:25 107:7 110:7 112:22 137:4,5 139:21 141:10 153:23 188:4 189:4 192:1,8 193:5 194:20 200:11 209:25 211:15 212:9 221:2 222:24 226:12 226:22
tables 48:6 101:14 123:25 142:16 167:11
tablet 209:25
tails 223:18 224:3
take 5:11 9:13 9:19,20,22,24 10:9 13:15 20:3 26:10 46:10 60:14 65:20 70:8 74:10 89:23 99:22 103:10 116:5,6 146:24 155:11 168:6 189:23 190:1 200:4 203:8 211:7 216:7 225:14 249:23 252:23,25 265:18
taken 5:14 61:2 84:17 99:20 173:18 174:6 263:12 270:6
takes 111:12 214:12 225:17 227:6 256:7
talk 8:19 11:13 21:6 38:17 41:14,24,25 46:15 47:10 61:24 67:6 84:25 156:3 161:6 207:22 207:23 218:8 247:2 248:15
talked 11:14,15 48:8 50:10 53:5 59:15 63:17 71:16 75:7 93:6 111:23 129:8 132:25 140:1 141:4 165:10 185:20,21 186:18 189:3 191:20 245:22
talking 11:10 17:25 24:5 26:1 44:12 51:16 55:8,15 68:8 72:14 81:16 97:20 98:3 99:21 102:25 103:15 114:14 163:23 175:14 186:13 193:4 208:7 210:4 222:23 250:1 254:14 254:15
talks 151:21
targeted 40:10
targeting 52:16 53:15
tasks 143:12
taught 8:17 245:13 246:15 246:16
taylor 4:17
taylorenglish... 4:18
tdp 154:12 166:8
tdps 154:18 155:19 158:14 159:9,10 166:7 182:3,14,18

221:12 226:21
teaching 245:7 246:1 252:13
teasing 54:6
technical 137:10,17,20 143:10 160:18 203:16 248:5
technically 160:7,9 262:4
techniques 225:8
technology 1:20 5:22
tell 16:12 63:4 70:12 86:15 98:2 160:2 165:19 169:22 201:4 222:11
tells 168:15 173:19
temperature 222:17
ten 126:25 127:1 235:17 236:12,13,16 236:24
tend 24:10 50:19 125:10 162:21 220:11
tendencies 221:19
tendency 98:11 233:7
tends 95:10
tennessee 251:2
tens 217:25 256:20
tenured 242:21
term 14:3 22:17 23:8,10 23:13,19 31:10 102:8 126:12 137:10,17 148:24 150:20 187:17,23 224:12 243:5
terminology 22:1
terms 11:18 14:14 15:25 17:23 20:7 22:2 23:15 26:24 31:1 34:4,25 43:1,3 43:15 44:10 46:13 51:4 62:7 66:10 71:9 87:6 95:14 115:18 115:19,21 131:2,10 133:15 142:19 147:2 148:25 155:19 163:11 164:10 165:9 165:17 167:16 174:10,22 176:9 196:15 203:1 204:11 209:21 210:6 213:2 215:25 218:9 222:9 225:5 226:5 227:22 229:13 237:8 243:1 254:16
territory 45:16 89:3 106:20,25
terse 100:14 101:1
test 175:18 236:1
testified 8:6 261:20
testifying 14:19 14:19
testimony 33:4 43:12 68:23 70:13,25 71:5 108:15,21 118:6 122:24 122:25 132:21 132:22 177:6 203:11 204:19 205:1,21 206:9 206:12,15 207:2 215:4 218:8,18 249:23,24 261:12,17 267:4
texas 263:24 264:1,2
text 164:16
thank 7:4 17:22 21:14 41:22 58:12 61:23 77:4 78:24 81:14 92:22 95:12 98:25 107:3 111:6 137:18,18 144:23 173:14 177:20 237:21 247:3 248:11 250:15 258:25 266:2
thanks 10:8 57:12 193:19 265:9
theme 150:8 203:6 244:10
theorem 248:6
thereto 270:16
thicker 176:6
thing 28:2 61:15 62:13 70:25 108:14 173:22 175:11 177:4 180:5 185:15 210:2 231:22 237:5 239:1
things 21:25 54:3 65:21 66:15 77:24 84:20 88:22 103:3 108:13

122:17 139:10 141:16 143:13 148:6 164:20 173:18 198:1 205:13 219:14 222:18 230:22 230:25 231:19 232:16 244:25 251:22 252:9 259:4
think 12:22 13:15,19 15:13 16:9,14 20:9 24:4 25:1,11 26:19 27:5 31:20 33:12 34:3,23 35:13 35:22,24 36:4 36:8 38:13 40:9 42:21 44:9 45:6,25 48:18 51:20 52:6,10,19 53:10 54:1,13 54:15 55:18 57:8,10 58:15 59:23,25 61:14 61:16 67:6,10 67:22 69:10 70:11 75:25 76:19 78:19 80:9 81:6,14 82:25 86:17,20 86:25 87:12,25 88:2 94:8 97:1 98:22 101:5 102:8,11,16 103:25 104:6,7 109:18,20 114:24 115:19 121:24 123:2 123:13 124:21 126:21,24 128:22,22 129:19 131:15 135:1 139:25 141:4 142:18 145:2 147:17 147:18 150:1 151:9 152:12 153:8 159:1,17 160:6,15,16,25 165:10 167:9 167:21,23 169:22 176:25 177:10 178:21 180:5,24 181:12 182:6,7 182:11 183:9 183:14 184:3 184:24 185:7 185:22 186:1 186:25 189:11 191:18,18 192:7 194:10 196:7 199:20 200:6 202:18 205:18 206:5 207:3 208:21 209:2 212:17 213:7 215:7 217:21,24 219:1 223:15 233:2,11 234:3 234:23 235:13 239:15,20,24 240:20 242:4 243:3 246:15 250:24 252:13 255:18 256:24 257:20 258:14 259:4,12 261:20 262:14 263:16
thinking 137:19 161:14
third 86:24 87:9,11,21 88:3,15 131:5 131:7 237:3 259:13,25,25 260:1,2,3
thornton 89:19 90:4
thought 17:11 37:17,20 72:1 72:6 73:23,24 76:3 78:22 121:9 128:9 185:12 221:2 230:3 233:14 250:25
thoughtful 88:11
thousand 214:10 215:3 215:14,17 216:4,20 217:6 219:21 223:22 223:23 227:7 228:6,7 236:15
thousands 218:1 250:3 256:20
three 21:1,15 21:18 29:2 42:13 55:9 75:15 91:2 99:15 105:7,12 106:25 107:1,2 107:13 113:25 133:16,21 134:14 139:6 152:20 160:9 160:12 207:16 243:6 246:16 248:7 262:1 263:13,15 264:6
threshold 29:2 32:1,5,18 41:17 45:4 47:18,20 48:4 52:13 89:1 96:17 113:2 123:5 124:24 125:9,14,23 126:6,10

thresholds 42:18
ticket 85:17
tight 154:14
tightrope 161:10
time 6:6 8:9 9:19 10:3,4 13:11 24:16,20 25:2,4 44:8 67:15 69:1,4 74:10 91:13 93:10 103:11 108:8 109:24 110:5 116:3 122:17 123:1 143:23 150:6 160:24 214:12 219:11 220:17 222:20 224:1 236:19 248:8 257:16 258:18 264:14 265:5
times 9:10 45:17 54:14 107:5 157:20 180:15 183:1 196:8 215:3 237:2,17 246:16 258:3
timing 250:17 262:17
tip 175:15 176:4,8 177:5
title 134:2 146:8 165:20
titled 165:9 209:24 253:23 256:3
today 5:25 8:13 9:14 10:25 11:14,16,19 12:9 17:25 20:23 27:9 30:4,19 55:24 55:24 81:3,7 81:10 86:15 190:4 207:2 265:5
together 24:22 43:21 111:20 132:6,9,13 173:19 174:6 181:5 197:17 255:1
told 12:18
tolerate 218:23
took 24:21,21 39:12 45:6 172:10 190:5 204:18 257:16
tool 99:8 179:24 186:7 252:21 255:21 257:1,3
tools 241:20
top 168:12,12 168:12,17 172:4 212:13 243:13 253:23 253:25 256:3
topic 244:11
topics 25:19 243:22 244:3
total 37:6,9 39:15 101:20 133:20 169:7 170:2
totally 58:8 130:24 170:6 187:25 263:17 263:18
toto 147:18
touch 58:24 171:8,14,16,18
touches 63:14 171:16
touching 106:18
tour 199:21
towards 99:5 175:15 256:6
town 260:1
tp 189:17
track 93:19 253:14 254:8
tracking 197:17
tract 47:5,7
tracts 47:5
trade 66:7
trademark 187:23
tradeoff 126:16 128:9,12,12,21 138:24 140:7 141:14
tradeoffs 65:14 65:18 72:5,10 121:3,11 126:23 128:19 209:16
traditional 28:13 43:6 62:2,10,17 79:5,10 108:2 109:12 120:16 120:20 146:14 146:20,22 147:3,6,23 182:10 188:8 189:6,21 198:8 221:7
traditionally 118:3
training 10:5 20:10
transcript 108:10,12 119:7 147:11 219:12 220:21 270:9,13
transcriptions 33:3,13
transfers 172:10,17 173:17 180:19 183:18,19,24

183:25 184:6,7
transformation 173:16
transition 172:22,24 173:19 174:7 174:10
transitioned 242:5
transparent 240:20
treatment 134:15
trend 50:23
trends 48:7
trial 261:12
tricky 69:22
tried 16:6,10 17:8 68:25 70:25 73:20 107:25 124:20 167:22 179:19 181:17,17 183:12 206:14 219:13 227:13 235:11
tries 235:7
trouble 133:11
troup 58:20
true 30:5 40:11 58:17 72:23 101:24 126:14 142:6 197:10 233:11 267:10 270:9
trump 85:2 87:7,17,19 192:21 219:5 220:1,6 221:6 221:16,22 222:6,14,18,19 224:19 226:9 226:14,18 229:3 230:11 231:3 233:3,5 233:8 235:17
trumps 159:9
truthfully 10:25
truthing 93:15
try 10:12 12:1 22:7 28:2 34:11 56:15 65:12 88:10,10 103:7 104:4,13 117:7 124:25 129:18 140:22 141:1 151:7 159:7 180:10 180:15 181:4 184:3 186:6 191:25 196:20 198:19 201:20 219:15 251:11 251:13
trying 22:10 35:21 43:8 65:20 66:7 70:5 76:6 80:22 81:4 82:19 97:19,23 110:5 124:22 125:12,13 126:16 128:7,7 140:17 141:3 159:9 171:12 184:15 187:23 190:7 194:6 195:1,10,24 210:20 219:14 226:4 232:21 233:21 238:21 240:19 241:19 255:1
tufts 241:23 242:20 246:10 246:16 251:14
turn 27:7 154:10 193:10 239:21,24 243:7
turned 239:25
turning 17:9 28:12 121:14 137:4 153:22 198:22
turns 153:15
twice 237:3
twinkle 250:21
two 10:9 11:21 12:13 21:11 25:20 26:14 31:8 40:17 48:11 50:19 55:9 63:11 72:1,4 81:7 86:21,22,25 87:2 88:6 90:13 96:14 103:23,25 104:1,1,3 108:12,16 113:11,15 121:11 126:14 128:8,25 140:6 156:16 165:6 212:18 223:22 243:8 262:2,16 263:5
twofold 161:5
type 185:10 215:25 224:9 244:21,22 262:7
types 66:11
typewriting 270:8
typical 229:2
typically 19:18 43:18 47:5 51:18 59:25 208:5 239:16
typo 141:25 142:3
tyson 3:4 4:17 6:12,14 7:20 8:8,10 12:5 27:16 28:1 67:24 68:7 77:13,20 78:22

78:25 81:20 92:21 93:5 100:9,13 123:24 144:17 144:23 145:1 207:4,11 253:22 264:22 265:4 269:8

u

u 48:22 114:12
uh 130:6 169:25
ultimate 196:11
ultimately 19:10,13 82:1 82:12 88:8 108:21 151:18 178:15 214:1 260:25 261:8 262:21,24
unable 173:8
unchanged 60:22,24 61:6 61:18 76:18,19 133:5
uncompetitive 38:18,21 39:13 39:16,25 55:12 74:12 98:8
uncontested 74:17,18,19
under 4:5 7:2 24:25 38:6 41:16 52:13 93:2 96:22,24 96:24 120:14 124:12 136:17 146:9 160:24 163:4,9 169:13 184:2 187:13 192:7 262:19 264:18 269:9 270:8,14
underlying 253:12 254:6
underneath 134:2
underpopulat... 170:18
undersigned 267:9
understand 9:3 9:16 13:16 18:9 19:22 20:5 31:12 32:9 35:14 36:1 46:23 47:16 60:7 68:25 88:16 97:16,19,23 98:3 104:12 106:9 108:11 109:22 110:5 125:17 127:17 128:7 132:3,24 141:4,23 153:9 155:8 164:24 165:16 178:9 179:5 184:16 184:16 187:25 195:10,25 199:15 208:12 216:1 224:15 233:18,21 246:20 256:25 260:8
understanding 17:20 28:25 38:8 47:18,21 47:25 79:17 81:16 108:15 109:23 123:5 130:17,19 146:10 170:22 186:7 239:17 241:19 256:9 256:18 258:8 258:10
understood 9:5 15:21 39:1 46:4 83:8,9 102:15 122:15 188:25 204:17 240:21
undertake 150:3 209:5
undertaking 99:16
undesirable 203:11
undisputed 50:9,12
unduly 219:17
unexpected 247:2
unfamiliar 137:9
unfortunately 63:12 66:25 142:14 204:24
uniform 259:22
unintended 183:5 186:21
unintentional 128:14
unique 190:15
unit 5:13 48:23 49:4
united 1:1
units 44:19 46:11 47:5 48:21 49:1,3 152:7,8 165:25 166:23 190:23
unity 17:2,10
universe 22:23 229:3
universities 242:25
university 251:14
unlikeliness 235:25
unnecessarily 201:23
unpack 138:15 175:4

unsplit 69:20
unusual 226:25 230:10
unusually 100:14 101:1 118:16
upstream 220:4
upwards 39:8
urban 59:5 70:22 122:21 172:17 174:23 175:21 176:8,9 176:12,14,16 177:5,8,9,13 218:23
urbans 197:16
urge 255:16
uriel 256:1
usage 150:20
use 18:24 19:3 19:15 20:8,12 22:17 23:19 31:1 32:4 33:23,25 34:13 35:9 47:2,25 48:19 49:6 55:4 67:2,9 69:12 87:25 89:1 96:16,17 102:8 110:22 110:22,23 132:17 147:12 147:22 154:10 154:15 177:8 180:17 181:4 183:2,6 186:5 198:5 200:11 207:24 208:9 208:11 215:6 217:8 225:8 234:4 240:24 244:12,22 245:17 249:18 250:4 257:3 260:23 267:6
used 20:1,7,10 23:8,10 31:6 32:23 34:7,9 42:8 45:5 47:4 47:7 54:16,21 56:1,9 68:15 70:17 73:3 81:21 102:13 122:9 136:20 147:13,24 148:24 155:5,6 165:2 167:2 180:9 184:4,13 184:17,20 189:13,14 195:20 196:12 205:3,6,7 211:24 214:7 215:5 223:19 224:12 225:20 238:23 239:2 239:15 250:23 251:7 257:5,6 258:12 260:12
useful 17:15,18 86:9 89:3 167:23 206:5 233:10
uses 111:17 245:21
using 5:22 15:19 19:19 23:13 47:13,14 55:19 57:5 68:9 78:4 102:17 106:1 138:4 187:16 189:8 210:13 214:2 219:4,19 244:16
usual 148:25 231:16 269:14
usually 59:23 103:25 112:1 208:7 221:24

v

v 80:23
vacuum 174:2
valdosta 45:3
valuable 72:6 86:25 129:1 209:3
value 84:19 87:24 170:1
vap 29:8 46:15 46:16 47:14 111:19 120:7,9 137:24 138:1 142:2,6,10 152:11,12 211:1,11
variable 86:23
variation 86:9
variety 43:16 87:1 119:12 244:2 252:8
various 19:7,19 21:2 32:22 48:8 60:6 62:8 68:10,15 69:11 70:10 99:19 101:11,14,15 104:25 106:1 107:4 119:15 132:14,25 153:18 155:25 167:8 188:3 194:12,12 205:13 209:21 213:19,22 214:21 215:13 228:1 235:19 242:25 261:6
vary 108:3 237:6
varying 89:15
verbatim 99:25
verbiage 43:8
verification 90:3
verified 89:14 214:21
verify 224:2

veritext 5:23 6:1 265:21 269:7,7,9,11,13 270:14
versa 6:24
versus 5:17,19 20:6 27:4 39:14 46:3 48:17 53:8 85:1,9 87:7 88:23 89:25 105:11 106:11 163:13 176:9 177:3 199:11 210:10 228:2 255:10
viable 83:23 84:2
vice 6:24
video 5:11,13 265:20
videographer 5:2,24 7:19,25 27:21,24 68:2 68:5 77:15,18 144:18,21 207:6,9 264:24 265:2,11,15,25 266:5
view 56:1 93:22 96:2 143:17 203:12 208:14
viewed 217:16
vince 4:14
vince.montoya 4:16
vincent 7:23
virtual 5:22 8:16 11:4
virtually 5:6
visible 67:14 155:10 164:1
visual 67:17 153:2,5 214:18
visually 76:20 214:20 229:19
voice 43:22
volume 257:13
volumen 206:9
voluminous 68:22 204:12
vote 39:3,8,14 41:6 50:19 88:25 138:6 244:18 254:17 254:22 259:25 260:4
voted 186:6
voter 116:19 247:22 254:16 254:17,20 255:1,2
voters 23:24 29:21,25 30:6 31:4 33:10 36:25 37:12,18 37:20 38:10,15 41:10 42:3,6 50:15,16,18,18 50:23,24 51:1 52:17,18,21,22 52:23 53:1,2,7 53:8 55:12,16 56:2,9 57:17 57:17,20 78:12 78:14 79:7 90:5,9,14,18,24 91:2 94:12,14 96:13 148:12 149:4 160:16 173:3,6,16 179:23 180:12 197:14 200:15 212:22 238:11 238:16,21 264:21
votes 87:18,18 87:19 96:11 185:25 199:14 222:15 233:8 245:2
voting 22:9,10 22:13 28:25 37:25 46:6 47:9 51:4 83:8 83:8,13 96:3,4 110:9,11,15 111:16,19 118:8 123:7 125:11 149:4 152:22 153:25 160:22 172:23 172:25 173:5 173:20 211:12 213:11,13,15 251:23 253:14 253:14 254:8,9 258:3 264:15 264:18
vra 28:22,24 263:22 264:5 264:20
vrdi 252:5,7,13
vs 1:6,11 47:19
vtds 109:14,17 109:20 186:14

w

waiting 246:6 263:11
walk 110:7 161:10 220:23 226:24 227:25 235:18 240:23 241:9
walks 129:8
wanders 63:1
want 18:9 22:2 27:18 54:6 62:5,6 80:1 84:9,25 88:15 109:20 145:4 149:4 155:7 164:21 169:23 170:14 171:10 176:18 181:4 195:25 234:25 240:23 241:9 248:1,15 252:1 252:23 256:24

260:8 265:16 265:19,19,20 265:20
wanted 8:13 13:25 16:25 33:1,18 46:4 115:6 123:20 127:16 128:21 133:7 137:5 140:7 141:19 149:16 159:16 164:21 186:25 193:3 218:9 242:4 253:8 255:11 261:10
wanting 59:24
war 45:17
ware 95:17
warnock 38:14
warnock's 42:16
way 9:5 24:3 25:9,25 27:9 32:15 36:13 43:21 44:6 51:11,24 55:13 56:23 60:12 63:1,1 65:14 65:19 67:8,21 70:3,13 71:4 72:6 88:11 98:14 111:1,6 119:21 127:15 128:9 129:2 130:18,22 132:20 134:21 135:1 136:17 138:6 139:3,12 141:7 143:2,17 147:18 153:15 155:5 157:23 158:12 159:4 161:22 167:20 175:22 178:1 179:6 182:7 188:16,18 189:10 192:3 192:10 197:8 198:13 206:24 208:18 217:23 225:13 232:18 234:10 236:2 238:17 254:17 254:18 262:17 265:18
ways 53:14 65:23 67:6 108:16 115:18 121:10 122:13 129:1 153:12 154:11 176:13 182:9 257:5
we've 8:23 55:15 64:7 71:9,15 72:14 74:2 75:7 82:21 122:14 123:16,18 141:4 144:12 185:19,20 206:21 209:14 231:19
weakened 258:3
weaker 36:18 36:20 197:13
website 246:4 252:4
weight 83:19
went 9:24 69:19 192:18 192:20 218:17 235:10
west 134:18 135:12,14
western 130:8 134:14
whichever 23:6
whisker 229:15
whiskers 227:25 228:9 228:11 230:6
white 23:4 47:4 49:11 50:16,18 50:22,24 51:1 51:5 52:9,10 52:18,22,22,25 53:3,4,7,8 75:19,20 84:18 89:25 93:3 94:10,15 96:20 97:1 98:19 112:17 120:5,7 148:12 149:4 197:14 242:14
whiter 172:19 179:16
widely 37:17 37:19 89:15
wildest 262:20
willing 26:12
willingness 218:23
wilmerhale 4:11 7:17
wilmerhale.c... 4:12
win 42:12,18 148:15 247:23
winding 194:15
wins 92:14,14
wipe 240:3,4
wisconsin 260:22,23 261:3,14,16
wish 152:11
withdrawn 270:11
witness 3:2 5:9 8:2 13:9,12 14:1,10 68:1 81:14 92:20,23 123:22 265:9 265:12 266:4
witnesses 240:3
wolf 262:9
women's 241:12
won 30:17 42:5 187:18 260:5

word 51:17 112:1 138:4 177:8 189:8 211:7,24
words 24:24 105:4
work 9:6,15,25 10:6 13:6 14:14,19,23 15:3,16 18:5 18:24 24:14 25:8,12,15 36:23 38:2,4 67:8 78:8 81:17 98:23,23 155:23 175:3 204:16 241:5 242:18 243:17 243:23 244:23 245:4,16 249:7 249:12 251:14 251:19 253:16 255:7 258:24 260:7 262:7 263:1,25
worked 30:10 75:9 244:4 251:10,23
working 8:12 16:1 18:3 20:17 24:25 27:8 66:12 69:8 70:4 73:4 73:18 82:6 124:15 139:3 187:8 220:9 264:1,3
works 11:12 28:3 65:9 95:24 97:20 128:22 130:18 144:14,16 241:4 257:7
world 244:1
worse 182:10 217:24
worth 117:16 185:16
wrapping 119:2,11
wraps 63:15 66:1
wright 108:10 147:12 179:2 219:9 239:18
wright's 118:2 169:7 207:18 215:4 218:7,11
write 257:15
writing 46:24 255:23,25
written 24:24 33:3,7,8,13 38:23 43:12 80:16 104:9 199:17 257:9
wrong 217:22 217:25
wrote 24:23 198:13 202:19 203:7 247:13 247:14

x

x 2:1 3:1

y

y 215:23
yeah 13:17 27:18 52:5 58:12 63:9 109:3 115:25 123:22 128:2 130:2 190:20 223:7 230:4 239:5 246:15
year 241:14 243:6
years 165:18 210:5 239:19 242:6
yellow 215:10 215:20 221:17 222:1,11

z

zabel 4:11 7:16 7:16
zealand 16:16 259:3
zero 57:22 92:14,24 98:10 178:25 179:8 259:14
zeros 98:12
zone 8:9 98:6 232:5,10
zoom 1:20 8:18 8:21 49:18 246:13

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF GEORGIA ATLANTA DIVISION

GEORGIA STATE CONFERENCE OF THE NAACP, et al. *Plaintiffs*, v. STATE OF GEORGIA, et al. *Defendants.*	Case No. 1:21-CV-5338-ELB-SCJ-SDG
COMMON CAUSE, et al., *Plaintiffs*, v. BRAD RAFFENSPERGER *Defendant*.	Case No. 1:22-CV-00090-ELB-SCJ-SDG

Expert Report of Dr. Moon Duchin

Exhibit
0001

Analysis of Race and Redistricting in Georgia

Moon Duchin
Professor of Mathematics, Tufts University
Senior Fellow, Tisch College of Civic Life

January 13, 2022

Contents

1 Background and qualifications **3**
1.1 Assignment . . . 3
1.2 Materials . . . 4

2 Summary of findings **4**

3 Demographics of Georgia **6**
3.1 Regions, counties, and cities . . . 6
3.2 Sources of population data . . . 7
3.3 Demographic trends . . . 8

4 Overview of enacted plans for Congress, Senate, and House **10**
4.1 Congress . . . 10
4.2 State Senate . . . 12
4.3 State House . . . 14

5 Assessing effective opportunity-to-elect districts **16**
5.1 Identifying probative elections . . . 16
5.2 Constructing and evaluating a score of electoral alignment . . . 17

6 Metrics for enacted plans **20**
6.1 Population balance . . . 20
6.2 Compactness . . . 21
6.3 Respect for political boundaries . . . 22
6.4 Racial demographics . . . 23
6.5 Incumbency and core retention . . . 24

7 Gingles demonstration plans **25**
7.1 Congressional alternatives . . . 25
7.2 State Senate alternatives . . . 25
7.2.1 SD Atlanta . . . 26
7.2.2 SD Gwinnett . . . 28
7.2.3 SD East Black Belt . . . 30
7.3 State House alternatives . . . 32
7.3.1 HD Atlanta . . . 32
7.3.2 HD Southwest . . . 35
7.3.3 HD East Black Belt . . . 37
7.3.4 HD Southeast . . . 39

8 Secondary population estimates for coalition districts **41**

9 Effectiveness-oriented demonstration plans **46**
9.1 Congressional effectiveness . . . 46
9.2 State Senate alternatives . . . 47
9.3 State House alternatives . . . 54

10 Racial gerrymandering **67**
10.1 Retention, displacement, and district disruption . . . 67
10.1.1 Congress . . . 67
10.1.2 State Senate . . . 69
10.1.3 State House . . . 70
10.2 Splitting of geographical units . . . 72
10.2.1 Congress . . . 72
10.2.2 State Senate . . . 77
10.2.3 State House . . . 79
10.3 Community narratives . . . 79

A Race, ethnicity, and citizenship **81**

B Electoral alignment in enacted legislative districts **82**

C Splits of geographical units **101**

1 Background and qualifications

I am a Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University. At Tisch College, I am the director and principal investigator of an interdisciplinary research group called the MGGG Redistricting Lab, focused on geometric and computational aspects of redistricting. My areas of research and teaching include the structure of census data, the history of the U.S. Census, the design and implementation of randomized algorithms for generating districting plans, and the analysis of redistricting more broadly. In 2019, I was awarded a major grant from the National Science Foundation to study *Network Science of Census Data*.

I am compensated at $400/hour for my work in this case. I have previously written reports and provided testimony by deposition, a hearing, or at trial in North Carolina, Pennsylvania, Wisconsin, Alabama, South Carolina, and Texas.[1] A full copy of my CV is attached to this report.

1.1 Assignment

I have been asked to examine the Congressional, state Senate, and state House districts enacted in Georgia this year in connection with challenges under the Voting Rights Act of 1965 (VRA) and the U.S. Constitution.

[1] *NC League of Conservation Voters, et al. v. Hall, et al.* No. 21-cvs-500085 (Wake Cnty. Sup. Ct. 2021); *Carter v. Chapman*, No. 7 MM 2022, 2022 WL 702894 (Pa. Mar. 9, 2022); *Johnson v. Wis. Elections Comm'n*, No. 2021AP1450-OA, 2022 WL 621082 (Wis. Mar. 3, 2022); *Milligan, et al. v. Merrill, et al.*, Case No. 2:21-cv-01530-AMM and *Thomas, et al. v. Merrill, et al.*, Case No. 2:21-cv-01531-AMM (N.D. Ala. 2021); *SC NAACP et al. v. Alexander, et al.*, Case No. 3-21-cv-03302-MBS-TJH-RMG (D.S.C.) (three-judge ct.); *TX NAACP et al. v. Abbott*, Case No. 1:21-CV-00943-RP-JES-JVB.

In particular, I review the maps' conformance with traditional districting principles (§6), then supply demonstration maps for the "Gingles 1" prong of a VRA challenge. Using a notion of district "effectiveness" based on electoral history (§5), I show that it is readily possible to draw additional majority-minority districts, while simultaneously increasing the number of effective districts (§7). These effective districts are shown to be highly likely to provide an opportunity for Black and Latino voters to elect candidates of their choice.

I have also assessed the maps to investigate the possibility of excessively race-conscious line-drawing (§10), especially noting when traditional districting principles have been undermined in a manner that results in "packing" and "cracking"—the related practices of over-concentrating Black and Latino voters on one hand, or splitting communities and dispersing their voters over multiple districts on the other. I have considered whether or not the design of the districts ultimately leads to discernible dilution of voting opportunity for Black voters in Georgia, or for coalitions of Black and Latino voters, and have found ample evidence to support that conclusion.

All work in this report was completed by me and by research assistants working under my direct supervision.

1.2 Materials

Materials consulted in the preparation of this report include the following.

- A major source is Census data, primarily the Decennial Census releases (i.e., the PL 94-171). Other data products from the Census Bureau, including the American Community Survey and the TIGER/Line shapefiles, were also used.
- For priorities and criteria, I consulted the "2021–22 Guidelines for the House Legislative and Congressional Reapportionment Committee." These are reprinted in full in the corresponding publication by the Senate Committee on Reapportionment and Redistricting.
- Shapefiles for the enacted plans are available on the state's redistricting website, hosted at `legis.ga.gov`.
- A collection of precinct shapefiles with historical election data joined to the shapes was provided by counsel, as well as addresses for incumbent representatives. I was also provided with written transcriptions of oral testimony in public hearings in Georgia about redistricting, and with corresponding written communication.

2 Summary of findings

- Census data shows that the state of Georgia is rapidly diversifying, and in fact now has a population very nearly evenly split between White people and people of color. At the same time, it has shifted to become what we might call "bright purple," with recent elections repeatedly demonstrating that candidates preferred by Black and Latino voters can be elected by simple majority on a statewide basis.
- At a high level, an examination of recent electoral history shows that the enacted plans at all three levels are conspicuously uncompetitive, which has been fueled by acutely race-conscious moves in the recent redistricting. In particular:
  - A Congressional district that had proved to perform for the preferences of Black and Latino voters—CD 6—has been targeted to eliminate electoral opportunity. This was achieved by excising parts of urban counties and adding conservative White counties to the north of the benchmark configuration.
  - In a ripple effect from the reconfiguration of CD 6, a dense, urban, largely Black residential segment of Cobb County has been submerged in CD 14.

  - On the western edge of Georgia, CD 3 has been drawn to retain its character as a firewall between racially and politically diverse parts of the state in metro Atlanta and the Southwest region. Meanwhile, CD 13 has been kept highly packed, which is cemented in the enacted plan through race-conscious county splitting.
  - In the enacted Senate map, numerous districts that had trended into diverse and competitive population configurations were targeted for "dismantling," i.e, were re-drawn in a way that splits the population of the benchmark district across numerous new districts. This is especially visible in the reconfiguration of SD 17 and 48, which flouts traditional districting principles and creates districts that lock out opportunity.
  - There is strikingly low core retention in the enacted House plan, with roughly three in every five Georgia residents assigned to a new district today relative to the benchmark plan. This dovetails with a pattern of "dismantling" districts in a way that usually eliminates electoral opportunity for Black and Latino voters, using racially imbalanced transfers of population.

- I have introduced a label of district "effectiveness" in §5: by definition, a district is deemed effective if candidates of choice for Black and Latino voters can frequently win both primary and general elections. To make this concrete, I have used a list of four primary and eight general statewide elections selected as being highly probative for the preferences of Black and Latino Georgians. To be effective, a district must have an electoral history such that the candidate of choice would win in at least 3/4 primary elections and 5/8 general elections from this dataset. I have confirmed that this is well aligned with actual 2022 electoral performance at the Congressional and state legislative level.

- A review of metrics associated with traditional districting principles (and other principles cited in the state's redistricting guidelines) is presented in §6. My alternative plans are shown to be highly compact, to respect the integrity of counties and cities, and to be far more cognizant of the integrity of state precincts than the enacted plans.

- I present Gingles 1 alternatives on a regional/district cluster basis in §7. These plans increase both the number of majority-BHVAP districts and the number of majority-BHCVAP districts, relative to the state, while also securing the "effective" label on the basis of electoral history. The modular design of the legislative alternatives will make it easy to mix and match plans from different clusters.

- If we foreground effectiveness instead of majority demographics, we find that districts can frequently be effective even well under the 50%+1 demographic threshold. This provides helpful examples leading in to a discussion of racial gerrymandering in the following section.

- Counties are often split in a racially sorted way, beyond what the partisan geography would suggest from a race-neutral process. In many cases this secures a high partisan differential as well; in some cases, the racial differential significantly exceeds the partisan gap.

- It is extremely frequent for precinct splits to show major racial disparity. If mapmakers were using cast vote history to track partisan lean, as is frequently done around the country, then these splits of state precincts are especially telling, since the vote history can not provide a partisan basis for the decision. These splits are shown to essentially always align with packing and cracking. Again, my alternative maps show that far less precinct splitting is possible.

- Public input, such as the record of strong pushback against the targeting of CD 6 and the encroachment of CD 14 into Cobb, also explains why the enacted plans are dissonant in terms of shared community interests.

3 Demographics of Georgia

3.1 Regions, counties, and cities

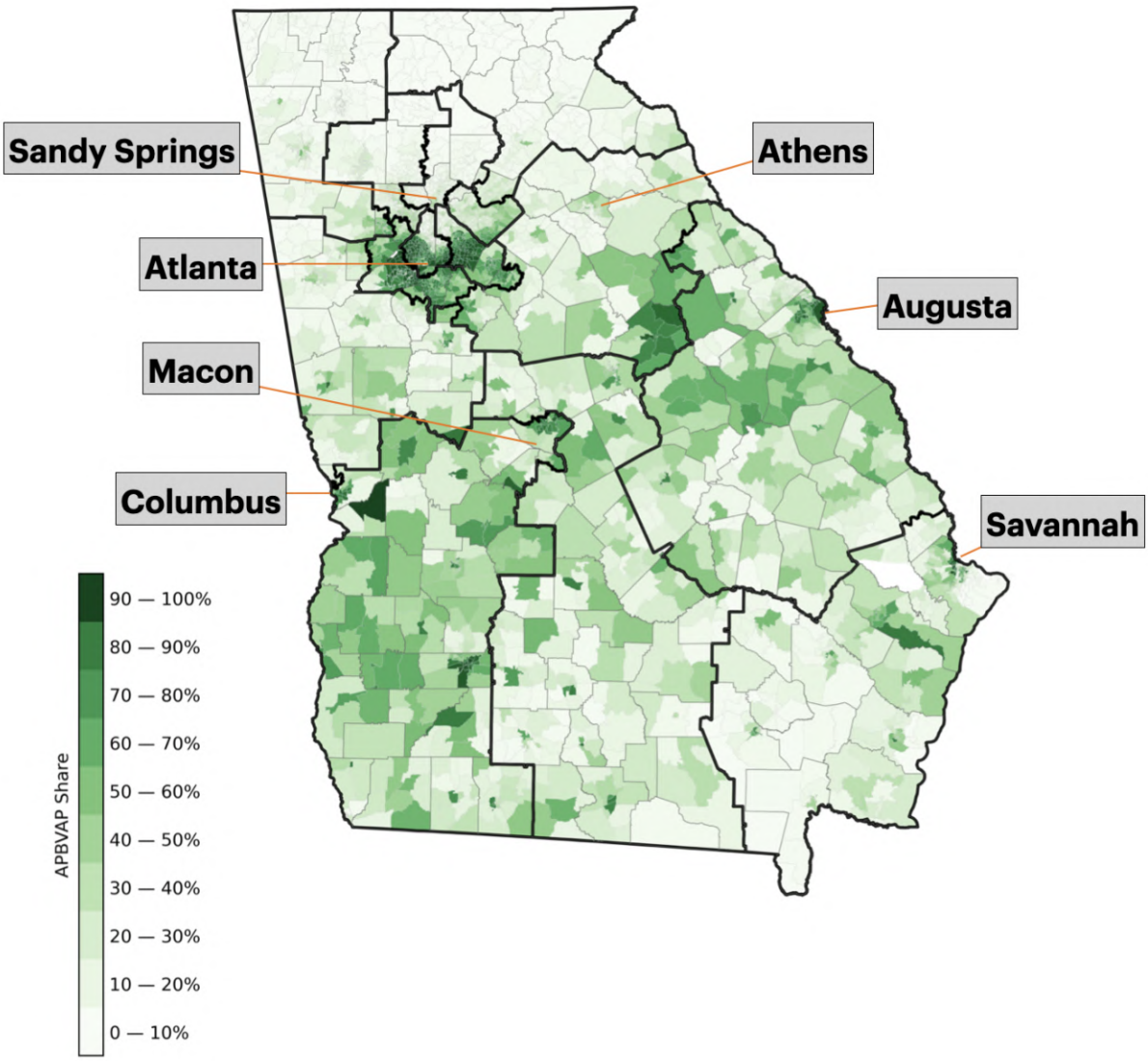


Figure 1: Choropleth of Black voting age population by state precinct, with the enacted Congressional map overlaid. County lines are shown in gray. The Atlanta metro area has dense Black population, while high proportions of Black residents in smaller cities and rural areas can be found in the swath of the state from Columbus to Augusta, broadly called Georgia's "Black Belt" region.

Georgia has 159 counties, the second highest number in the nation (after Texas with 254). Georgia's counties vary in population from Fulton County, with over a million residents, to Taliaferro County, with just 1559 residents, so that they differ by a factor of over 680×. Twenty-two of the counties are majority-Black, from DeKalb (pop. 764,382) to Taliaferro.

In Georgia, the cities proper are not very populous; even Atlanta has under 500,000 people by the 2020 Census numbers, smaller than the ideal Congressional district population of 765,136. However, the Atlanta metro area (formally the "Atlanta–Sandy Springs–Alpharetta, GA Metropolitan Statistical Area") is the eighth largest in the country, with over six million residents (6,089,815), making up nearly 57% of Georgia's total population.

3.2 Sources of population data

Apportionment and redistricting was the fundamental motivation for the establishment of the U.S. Census. The primary source of ground-truth data for redistricting is the Decennial Census tables in the PL94-171 (also called the *redistricting data release*). There are many reasons to rely on the 2020 Decennial data: it is the most recent available, it is based on a more extensive enumeration of the population (rather than a survey), it is available on the smallest geographic units (census blocks), it offers a high level of detail in its categories of race and ethnicity, and it includes both total population (TOTPOP) and voting age population (VAP).

An important secondary source of data, also produced by the Census Bureau, is the American Community Survey, or ACS. This has the advantage of being collected every year rather than at ten-year intervals, and it includes an estimate of citizen voting age population (CVAP), but this trades off with a number of well-known caveats. Since it is survey-based, it is known to have wider error bars on small geography: accordingly, the Bureau only releases single-year estimates at the tract level; 5-year estimates are released at the level of block groups, but this is still not sufficiently detailed to get exact totals on electoral districts. Furthermore, the ACS racial and ethnic categories are significantly simplified relative to the Decennial data, so that for instance it is not possible to tabulate Any-Part Black population with the same set of multiracial categories or even to tabulate Afro-Latino (Black and Hispanic) population. In addition, the use of a 5-year average will mean that the numbers are somewhat out of date, since even the most recent currently available data draws partly from 2016, which is quite a long time ago in a rapidly diversifying state. Finally, the 2020 ACS was so badly compromised by the COVID pandemic that the Bureau has cautioned people to treat the numbers that year as "experimental."[2]

For these reasons I have chosen to emphasize VAP in discussing the demographics of districts in this report, such as when counting the majority-Black districts in a plan. However, the plaintiffs' claims involve a coalition of Black and Latino voters, and the voting eligibility rate for Latino voters can be significantly lower than other groups, particularly due to a lower rate of citizenship. Therefore litigation involving Latino plaintiffs typically uses a secondary data source to validate that Gingles plans meet the 50%+1 threshold. Below, I will rely on estimated CVAP built from block-level adjusted VAP, where the citizenship rate (CVAP/VAP) for Black, Latino, White, and Other residents is pulled from the 2020 5-year ACS on larger geographies, namely census tracts. I judge this to be significantly more accurate than using the 2016-2020 5-year CVAP numbers directly. For one vivid illustration of why this is important, consider that the total voting age population of Georgia is 8,220,274 in the redistricting data, but only 8,011,265 in the 2016-2020 5-year numbers. That is, there is a shortfall of more than 200,000 adults if we pull from the ACS directly.

A full description of racial categories and of the construction of CVAP for this report can be found in Appendix A. In §8 I will confirm that my alternative plans satisfy the Gingles 1 standard for coalition districts using estimated Black and Hispanic CVAP as well as using VAP.

[2] "The Census Bureau will not release its standard 2020 ACS 1-year supplemental estimates because of the impact of the COVID-19 pandemic on data collection. Experimental estimates, developed from 2020 ACS 1-year data[,] are available on the ACS Experimental Data page. They will not be available on data.census.gov or the Application Programming Interface (API)." From www.census.gov/data/developers/data-sets/ACS-supplemental-data/2020.html, accessed January 4, 2023.

3.3 Demographic trends

A snapshot of the demographics of Georgia can be extracted from data products by the Census Bureau, as in Table 1.[3] Below, I will use the abbreviations B, H, BH, W, and POC to denote the share of population (or VAP, etc.) that is Black, Latino, Black and/or Latino, White, and people of color respectively. Detailed definitions of the racial and ethnic groupings can be found in Appendix A.

	All	Black alone	Black (APB)	Hispanic	BH Coalition	AfroLatino	White alone	POC
TOTPOP	10,711,908	3,278,119 30.60%	3,538,146 33.03%	1,123,457 10.49%	4,578,941 42.75%	82,662 0.77%	5,362,156 50.06%	5,349,752 49.94%
VAP	8,220,274	2,462,933 29.96%	2,607,986 31.73%	742,918 9.04%	3,302,581 40.18%	48,323 0.59%	4,342,333 52.82%	3,877,941 47.18%
CVAP	7,598,787	2,422,569 31.88%	2,537,328 33.39%	429,562 5.65%	2,920,522 38.43%	— —	4,285,394 56.40%	3,313,393 43.60%

Table 1: Demographics overview. The TOTPOP and VAP figures are taken from the 2020 Decennial Census. The CVAP figures use citizenship rates drawn from the most recent 5-year ACS (ending in 2020), applied to decennial VAP.

Georgia's fast growth is entirely due to the expansion in the population of people of color. In fact, the (non-Hispanic) White population of Georgia actually dropped from 2010 to 2020—from 5,413,920 to 5,362,156—while the state overall grew by over a million people. As a result, the population share of Black and Latino residents expanded from 39.75% to 42.75% in the time between the 2010 and the 2020 Census data release, while the White population share dropped markedly from 55.88% to 50.06%. Thus, to within a tenth of a percent, current redistricting data finds Georgia evenly split between White residents and people of color.

The steady diversification is visible in the citizen voting age population as well, for which we can get a snapshot each year from the American Community Survey (Table 2).[4]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BCVAP	1,961,750 0.3029	2,008,587 0.3049	2,055,423 0.3071	2,096,295 0.3089	2,140,693 0.3110	2,179,729 0.3123	2,228,551 0.3155	2,276,776 0.3182	2,322,275 0.3201	2,376,110 0.3230
HCVAP	188,878 0.0292	210,412 0.0319	230,724 0.0345	245,517 0.0362	263,787 0.0383	282,158 0.0404	290,840 0.0412	306,713 0.0429	324,368 0.0447	344,182 0.0468
BHCVAP	2,150,628 0.3321	2,218,999 0.3368	2,286,147 0.3415	2,341,812 0.3451	2,404,480 0.3493	2,461,887 0.3528	2,519,391 0.3567	2,583,489 0.3610	2,646,643 0.3648	2,720,292 0.3698
POC CVAP	2,239,082 0.3457	2,299,730 0.3491	2,358,789 0.3524	2,415,907 0.3560	2,477,036 0.3599	2,538,250 0.3637	2,603,198 0.3685	2,671,269 0.3733	2,738,577 0.3775	2,811,677 0.3822
WCVAP	4,237,007 0.6543	4,288,602 0.6509	4,335,200 0.6476	4,369,477 0.6440	4,405,843 0.6401	4,440,410 0.6363	4,460,606 0.6315	4,484,704 0.6267	4,516,116 0.6225	4,544,881 0.6178
total CVAP	6,476,089	6,588,332	6,693,989	6,785,384	6,882,879	6,978,660	7,063,804	7,155,973	7,254,693	7,356,558

Table 2: Georgia has seen significant growth in its citizen adult population, and nearly all of it is from communities of color. This table shows the 1-year ACS figures from 2010 through 2019.

[3] As noted in the last section, the American Community Survey (ACS) is based on an annual survey, often presented in 5-year rolling averages, where not all of the same racial and ethnic categories from the PL94-171 are available. Since the methodology, categories, and time periods are different between the ACS and the Decennial data, there is no contradiction in observing WCVAP>WVAP, for instance.

[4] As described above, the 2020 ACS was not recommended for standard use on a 1-year basis, which is why it is excluded from Table 2.

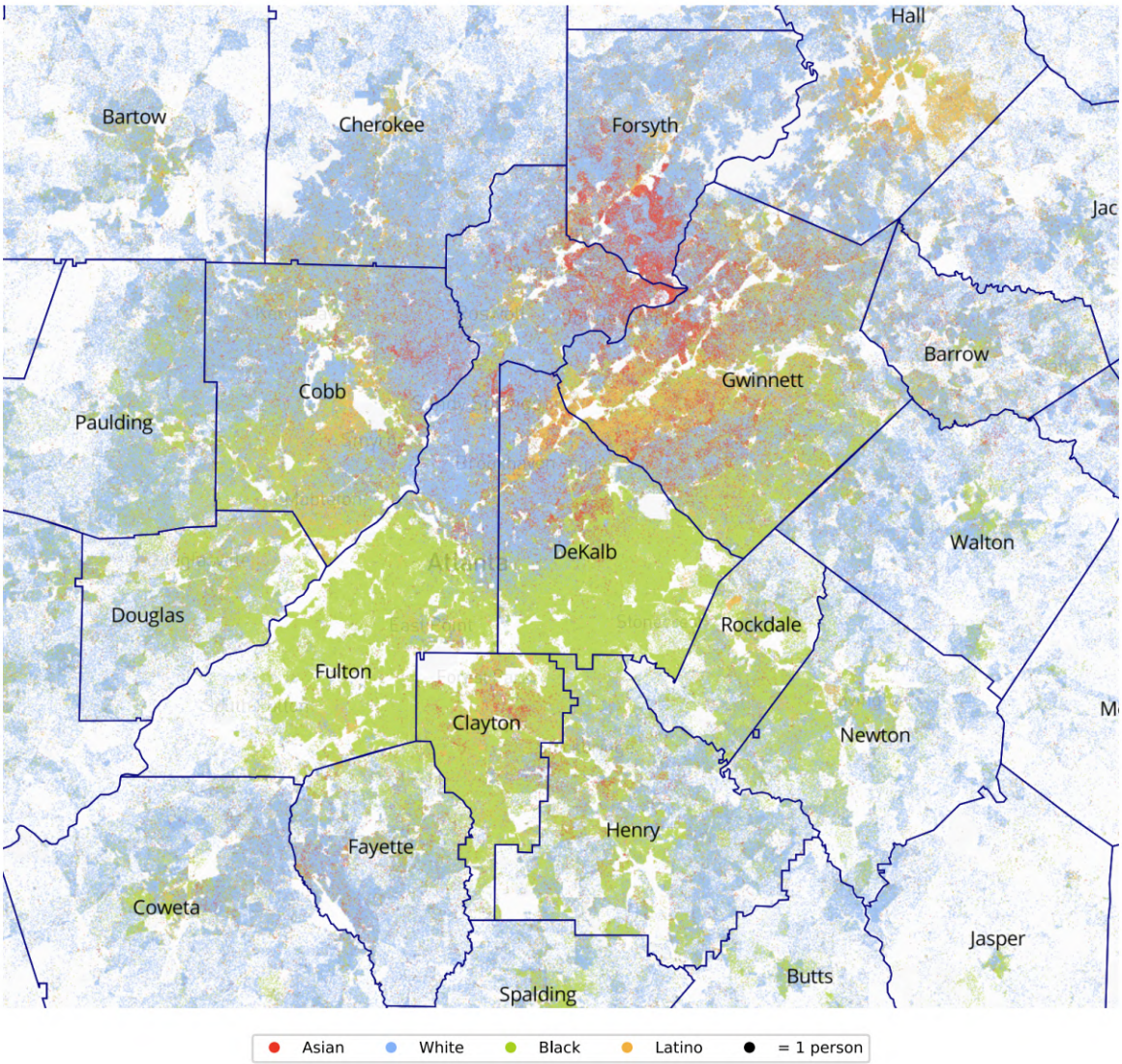


Figure 2: Racial dot density plot in the counties of the Atlanta metro area. Dense concentrations of Black population are visible in Cobb, Douglas, Fulton, Clayton, DeKalb, and southern Gwinnett Counties. Gwinnett is the heart of Georgia's Latino population, and following the I-85/I-985 corridor north connects to a substantial Latino community in Hall County.

4 Overview of enacted plans for Congress, Senate, and House

4.1 Congress

As discussed in the last section, the last decade has seen substantial growth in the Black and Latino population of Georgia and a reduction in White population. At the same time, and in a climate where the racial polarization between White Georgians and voters of color is essentially undisputed, Black and Latino candidates of choice are now routinely competitive in statewide elections, and now can frequently win outright. Despite this, the newly enacted Congressional plan makes major changes to the benchmark and does so in a way that reduces the number of performing districts for Black- and Latino-preferred candidates from 6 out of 14 (42.9%) to just 5 out of 14 (35.7%).

In 2018, Democratic candidate Lucy McBath won a surprise victory in CD 6, north of Atlanta, unseating Republican Karen Handel. She then defended her seat in 2020. My study of the Congressional plan enacted in Georgia in 2021 is completely consistent with the scenario that line-drawers targeted McBath's district, specifically by removing Black and Hispanic voters from CD 6 and replacing them with White suburban, exurban, and rural voters in Forsyth and Dawson counties. This displacement ripples across CD 11 and ends up submerging Black urban voters in rural CD 14. This is corroborated by the core retention numbers that show that CD 6 was singled out for major reconfiguration (see §10).

Correspondingly, the community of interest narratives supplied to the state in a series of public hearings and communications show that coherent and salient local identities were disregarded in the process: rural, mountainous, and industrial interests in the Northwest counties; metro Atlanta's urban counties with large Black populations and clear shared needs for infrastructure, transit, and housing; and largely suburban Forsyth and Dawson. (See §10.3.)

Strikingly, all fourteen new districts had wider than a ten-point margin between Biden and Trump in the 2020 Presidential voting—there are zero remotely competitive districts. In particular, the completely reconfigured CD 6 is now far out of reach for a Black-preferred candidate; Biden had just 42.5% of the major-party vote against Trump in the district. This lean held up in actual Congressional voting under the new lines in 2022, where the closest of the fourteen outcomes was Sanford Bishop's margin of 9.95 percentage points over opponent Chris West in CD 2; every other race was a blowout. The overall effect of the Congressional redistricting in Georgia is the instrumentalization of Black and Latino voters to achieve a profoundly uncompetitive plan in which the line-drawers have gone a long way to locking in the outcomes.

In this section I will show images, and in the following section I will present statistics, for the enacted Congressional plan compared to the benchmark plan from ten years prior. I will also consider a map I have labeled **Duncan-Kennedy**, a draft congressional map released to the public by Lt. Governor Geoff Duncan and Chairman John F. Kennedy on September 27, 2021.

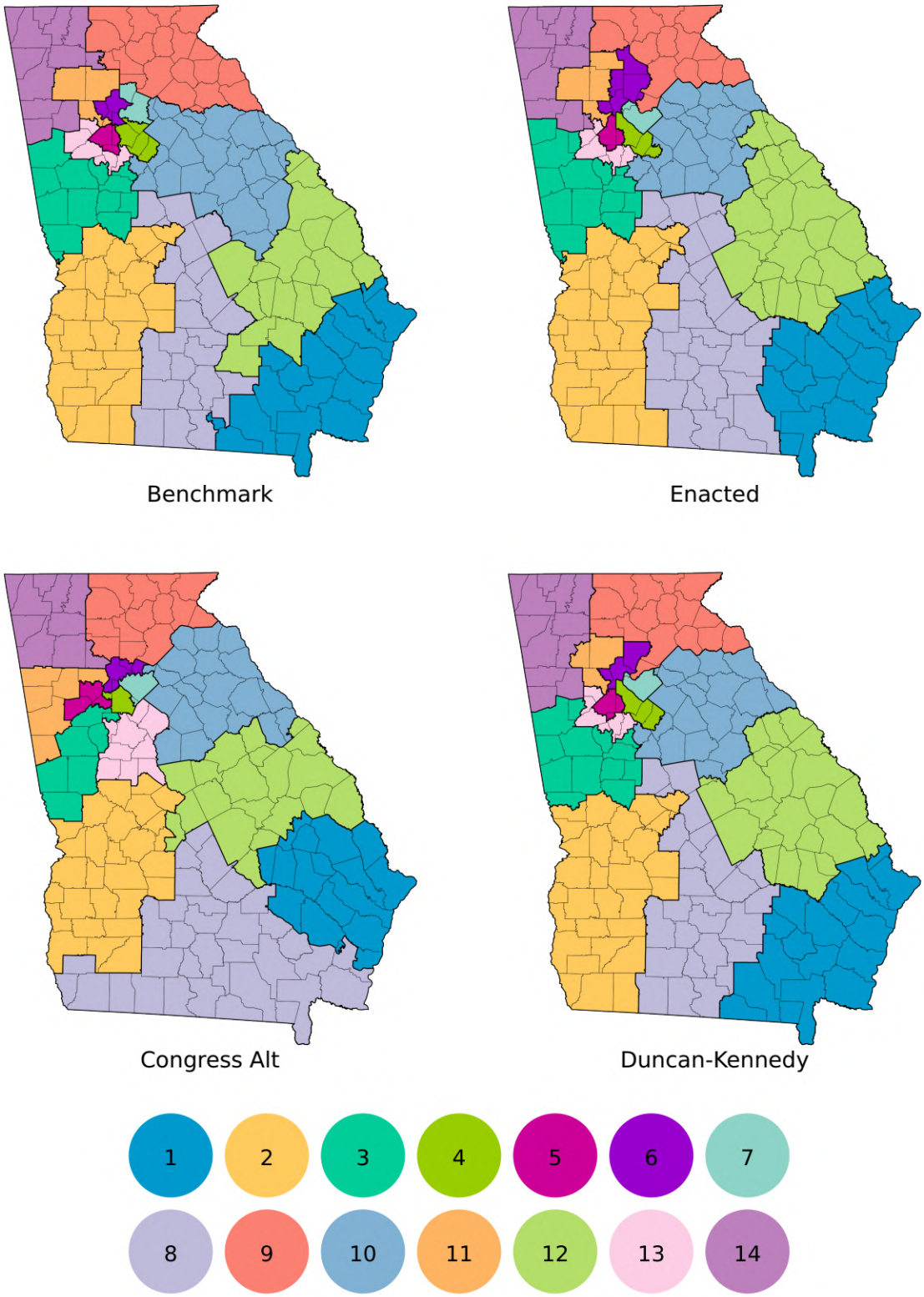


Figure 3: Congressional plans.

4.2 State Senate

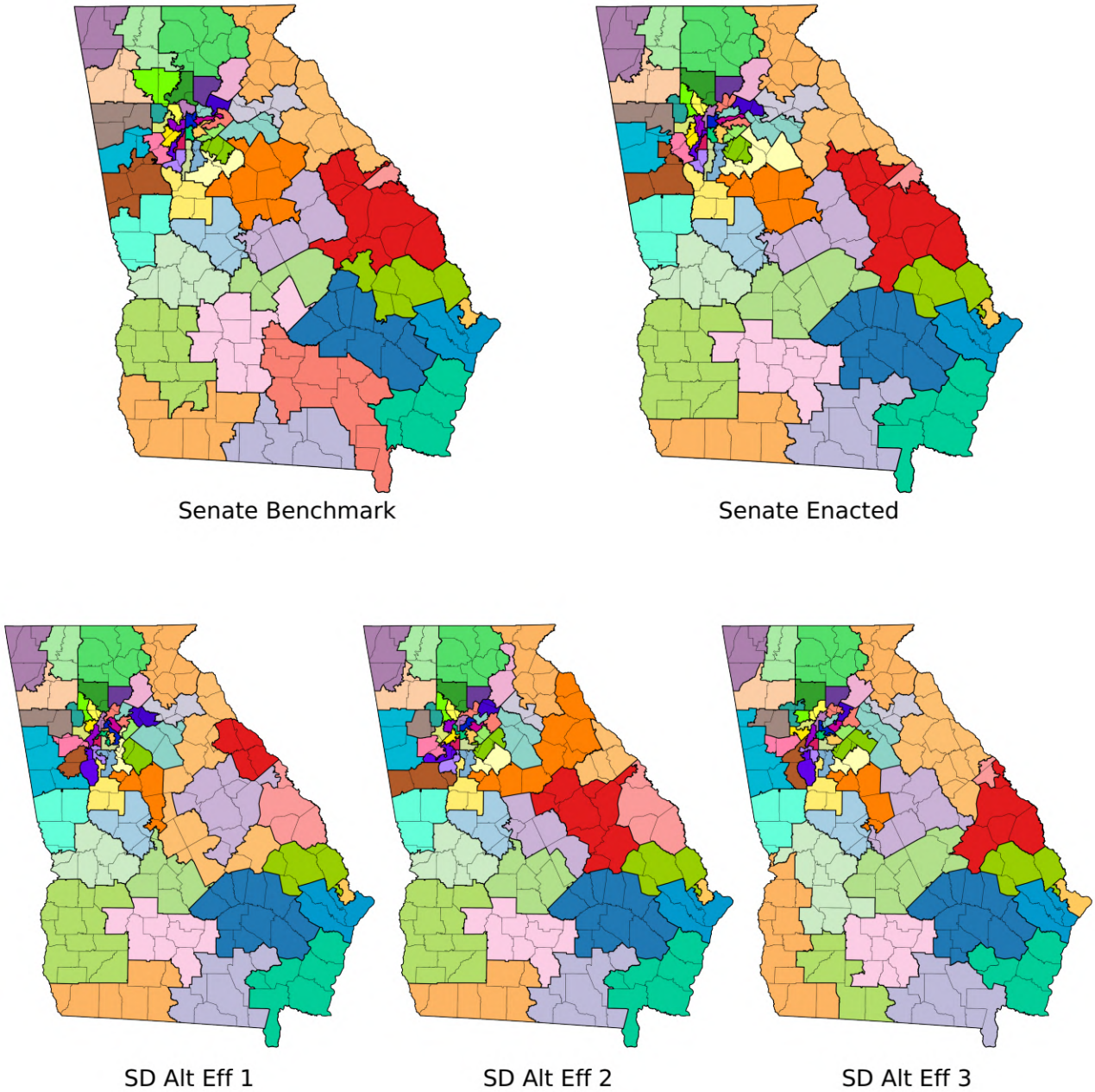


Figure 4: State Senate plans.

The state Senate plan enacted in Georgia is also remarkable in its lack of competitiveness. Despite Georgia's clear status as a new swing state, only one of the districts (SD 48) would have been within a ten-percentage-point margin (i.e., 55-45 or closer) in the Biden-Trump presidential contest of 2020. And indeed, only two of 56 districts (SD 7 and 14) were within a ten-point margin in the actual legislative voting of 2022. (Note that Georgia state Senators stand for election every two years, as for U.S. House and Georgia's state House.) More than half of the districts—30 out of 56—were uncontested.

Below, I will propose alternative districts with a *modular* approach, starting by dividing the 56 districts in the enacted plan into six district clusters, shown in Figure 5. In three of the six—Atlanta, Gwinnett, and East Black Belt—I will present alternative "Gingles 1" plans that increase the number of majority-Black and/or the number of majority-coalition districts, while ensuring that new districts are effective at securing electoral opportunity for Black and Latino voters. I will supplement the Gingles plans with regional maps showing improved effectiveness in additional clusters to create plans that span many regions of the state to form SD Alt Eff 1 and SD Alt Eff 2. Finally, I will offer an all-clusters alternative keyed to increased effectiveness alone, called SD Alt Eff 3. (See Table 10.) This is accomplished while maintaining scores for traditional districting principles that are comparable or superior to those of the enacted plan, and while giving great deference to the enacted plan by reconfiguring its own districts in clusters rather than starting from a blank map.

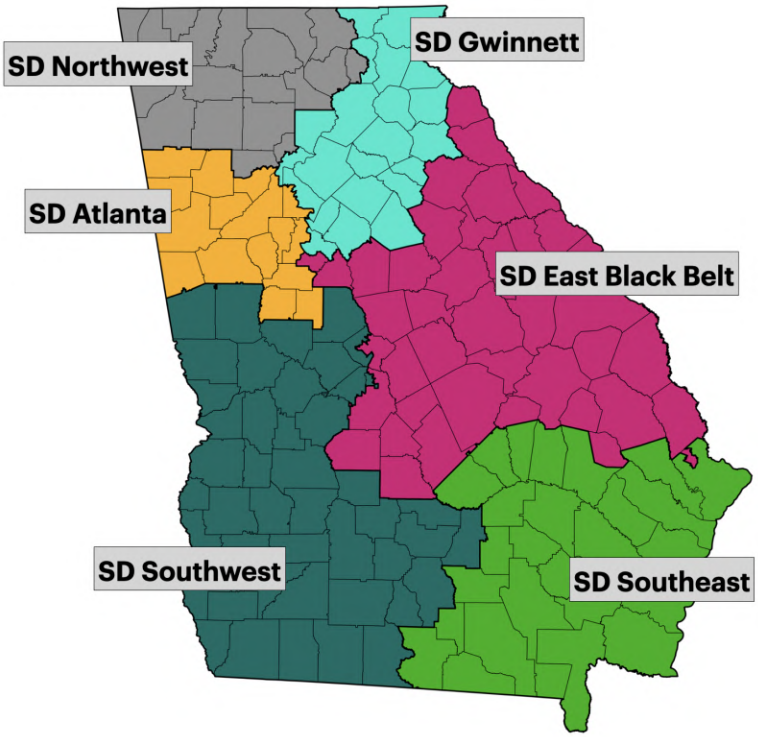


Figure 5: Six "modular" Senate clusters made up of groups of enacted districts. Below, Gingles demonstrative plans will be offered in selected clusters and effectiveness-oriented demonstrative plans will be presented in all six.

Senate Clusters

- SD Atlanta (14 districts): 6, 10, 16, 28, 30, 31, 33, 34, 35, 36, 38, 39, 42, 44
- SD Gwinnett (16 districts): 5, 7, 9, 14, 17, 27, 40, 41, 43, 45, 46, 47, 48, 49, 50, 55
- SD Southwest (6 districts): 11, 12, 13, 15, 18, 29
- SD East Black Belt (7 districts): 4, 20, 22, 23, 24, 25, 26
- SD Southeast (5 districts): 1, 2, 3, 8, 19
- SD Northwest (8 districts): 21, 32, 37, 51, 52, 53, 54, 56

4.3 State House

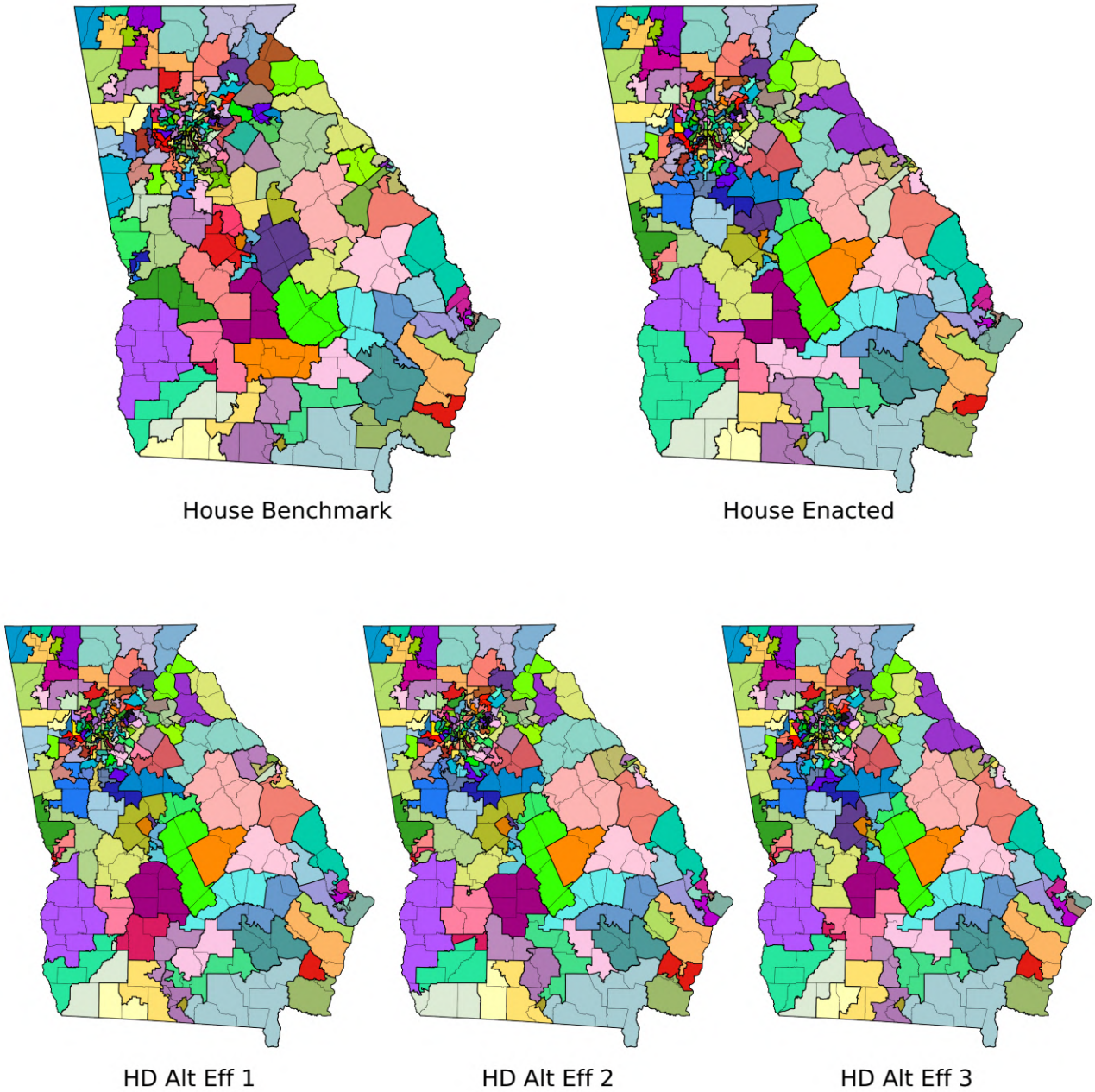


Figure 6: State House plans.

The state House plan repeats the uncompetitive design found in the other levels of redistricting; only fifteen of the 180 districts were within a ten-point margin for Biden-Trump, and only nine (HD 48, 50, 53, 99, 101, 105, 108, 117, and 151) had 2022 legislative outcomes in that range.Like in the Senate, more than half of the House districts—93 out of 180—were uncontested in 2022.

I have extended the modular approach from state Senate to the House, using seven regions formed by clusters of enacted districts, as in Figure 7. Each can be reconfigured to create

additional majority-coalition districts, and I offer up to two demonstration maps per cluster (Alt 1 and Alt 2) as Gingles 1 demonstratives in §7. As overviewed in Table 10, the alternative plans can be completed to highly effective alternatives statewide, which I call HD Alt Eff 1 and HD Alt Eff 2; a third all-clusters effective alternative is also offered, called HD Alt Eff 3.

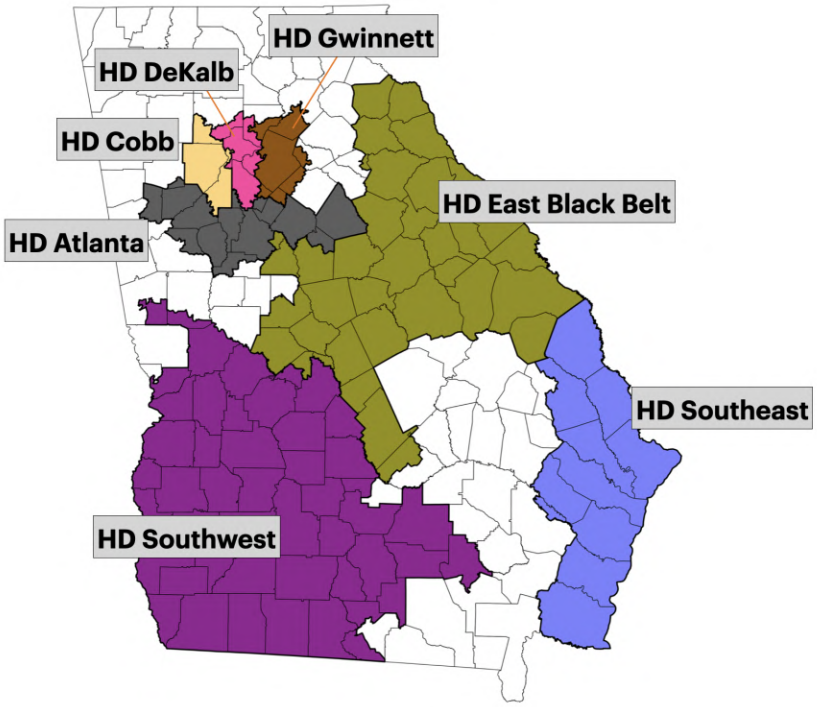


Figure 7: Seven "modular" House clusters made up of groups of enacted districts.

House Clusters

- HD Atlanta (25 districts): 61, 64, 65, 66, 67, 68, 69, 71, 73, 74, 75, 76, 77, 78, 79, 90, 91, 92, 93, 112, 113, 114, 115, 116, 117
- HD Cobb (25 districts): 20, 22, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63
- HD DeKalb (22 districts): 21, 24, 25, 47, 48, 49, 50, 51, 52, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 96, 97, 98
- HD Gwinnett (18 districts): 26, 29, 30, 94, 95, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111
- HD Southwest (18 districts): 137, 140, 141, 146, 147, 148, 150, 151, 152, 153, 154, 169, 170, 171, 172, 173, 175, 176
- HD East Black Belt (18 districts): 33, 118, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 142, 143, 144, 145, 149
- HD Southeast (12 districts): 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 179, 180

Together, these cover 138 of the 180 districts in the Georgia House. All of my demonstrative plans will leave the other 42 House districts unchanged.

5 Assessing effective opportunity-to-elect districts

The Gingles demonstration maps shown below in Section 7 are presented to satisfy the Gingles 1 condition for use with a Voting Rights Act challenge. In part, they are designed to show that it is (readily) possible to draw additional districts with a majority of Black and Latino adults in many parts of the state of Georgia, and for each of the three levels of districting plan, even while giving great deference to the Legislative enacted plan by only replacing its districts in modular clusters.[5]

In addition to demographic composition, I have offered alternative districts that showcase *effective electoral opportunity*. This shows that the harms to voters can be remedied by better design and, in the context of racial gerrymandering, demonstrates that better performance on traditional districting principles is completely compatible with greater electoral opportunity for Black and Latino voters.

There are many reasons that we should not rely on the 50%+1 line as a predictor of electoral opportunity. Some have argued that the Gingles/Bartlett 50%+1 requirement requires an element of race-consciousness that is in tension with other aspects of best practices in map-making. Additionally, a demographic share alone does not take into account voting eligibility, registration levels, and turnout. It has long been well understood that a majority-minority district is neither necessary nor sufficient to secure electoral opportunity.

Therefore it is critical to use electoral history to gauge whether a district affords a reasonable opportunity for a group to elect a candidate of its choice. I will describe an effectiveness analysis here and will provide demonstration maps emphasizing increased electoral opportunity for Black and Latino voters, without any racial threshold in play, in §9.

5.1 Identifying probative elections

In the voting rights sphere, it is well understood that certain past elections are more probative—that is, provide better and clearer evidence of polarization patterns and preferences—than others. The peer-reviewed literature is certainly clear that some factors flagging probative contests include the following: all other things being equal, elections are more suitable for an effectiveness analysis when they are more recent, when they have a viable POC candidate on the ballot, and when we can make confident statistical inferences about each group's preference. They are less suitable when they are blowouts or, of course, uncontested.

To this end, I have designated the following eight general elections and four Democratic primary elections (Tables 3) to be especially probative for analyzing effective electoral opportunity for Black and Latino voters in Georgia. All are recent statewide elections (held since 2018), most have a Black candidate on the ballot, and most are quite close on a statewide basis.[6]

[5] It is my understanding that the VRA, as clarified in *Bartlett v. Strickland*, requires a demonstration of additional districts that are have at least 50%+1 minority population. The usual standard uses VAP, or voting age population, when Black voters are the main minority group in a challenge; sometimes, CVAP, or citizen voting age population, is used when the principal group of plaintiffs has a large share of immigrants, as for Latino or Asian plaintiffs. In this case, the claims are for a coalition of Black and Latino voters, and I have used both VAP and CVAP, as explained in §3.2.

[6] Even Robinson's primary election, which was won with nearly 63% of the statewide vote, shows substantial district-level variation. By contrast, in the Democratic primary for Governor in 2018, Abrams won with 76.4% and with little regional variation, making it a less informative contest, which explains why it is not included.

Year	Contest	R Candidate	D Candidate	D share
2016	President	Trump-Pence	Clinton-Kaine	.4734
2018	Governor	Brian Kemp	Stacey Abrams (B)	.4930
2018	Super. Pub. Instruc.	Richard Woods	Otha Thornton (B)	.4697
2020	President	Trump-Pence	Biden-Harris (B)	.5013
2020	Public Serv. Commiss.	Lauren McDonald	Daniel Blackman (B)	.4848
2021	Senate Runoff	David Perdue	Jon Ossoff	.5061
2021	Senate Runoff Special	Kelly Loeffler	Raphael Warnock (B)	.5104
2022	Governor	Brian Kemp	Stacey Abrams (B)	.4620

Year	Contest	BH-Preferred Candidate	D share (outcome)
2018	Lt. Governor	Triana Arnold James (B)	.4475 (L)
2018	Super. Primary	Otha Thornton (B)	.4387 (1st of 3)
2018	Super. Runoff	Otha Thornton (B)	.5914 (W)
2018	Insurance Commiss.	Janice Laws Robinson (B)	.6286 (W)

Table 3: Eight general elections and four primaries and primary runoffs are chosen for the score of effectiveness.

5.2 Constructing and evaluating a score of electoral alignment

Using the four primary and eight general elections listed here, I will deem a district to be *effective* if it is electorally aligned with the preferences of Black and Latino voters in at least three out of four primaries and at least five out of eight general elections. This standard ascertains that minority-preferred candidates can be both nominated and elected from the district, and it distinguishes minority preferences from (related, but distinct) Democratic party preferences. This same core idea of measuring district effectiveness—keyed to electoral history, not to demographics of the district—appears frequently in the peer-reviewed literature, for instance in [1].

The enacted plans starkly limit the number of districts that earn the label of effective. Tables 4-6 show that five out of 14 Congressional districts are likely to give Black and Latino voters an effective opportunity to elect candidates of choice.

Similarly, the enacted plans have 19 expected effective districts out of 56 in the Senate, and 68/180 in the House. (For detailed supporting tables, see Appendix B.)

Since elections were conducted under these new districts in 2022, we can review some basic evidence about the success of the classification of "effective" opportunity districts. I have not conducted a racially polarized voting analysis, but we can nonetheless use information about whether each district elected candidates of color as a rough proxy for the preferences of voters of color. Since White and/or Republican candidates can certainly be preferred by voters of color, this is imperfect, but it is at least an indication that can help us assess the labeling mechanism.[7] Here is what we find for the enacted plans:

- 5/5 Congressional districts marked effective elected POC Democrats (100%);
- 0/9 Congressional districts marked ineffective elected POC Democrats (0%);
- 18/19 Senate districts marked effective elected POC Democrats (94.7%);
- 1/37 Senate districts marked ineffective elected POC Democrats (2.7%);
- 58/68 House districts marked effective elected POC Democrats (85.3%);
- 4/112 House districts marked ineffective elected POC Democrats (3.6%).

CD	Primaries out of 4	Generals out of 8	Effective?
1	3	0	N
2	4	8	Y
3	3	0	N
4	3	8	Y
5	3	8	Y
6	0	0	N
7	3	8	Y
8	3	0	N
9	2	0	N
10	3	0	N
11	3	0	N
12	3	0	N
13	4	8	Y
14	3	0	N

Table 4: By the standard of requiring that the candidate of choice should win at least three out of four primaries and at least five out of eight generals, the enacted plan has five districts that present an effective opportunity: CD 2, 4, 5, 7, and 13.

CD overall	James18P 0.4475	Thornton18P 0.4387	Thornton18R 0.5914	Robinson18P 0.6286
1	0.4992	0.4997	0.7150	0.6967
2	0.5515	0.4720	0.6379	0.7430
3	0.4177	0.4185	0.5388	0.6178
4	0.4566	0.4444	0.5622	0.6034
5	0.3747	0.4082	0.5611	0.5184
6	0.2815	0.3458	0.4720	0.4789
7	0.4489	0.4515	0.5968	0.6082
8	0.4861	0.4403	0.6273	0.6940
9	0.3411	0.3811	0.5444	0.5560
10	0.4112	0.4294	0.6444	0.5898
11	0.3603	0.4200	0.5276	0.5549
12	0.4928	0.4196	0.6462	0.7626
13	0.5594	0.5089	0.6524	0.7190
14	0.4190	0.3863	0.5049	0.6123

Table 5: Vote shares for the candidate of choice in probative primary and runoff elections. (Note that the Superintendent primary from 2018 (Thornton18P) is a race with three candidates, so a win is recorded if Thornton has the most votes, even if that does not exceed 50% of cast votes.)

[7] Indeed, Nan Orrock of SD 36, the only White Democrat in the Senate to be elected from a district marked effective, is an Associate Member of the Georgia Black Legislative Caucus, suggesting with high likelihood that she is the Black candidate of choice.

CD	**Clinton16**	**Abrams18**	**Thornton18**	**Biden20**	**Blackman20**	**Ossoff21**	**Warnock21**	**Abrams22**
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
1	0.4149	0.4245	0.4105	0.4322	0.4193	0.4379	0.4386	0.3950
2	0.5463	0.5508	0.5354	0.5524	0.5445	0.5611	0.5624	0.5188
3	0.3168	0.3287	0.3119	0.3476	0.3312	0.3524	0.3564	0.3130
4	0.7692	0.7886	0.7567	0.7917	0.7789	0.7927	0.7982	0.7707
5	0.8352	0.8418	0.7910	0.8366	0.8080	0.8203	0.8287	0.8072
6	0.3603	0.3878	0.3498	0.4250	0.3851	0.4068	0.4151	0.3602
7	0.5727	0.6113	0.5788	0.6307	0.6136	0.6366	0.6421	0.5874
8	0.3430	0.3427	0.3280	0.3604	0.3473	0.3648	0.3664	0.3185
9	0.2650	0.2822	0.2668	0.3081	0.2897	0.3084	0.3129	0.2554
10	0.3510	0.3654	0.3518	0.3814	0.3650	0.3864	0.3903	0.3480
11	0.3708	0.4014	0.3741	0.4223	0.3972	0.4163	0.4233	0.3696
12	0.4324	0.4319	0.4174	0.4487	0.4331	0.4511	0.4526	0.4023
13	0.7790	0.8112	0.7916	0.8048	0.8068	0.8230	0.8261	0.8056
14	0.2767	0.2961	0.2873	0.3105	0.3015	0.3217	0.3234	0.2778

Table 6: Vote shares for the candidate of choice in probative general/runoff elections.

In addition, this method works quite well to distinguish race from party: if we flag districts with 0/4 primary wins and at least 5/8 general wins, these might reasonably be considered likely to elect White-preferred Democrats. There are no such districts in the enacted Congressional map, but the Senate map has three (which elected three White Democrats and one Asian Democrat in November 2022) and the House map has eight (which elected seven White Democrats and one Asian Democrat).

6 Metrics for enacted plans

Georgia has 14 Congressional districts, 56 state Senate districts, and 180 state House districts, making the task of redistricting into an extremely complicated balancing act. The list of substantive criteria for assessing districting plans that was published by each chamber of the Legislature reads as follows, in full:

```
A. GENERAL PRINCIPLES FOR DRAFTING PLANS
1. Each congressional district should be drawn with a total population of plus
   or minus one person from the ideal district size.
2. Each legislative district of the General Assembly should be drawn to
   achieve a total population that is substantially equal as practicable,
   considering the principles listed below.
3. All plans adopted by the Committee will comply with Section 2 of the
   Voting Rights Act of 1965, as amended.
4. All plans adopted by the Committee will comply with the United States
   and Georgia Constitutions.
5. Districts shall be composed of contiguous geography. Districts that
   connect on a single point are not contiguous.
6. No multi-member districts shall be drawn on any legislative redistricting plan.
7. The Committee should consider:
   a.  The boundaries of counties and precincts;
   b.  Compactness; and
   c.  Communities of interest.
8. Efforts should be made to avoid the unnecessary pairing of incumbents.
9. The identifying of these criteria is not intended to limit the consideration
   of any other principles or factors that the Committee deems appropriate.
```

This is unusually terse for a redistricting framework at the state level, declining to specify more detail, for example, about the operative principles of racial fairness, the definition of communities of interest, or even whether to encourage the use of quantitative metrics of compactness.

All of the plans under consideration are contiguous, and I will systematically discuss the other principles below.

6.1 Population balance

All plans are tightly balanced in population terms, using the Census redistricting data.

	Maximum positive deviation	Maximum negative deviation	Top-to-bottom deviation
EnactedCD	+1	−1	2
DuncanKennedy	+2	−1	3
CD Alt	+1	−1	2
EnactedSD	+1879	−1964	3843 (2.01%)
SD Alt Eff 1	+2457	−2598	5055 (2.64%)
SD Alt Eff 2	+2547	−2490	5037 (2.63%)
SD Alt Eff 3	+3200	−3305	6505 (3.40%)
EnactedHD	+797	−833	1630 (2.74%)
HD Alt Eff 1	+1194	−1176	2370 (3.98%)
HD Alt Eff 2	+1222	−1097	2319 (3.90%)
HD Alt Eff 3	+1173	−1026	2199 (3.70%)

Table 7: Population deviation in each plan.

6.2 Compactness

In redistricting, the notion of *compactness* is connected to the shapes of the districts, where simple boundaries and regular shapes are traditionally thought to indicate a "natural" division of population, while eccentric boundaries and contorted shapes can signal that some other agenda has predominated.

The two most common compactness metrics are the Polsby-Popper score and the Reock score. These are both *contour-based* scores that rely on the outline of the district on a map. *Polsby-Popper* is a ratio formed by comparing the district's area to its perimeter via the formula $4\pi A/P^2$. *Reock* considers how much of the smallest bounding circle is filled out by the district's area. Recently, mathematicians (such as myself) have argued for the use of discrete compactness metrics that de-emphasize the outline and instead consider how the districts are formed from units of census geography. The simplest discrete metric is called *(block) cut edges*, found by counting the number of pairs of census blocks that are adjacent to each other in the state, but are assigned to different districts. This assesses the "scissors complexity" of a plan, giving a measure of how many blocks would have to be separated from one another to divide up all the districts.

An advantage of the contour scores is that they are familiar and in wide use. An advantage of discrete scores is that they do not excessively penalize districts for having winding boundaries when those boundaries come from physical geography, like coastlines or rivers.

	avg Polsby-Popper (higher is better)	**avg Reock** (higher is better)	**Block cut edges** (lower is better)
BenchmarkCD	0.238	0.452	5775
EnactedCD	0.267	0.441	5075
DuncanKennedy	0.295	0.471	4665
CD Alt	0.287	0.452	4729
BenchmarkSD	0.250	0.421	12,549
EnactedSD	0.287	0.418	11,005
SD Alt Eff 1	0.287	0.427	10,897
SD Alt Eff 2	0.296	0.440	10,349
SD Alt Eff 3	0.295	0.431	10,479
BenchmarkHD	0.244	0.382	24,001
EnactedHD	0.278	0.391	22,014
HD Alt Eff 1	0.275	0.399	21,360
HD Alt Eff 2	0.281	0.406	21,301
HD Alt Eff 3	0.279	0.403	20,917

Table 8: Compactness scores for each plan.

Note that compactness scores should only be used to make relative assessments, comparing plans to others in the same state and at the same level of redistricting.

6.3 Respect for political boundaries

The most populous Georgia counties by 2020 population are Fulton County (pop. 1,066,710), Gwinnett County (pop. 957,062), Cobb County (pop. 766,149), and DeKalb County (pop. 764,382). Both Cobb and DeKalb are within 0.1% of ideal Congressional district size of 765,136, with Cobb slightly larger and DeKalb slightly smaller.[8]

Since there are four times as many Senate as Congressional districts, this also means that Cobb (4.005) and DeKalb (3.996) are ideally suited in population terms to make up four Senate districts; in addition, Gwinnett (5.003) is very nearly five times ideal Senate population. Instead, Cobb touches six Senate districts, DeKalb touches seven, and Gwinnett is split among nine in the enacted Senate plan. This observation spotlights the fact that it is important to consider not only how many counties are split, but into how many pieces, as in Table 9. If a unit is split in two, that adds two to the "pieces" count; likewise, if it is split into three parts, this counts as three "pieces," and so on. Unsplit units do not count toward "pieces." (A forensic look at the nature of the county and precinct splits can be found below in §10.2.) In this table, the "muni" units are Census places with functional status A ("Active government providing primary general-purpose functions").[9] These primarily include cities and towns.

	County Splits (out of 159)	**County Pieces**	**Muni Splits** (out of 538)	**Muni Pieces**	**Precinct Splits** (out of 2685)	**Precinct Pieces**
BenchmarkCD	16	38	67	141	67	134
EnactedCD	15	36	64	136	86	172
DuncanKennedy	15	36	53	114	66	132
CD Alt	13	30	58	127	47	95
BenchmarkSD	37	100	114	269	154	309
EnactedSD	29	89	109	266	144	289
SD Alt Eff 1	33	95	112	275	110	221
SD Alt Eff 2	26	78	108	264	97	196
SD Alt Eff 3	29	84	108	264	106	213
BenchmarkHD	72	284	169	506	303	630
EnactedHD	69	278	166	494	352	724
HD Alt Eff 1	73	276	164	492	279	570
HD Alt Eff 2	69	266	168	494	276	567
HD Alt Eff 3	69	265	165	478	277	567

Table 9: Number of county, muni, and precinct splits and pieces in each plan.

[8] This means that only three Georgia counties are larger than the ideal population of a Congressional district. Twelve Georgia counties are larger than ideal Senate size, and thirty-nine Georgia counties, from Fulton down to Effingham (pop. 64,769) are larger than ideal House size.

[9] https://www.census.gov/library/reference/code-lists/functional-status-codes.html

6.4 Racial demographics

Though majority-minority districts are not demanded for compliance with the Voting Rights Act, they nonetheless play a significant role in VRA litigation, especially in the Gingles 1 threshold test. For that purpose, plaintiffs must show maps with additional districts that are at least 50%+1 person composed of members of the specified minority group. Typically, when Black residents are the largest minority group, the basis for measurement is BVAP, or voting age population, as tabulated in the Decennial Census data. For a coalition of Black and Latino voters, we additionally use a secondary basis of population, in this case BHCVAP.

Here, I review the plans discussed in this report and enumerate the number of districts that have a majority of voting age population that is Black by VAP, Black and Latino by VAP, or Black and Latino by CVAP. The final column enumerates the number of districts that, according to their recent electoral history in statewide contests, are likely to provide an effective opportunity for Black and Latino voters to nominate and elect candidates of their choosing. Racial and ethnic categories are described in Appendix A, and the concept of measuring district effectiveness is delineated in §5.

	majority BVAP	**majority BHVAP**	**majority BHCVAP**	**effective**
BenchmarkCD	4	4	4	5
EnactedCD	2	5	4	5
Duncan-Kennedy	3	5	4	5
CD Alt	4	6	6	6
BenchmarkSD	14	17	17	19
EnactedSD	14	17	17	19
SD Alt Eff 1	17	23	22	23
SD Alt Eff 2	15	21	21	23
SD Alt Eff 3	8	17	16	28
BenchmarkHD	46	57	57	62
EnactedHD	49	62	60	68
HD Alt Eff 1	50	77	74	77
HD Alt Eff 2	44	75	71	79
HD Alt Eff 3	37	62	54	83

Table 10: The first three columns report the number of majority-BVAP, majority-BHVAP, and majority-BHCVAP districts, in the plans under discussion in this report. Overall, the state is 31.7% Black by VAP, 40.18% Black and Latino by VAP, and 38.43% Black and Latino by CVAP. The final column reports the number of districts labeled as effective in terms of electoral opportunity for Black and Latino voters.

6.5 Incumbency and core retention

Next, we review the handling of incumbency and the more general issue of reassigning voters to new districts in the plans under consideration. Note that members of Congress do not have to establish residency in the district that they represent, while Georgia law does have a district residency requirement for members of the state legislature.[10] In this section, I am relying on address data for incumbents that was supplied by counsel and there is certainly a strong possibility that it is not fully up-to-date or accurate.

The enacted Congressional plan double-bunked two pairs of incumbents: Nikema Williams (D) and David Scott (D) in CD 5; Jody Hice (R) and Andrew Clyde (R) in CD 10. However, Hice did not run for Congress in 2022, shifting to an unsuccessful run for Secretary of State, and David Scott already lived in CD 5 in the benchmark plan.

The enacted Senate plan also double-bunked two pairs of incumbents: Tyler Harper (R) and Carden Summers (R) in SD 13; Chuck Hufstetler (R) and Bruce Thompson (R) in SD 52. But Harper ran a successful campaign for Agriculture Commissioner, leaving Summers to win SD 13, while Thompson ran a successful campaign for Labor Commissioner, leaving SD 52 for Hufstetler. This leaves no meaningful pairings in the Senate map.

The shifting of incumbents is also apparent in the state House map. The enacted House plan seemingly double-bunks seventeen pairs of incumbents: nine R/R pairs, six D/D pairs, and two R/D pairs.

However, the apparent HD 10 collision is suspect (likely due to an inaccurate address for Lauren "Bubba" McDonald) because McDonald was reelected in HD 26, which contains no incumbent address from our list. Several seeming collisions are not meaningful because one of the Representatives had already retired or resigned: this includes Micah Gravley (now located in HD 19), Wes Cantrell (HD 21), Tommy Benton (HD 31), Matt Dollar (HD 45), Susan Holmes (HD 118), and Dominic LaRiccia (HD 176). The HD 100 collision is real, and Bonnie Rich lost to David Clark in the Republican primary; the HD 149 collision also ended in a primary showdown.

Among Democratic collisions, we note that Matthew Wilson (placed in HD 52) made an unsuccessful primary run for Insurance Commissioner; William Boddie made an unsuccessful run for Labor Commissioner; and David Dreyer (HD 62) did not run. Mitchell and Hutchinson did face off in a primary in HD 106.

Among the R/D collisions, Mickey Stephens (HD 74) died in office; Timothy Barr (HD 101) ran an unsuccessful primary for CD 10; and Winifred Dukes (HD 154) ran an unsuccessful primary for Agriculture Commissioner.

In all, this means that of 17 apparent collisions of incumbents, only three ended in a contest between incumbents. By far most of the others seem to be explained by retirement, resignation, or a run for another office.[11]

While incumbent pairings were therefore avoided, this is not to say that the new House plan was very favorable to incumbents in other ways. As I will discuss throughout this report, the state's line-drawers clearly placed a low priority on *core retention*, i.e., on maintaining voters in the same districts as they belonged to in the benchmark plan. The enacted plans for Congress and for state Senate each reassign more then two million residents to new districts relative to the prior assignment of their census block. But the House plan is on another level, with 6,135,234 people—roughly three out of every five Georgia residents—voting in a different district than before. This unusually high displacement is certainly permissible under the law, but it reveals that the legislature was willing to accept major changes to the map in pursuit of other goals. Below, in §10.1, I will present a closer look at which districts were particularly targeted for wholesale reconfiguration.

[10] See law.georgia.gov/opinions/2001-3-0.

[11] With the caveat that these numbers may not be highly meaningful without considering who planned to run again, and that they may not be wholly accurate, here are the numbers of districts with more than one incumbent address for the alternative plans. Benchmark CD - 1, SD - 0, HD - 5; Duncan-Kennedy - 3; CD Alt - 3; SD Alt Eff 1 - 11; SD Alt Eff 2 - 8; SD Alt Eff 3- 9; HD Alt Eff 1 - 35; HD Alt Eff 2 - 31; HD Alt Eff 3 - 31.

7 Gingles demonstration plans

7.1 Congressional alternatives

The state's enacted Congressional plan has two majority-BVAP districts (CD 4 and CD 13). Moving to the Black and Latino coalition, three more districts (CD 2, CD 5, and CD 7, by a hair) join these in being majority-BHVAP. However, if we switch the basis of population to CVAP rather than VAP, the number of coalition districts in the state's enacted plan drops to 4, losing CD 7.

Here, I have provided an alternative plan with 4/6/6 majority districts (by BVAP, BHVAP, and BHCVAP, respectively). That is, the six coalition-majority districts (CD 2, 3, 4, 5, 7, and 13) are still BH-majority on the basis of CVAP, making this a gain of two districts over the state. The newcomer to the list is CD 3, which runs along Georgia's western border, connecting the metro Atlanta area to Sanford Bishop's district in the southwest. By the notion of electoral effectiveness outlined in §5 below, all six of these districts offer an effective opportunity for Black and Latino voters to elect candidates of choice (Table 50).

	CD Enacted (Statewide)						**CD Alt 1**					
CD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
1	28.2%	6.8%	35.0%	60.4%	0.285	0.456	30.3%	6.9%	37.2%	58.5%	0.312	0.633
2	49.3%	5.1%	54.4%	42.7%	0.267	0.458	47.7%	4.7%	52.4%	44.5%	0.315	0.494
3	23.3%	5.3%	28.6%	66.8%	0.275	0.461	51.2%	7.2%	58.4%	37.4%	0.278	0.411
4	54.5%	10.1%	64.6%	28.3%	0.246	0.307	50.6%	8.2%	58.8%	33.8%	0.295	0.481
5	49.6%	6.7%	56.3%	37.9%	0.322	0.512	50.1%	11.4%	61.5%	33.4%	0.216	0.424
6	9.9%	9.1%	19.0%	66.6%	0.198	0.424	13.7%	10.9%	24.6%	57.1%	0.232	0.346
7	29.8%	21.3%	51.1%	32.8%	0.386	0.496	34.3%	22.4%	56.7%	29.4%	0.351	0.518
8	30.0%	6.1%	36.1%	60.5%	0.210	0.338	27.3%	6.9%	34.2%	63.0%	0.227	0.377
9	10.4%	12.9%	23.3%	68.3%	0.253	0.380	4.6%	11.5%	16.1%	77.9%	0.403	0.512
10	22.6%	6.5%	29.1%	66.2%	0.284	0.558	17.6%	6.9%	24.5%	69.8%	0.335	0.576
11	17.9%	11.2%	29.1%	64.0%	0.207	0.480	17.6%	7.6%	25.2%	68.1%	0.283	0.364
12	36.7%	4.9%	41.6%	54.6%	0.278	0.502	39.2%	4.6%	43.8%	51.9%	0.181	0.489
13	66.7%	10.5%	77.2%	18.8%	0.157	0.380	52.0%	6.8%	58.8%	37.8%	0.276	0.510
14	14.3%	10.6%	24.9%	71.3%	0.373	0.426	7.6%	11.0%	18.6%	77.0%	0.514	0.484
Avg					0.267	0.441					0.301	0.473

Table 11: VAP statistics and compactness comparison by district for the enacted Congressional plan and an alternative plan. The alternative plan has more majority-minority districts; it is also more compact by all three scores of compactness, including both contour-based scores in the table as well as 4665 rather than 5075 cut edges. The alternative also splits only 13 counties while the enacted plan splits 15. CVAP comparison is shown below in Table 24.

7.2 State Senate alternatives

Overall, the enacted state Senate plan creates majority BVAP/BHVAP/BHCVAP majority districts in the numbers 14/17/17 out of 56. By mixing and matching the options I have provided, my modular alternatives can replace that with a new Senate plan with and additional 1-6 majority districts.

The increase is accomplished while maintaining other traditional principles—like compactness and splitting scores—that are generally comparable to or better than those of the state's enacted plan.

Below, I will review the Gingles demonstration alternatives one cluster at a time, showing the enacted plan and alternatives (which sometimes include both an Alt 1 and an Alt 2) for each cluster. The purpose of showing multiple alternatives is to illustrate the kinds of tradeoffs present in all redistricting problems, and to give a sense of the enormous range of possible directions for satisfying the Gingles 1 threshold test.

7.2.1 SD Atlanta

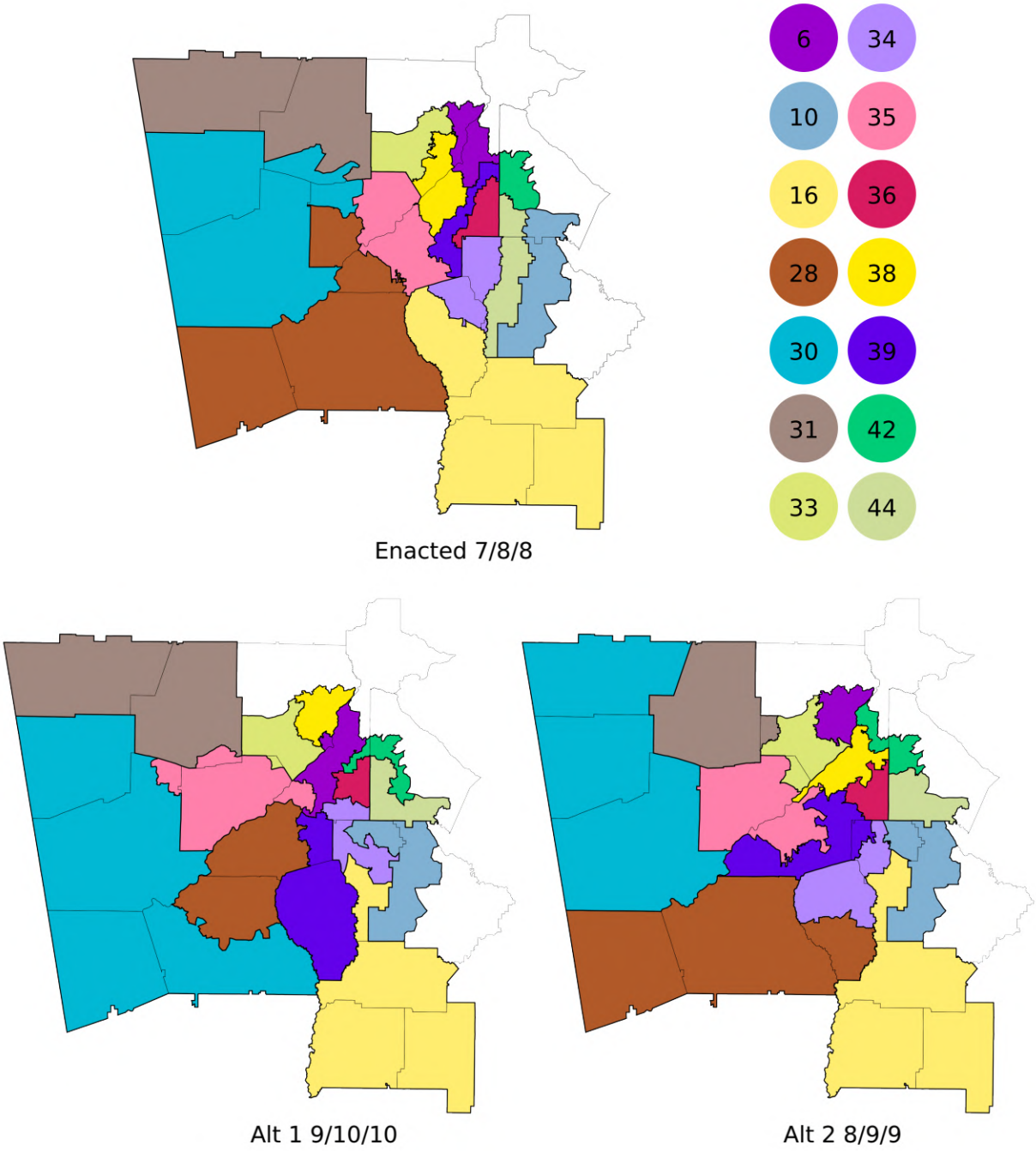


Figure 8: SD Atlanta (14 districts).

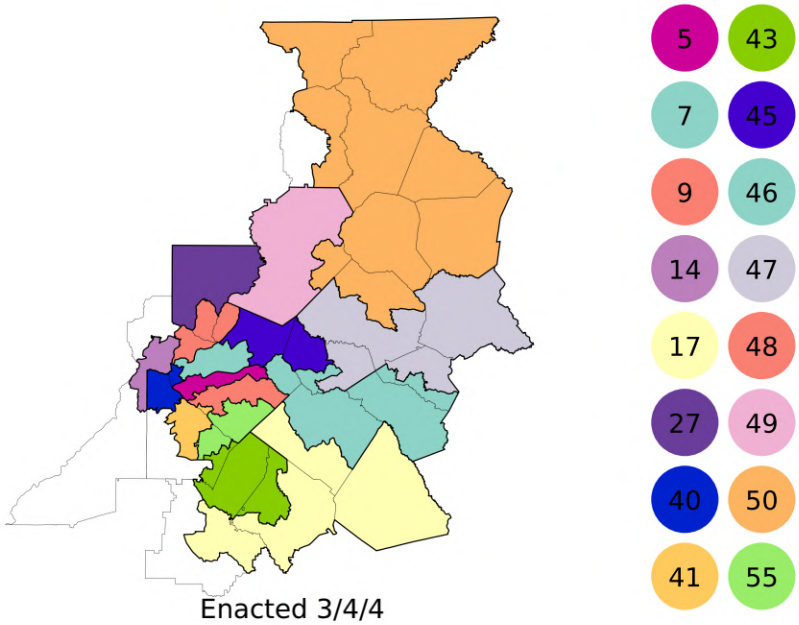
	SD Atlanta Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
6	23.9%	8.2%	32.1%	57.8%	0.236	0.405	50.1%	6.1%	56.2%	39.8%	0.169	0.246
10	71.5%	5.2%	76.7%	19.6%	0.231	0.281	59.5%	11.0%	70.5%	23.4%	0.238	0.420
16	22.7%	5.0%	27.7%	66.9%	0.314	0.368	50.2%	6.2%	56.4%	40.9%	0.254	0.354
28	19.5%	6.4%	25.9%	69.4%	0.246	0.445	50.6%	6.8%	57.4%	39.3%	0.335	0.489
30	20.9%	6.1%	27.0%	69.4%	0.407	0.597	14.3%	5.1%	19.4%	76.9%	0.286	0.361
31	20.7%	7.4%	28.1%	68.3%	0.379	0.366	19.7%	7.2%	26.9%	69.4%	0.470	0.395
33	43.0%	22.9%	65.9%	30.2%	0.215	0.401	50.4%	18.1%	68.5%	27.9%	0.381	0.528
34	69.5%	12.7%	82.2%	13.4%	0.335	0.451	72.2%	11.6%	83.8%	11.5%	0.163	0.326
35	71.9%	7.5%	79.4%	18.8%	0.263	0.472	50.9%	8.0%	58.9%	38.2%	0.347	0.400
36	51.3%	7.1%	58.4%	36.2%	0.305	0.321	50.0%	5.7%	55.7%	38.8%	0.339	0.452
38	65.3%	8.4%	73.7%	21.9%	0.208	0.361	27.9%	15.4%	43.3%	46.1%	0.271	0.487
39	60.7%	5.6%	66.3%	27.9%	0.128	0.166	51.2%	5.4%	56.6%	38.6%	0.277	0.357
42	30.8%	8.6%	39.4%	51.4%	0.321	0.479	35.8%	9.6%	45.4%	43.5%	0.112	0.289
44	71.3%	8.6%	79.9%	15.3%	0.185	0.180	61.6%	3.6%	65.2%	31.0%	0.237	0.356
Avg					0.270	0.378					0.277	0.390

Table 12: SD Atlanta Alt 1 splits 8 counties within the cluster compared to 7 in the enacted plan and has a better discrete compactness score, with 2017 cut edges rather than 2197, to go with comparable Polsby-Popper and superior Reock compactness.

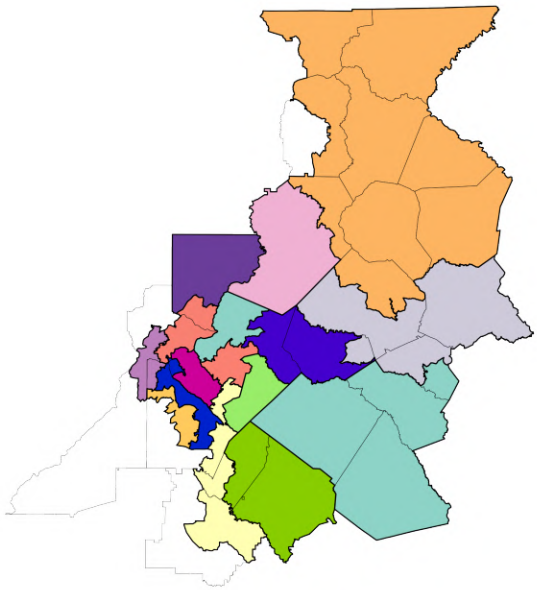
	SD Atlanta Enacted						**SD Alt 2**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
6	23.9%	8.2%	32.1%	57.8%	0.236	0.405	28.0%	14.9%	42.9%	46.7%	0.256	0.477
10	71.5%	5.2%	76.7%	19.6%	0.231	0.281	59.7%	9.8%	69.5%	23.3%	0.307	0.416
16	22.7%	5.0%	27.7%	66.9%	0.314	0.368	48.4%	6.1%	54.5%	42.4%	0.258	0.366
28	19.5%	6.4%	25.9%	69.4%	0.246	0.445	15.8%	6.1%	21.9%	72.8%	0.347	0.371
30	20.9%	6.1%	27.0%	69.4%	0.407	0.597	15.7%	6.6%	22.3%	74.2%	0.473	0.508
31	20.7%	7.4%	28.1%	68.3%	0.379	0.366	25.9%	6.7%	32.6%	63.6%	0.591	0.636
33	43.0%	22.9%	65.9%	30.2%	0.215	0.401	50.6%	18.2%	68.8%	27.4%	0.224	0.463
34	69.5%	12.7%	82.2%	13.4%	0.335	0.451	54.4%	11.9%	66.3%	27.9%	0.246	0.381
35	71.9%	7.5%	79.4%	18.8%	0.263	0.472	60.9%	7.5%	68.4%	29.3%	0.206	0.490
36	51.3%	7.1%	58.4%	36.2%	0.305	0.321	54.0%	6.8%	60.8%	33.6%	0.263	0.466
38	65.3%	8.4%	73.7%	21.9%	0.208	0.361	51.0%	5.6%	56.6%	37.6%	0.154	0.260
39	60.7%	5.6%	66.3%	27.9%	0.128	0.166	86.5%	5.5%	92.0%	7.0%	0.118	0.271
42	30.8%	8.6%	39.4%	51.4%	0.321	0.479	17.0%	10.7%	27.7%	61.4%	0.144	0.282
44	71.3%	8.6%	79.9%	15.3%	0.185	0.180	76.3%	3.2%	79.5%	18.7%	0.374	0.456
Avg					0.270	0.378					0.283	0.417

Table 13: SD Atlanta Alt 2 splits 6 counties within the cluster and has just 1985 cut edges, better than the enacted plan's 7 and 2197, while also improving on both contour-based compactness scores.

7.2.2 SD Gwinnett



Enacted 3/4/4



Alt 1 4/7/6

Figure 9: SD Gwinnett (16 districts).

	SD Gwinnett Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
5	29.9%	41.7%	71.6%	15.7%	0.207	0.166	20.3%	34.6%	54.9%	28.0%	0.285	0.384
7	21.4%	16.6%	38.0%	37.8%	0.339	0.344	17.1%	14.3%	31.4%	45.5%	0.278	0.401
9	29.5%	18.8%	48.3%	35.8%	0.213	0.233	29.3%	27.0%	56.3%	26.2%	0.234	0.498
14	19.0%	12.1%	31.1%	57.1%	0.242	0.273	18.1%	11.4%	29.5%	57.6%	0.208	0.296
17	32.0%	5.1%	37.1%	59.4%	0.168	0.342	51.1%	6.6%	57.7%	35.9%	0.113	0.188
27	5.0%	10.2%	15.2%	71.5%	0.456	0.499	4.7%	10.2%	14.9%	70.8%	0.500	0.497
40	19.2%	21.6%	40.8%	46.3%	0.345	0.508	50.1%	17.7%	67.8%	25.1%	0.130	0.208
41	62.6%	6.7%	69.3%	21.4%	0.302	0.509	57.3%	10.0%	67.3%	23.3%	0.149	0.279
43	64.3%	6.9%	71.2%	26.5%	0.346	0.635	52.0%	7.0%	59.0%	38.3%	0.420	0.537
45	18.6%	13.1%	31.7%	55.5%	0.305	0.350	19.8%	12.1%	31.9%	58.8%	0.226	0.380
46	16.9%	7.0%	23.9%	69.9%	0.207	0.365	16.5%	5.0%	21.5%	73.4%	0.416	0.514
47	17.4%	9.6%	27.0%	67.5%	0.187	0.353	16.7%	8.7%	25.4%	68.5%	0.176	0.326
48	9.5%	7.0%	16.5%	52.2%	0.342	0.348	10.1%	6.4%	16.5%	54.8%	0.266	0.387
49	8.0%	21.9%	29.9%	65.6%	0.341	0.461	8.1%	24.6%	32.7%	62.8%	0.382	0.573
50	5.6%	8.8%	14.4%	81.5%	0.228	0.450	5.4%	6.1%	11.5%	84.3%	0.232	0.462
55	66.0%	8.7%	74.7%	20.6%	0.271	0.333	50.0%	13.9%	63.9%	30.0%	0.419	0.451
Avg					0.281	0.386					0.277	0.399

Table 14: SD Gwinnett Alt 1 has 9 splits and 2024 cut edges, both better than the enacted plan (10 and 2232). The Polsby-Popper scores are comparable while the alternative plan has a better Reock score.

7.2.3 SD East Black Belt

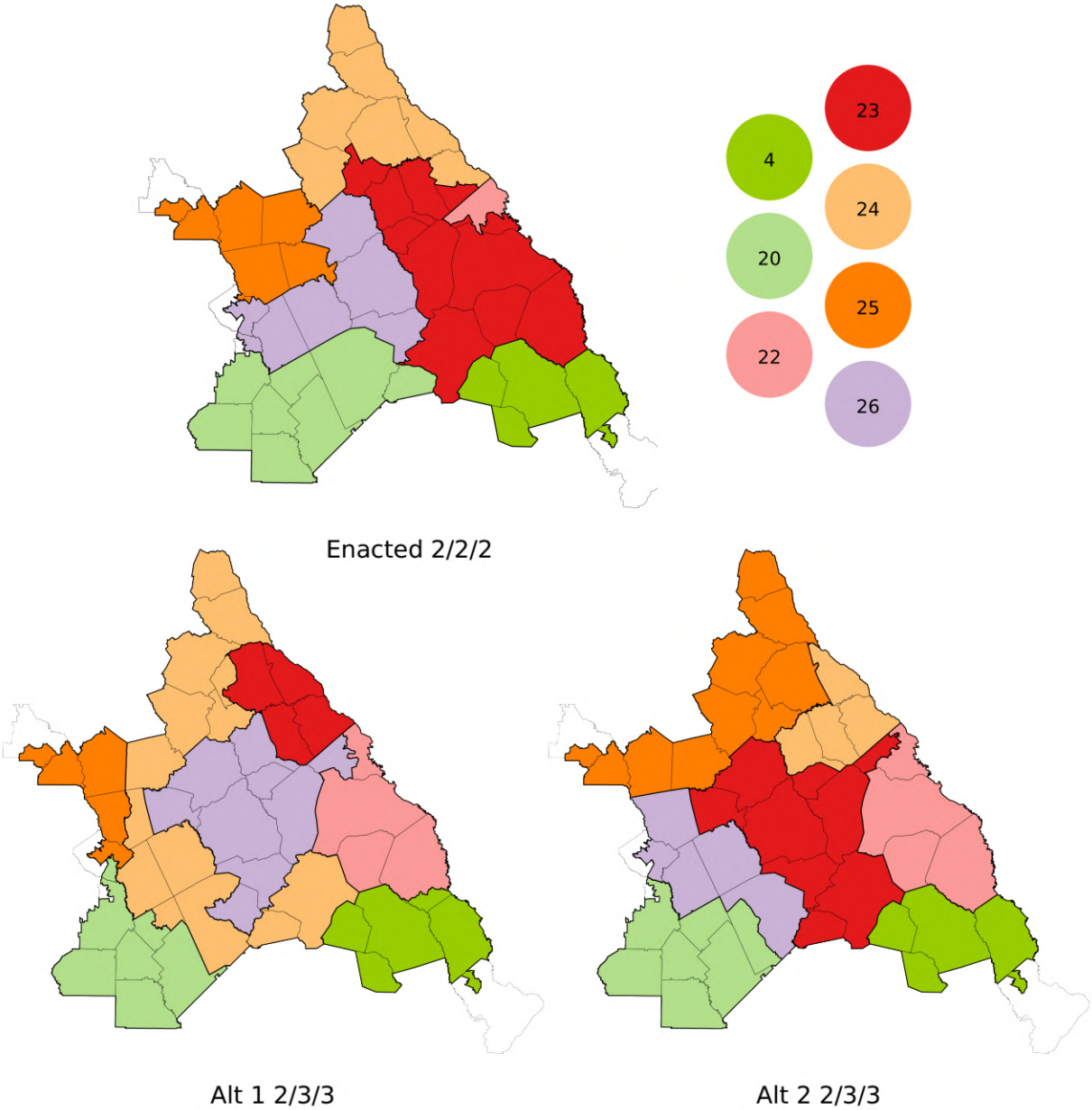


Figure 10: SD East Black Belt (7 districts).

	SD East Black Belt Enacted						**SD Alt 1**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
4	23.4%	5.5%	28.9%	66.8%	0.265	0.471	23.5%	5.5%	29.0%	66.7%	0.284	0.495
20	31.3%	3.5%	34.8%	61.7%	0.358	0.404	34.4%	5.1%	39.5%	56.5%	0.231	0.498
22	56.5%	5.3%	61.8%	34.4%	0.288	0.404	50.5%	3.8%	54.3%	42.6%	0.241	0.455
23	35.5%	4.5%	40.0%	56.9%	0.164	0.365	23.0%	5.6%	28.6%	64.6%	0.466	0.497
24	19.9%	4.4%	24.3%	69.8%	0.213	0.366	25.0%	3.5%	28.5%	69.1%	0.083	0.229
25	33.5%	3.7%	37.2%	59.9%	0.241	0.386	50.0%	4.0%	54.0%	43.4%	0.174	0.344
26	57.0%	4.2%	61.2%	36.6%	0.203	0.469	50.1%	3.7%	53.8%	43.4%	0.209	0.472
Avg					0.247	0.409					0.241	0.427

Table 15: SD East Black Belt Alt 1 has more cut edges than the state (1301 vs. 1021 from the enacted plan), paired with a comparable Polsby-Popper and a superior Reock score. This alternative plan splits seven counties while the state splits four within the cluster.

	SD East Black Belt Enacted						**SD Alt 2**					
SD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
4	23.4%	5.5%	28.9%	66.8%	0.265	0.471	23.4%	5.5%	28.9%	66.8%	0.265	0.471
20	31.3%	3.5%	34.8%	61.7%	0.358	0.404	32.5%	4.9%	37.4%	58.7%	0.304	0.586
22	56.5%	5.3%	61.8%	34.4%	0.288	0.404	50.4%	3.5%	53.9%	42.9%	0.264	0.432
23	35.5%	4.5%	40.0%	56.9%	0.164	0.365	47.4%	4.1%	51.5%	45.8%	0.231	0.441
24	19.9%	4.4%	24.3%	69.8%	0.213	0.366	23.1%	5.6%	28.7%	64.5%	0.327	0.458
25	33.5%	3.7%	37.2%	59.9%	0.241	0.386	28.2%	4.5%	32.7%	64.3%	0.176	0.311
26	57.0%	4.2%	61.2%	36.6%	0.203	0.469	51.2%	3.1%	54.3%	43.5%	0.205	0.331
Avg					0.247	0.409					0.253	0.433

Table 16: SD East Black Belt Alt 2 has just two county splits, compared to four in the state's plan. With just 1008 cut edges, it also executes a clean sweep of compactness scores relative to the enacted plan.

7.3 State House alternatives

In the state House, the enacted plan creates majority districts for BVAP/BHVAP/BHCVAP in the numbers 49/62/60 out of 180. Taken together, my modular alternatives can combine to replace that with a new House plan with up to 77 majority-BHVAP districts and up to 74 majority-BHCVAP districts.

7.3.1 HD Atlanta

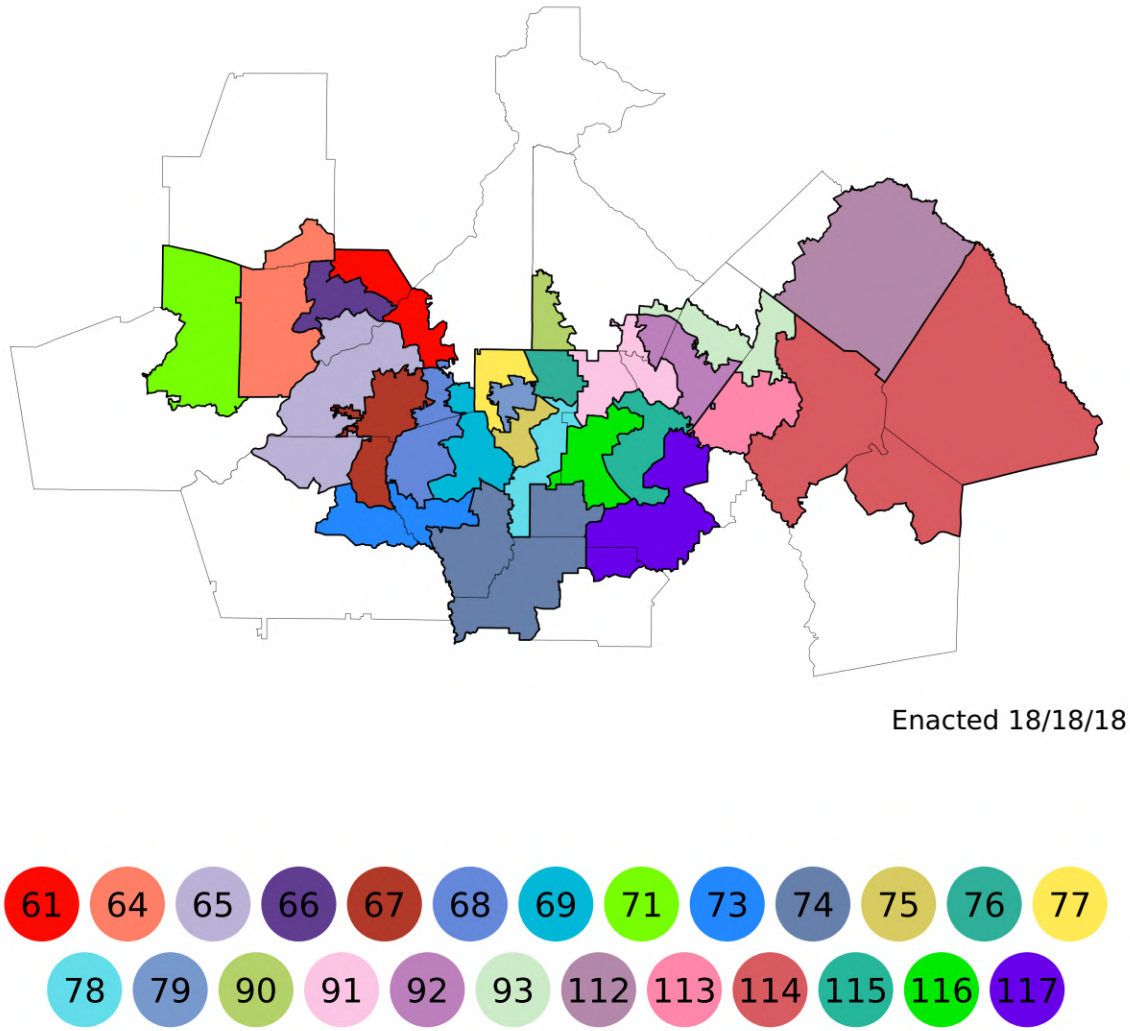
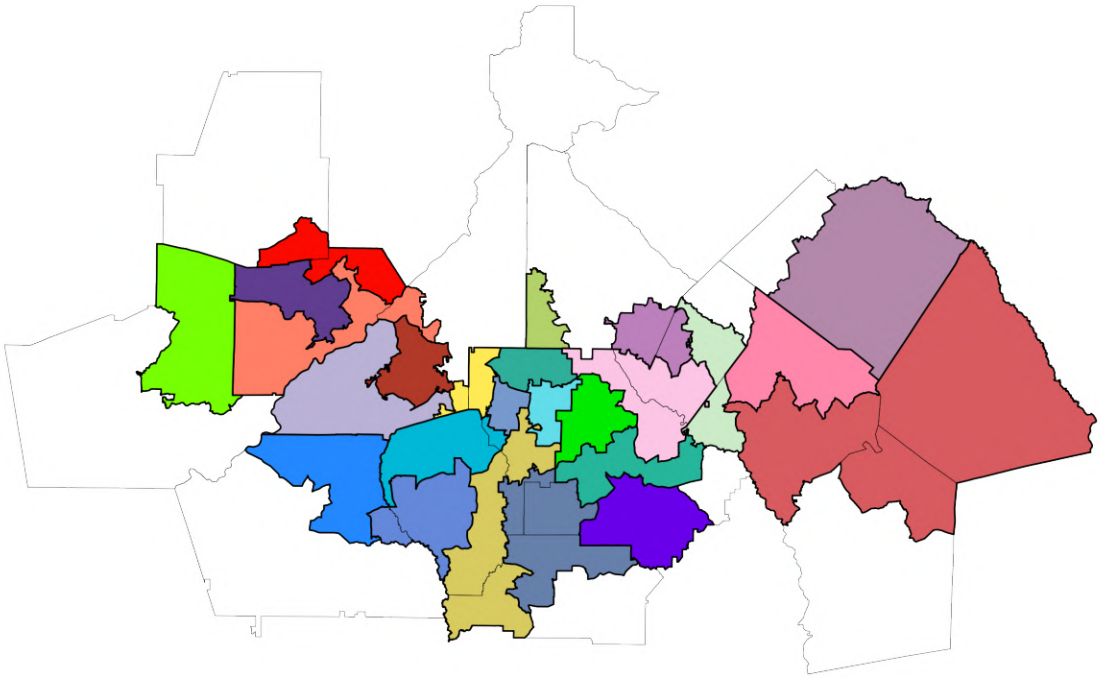
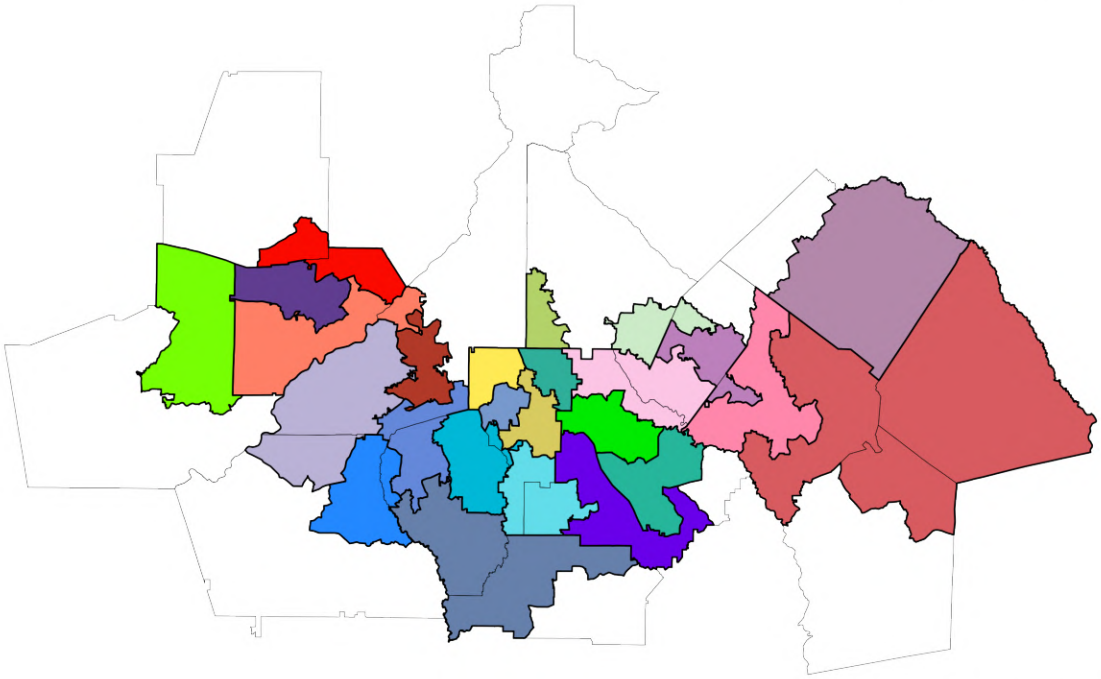


Figure 11: HD Atlanta (25 districts).



Alt 1 20/20/20



Alt 2 19/20/20

Figure 12: HD Atlanta (25 districts).

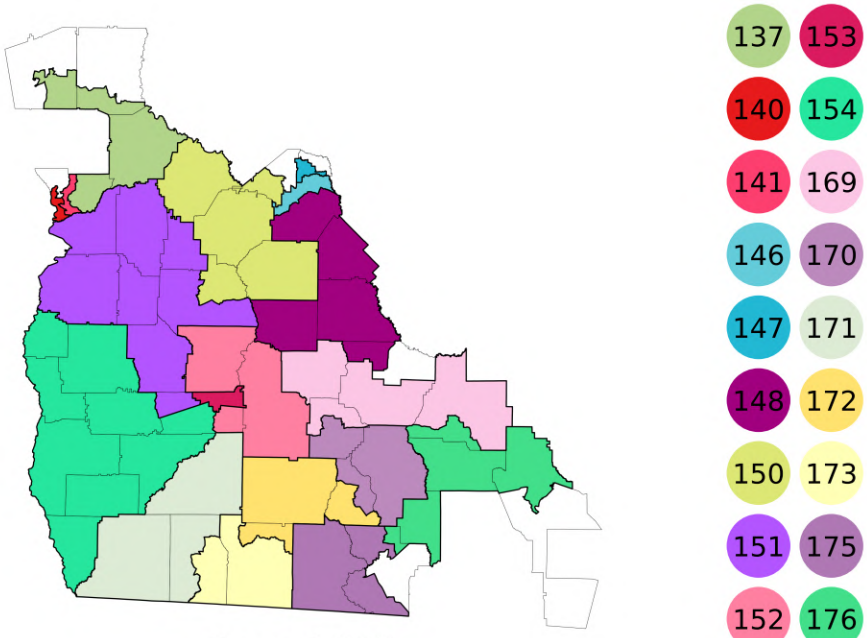
	HD Atlanta Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
61	74.3%	7.6%	81.9%	16.8%	0.198	0.247	50.1%	10.0%	60.1%	37.1%	0.229	0.265
64	30.7%	7.4%	38.1%	57.8%	0.361	0.365	50.9%	6.5%	57.4%	40.0%	0.132	0.263
65	62.0%	4.5%	66.5%	31.5%	0.172	0.454	81.7%	4.7%	86.4%	12.5%	0.222	0.350
66	53.4%	9.5%	62.9%	33.9%	0.246	0.356	51.0%	9.0%	60.0%	36.2%	0.256	0.386
67	58.9%	7.8%	66.7%	30.9%	0.122	0.357	89.9%	5.4%	95.3%	4.4%	0.195	0.515
68	55.7%	6.3%	62.0%	33.9%	0.172	0.318	13.7%	6.6%	20.3%	71.5%	0.310	0.518
69	63.6%	5.4%	69.0%	26.9%	0.247	0.403	51.9%	8.8%	60.7%	34.0%	0.339	0.409
71	19.9%	6.2%	26.1%	69.8%	0.352	0.441	19.9%	6.2%	26.1%	69.8%	0.350	0.441
73	12.1%	7.0%	19.1%	72.6%	0.198	0.278	11.8%	6.4%	18.2%	75.9%	0.335	0.417
74	25.5%	5.6%	31.1%	64.4%	0.247	0.496	50.8%	6.9%	57.7%	39.7%	0.205	0.461
75	74.4%	11.3%	85.7%	11.3%	0.285	0.420	54.2%	7.7%	61.9%	34.1%	0.133	0.230
76	67.2%	13.2%	80.4%	10.5%	0.509	0.524	61.6%	20.0%	81.6%	11.2%	0.460	0.409
77	76.1%	12.2%	88.3%	7.6%	0.211	0.396	89.6%	5.0%	94.6%	3.5%	0.211	0.292
78	71.6%	8.9%	80.5%	15.0%	0.194	0.210	64.2%	11.3%	75.5%	15.4%	0.256	0.414
79	71.6%	16.0%	87.6%	7.1%	0.209	0.498	73.3%	14.6%	87.9%	8.0%	0.370	0.444
90	58.5%	4.3%	62.8%	34.0%	0.286	0.359	58.5%	4.3%	62.8%	34.0%	0.286	0.359
91	70.0%	5.9%	75.9%	22.0%	0.202	0.447	50.3%	5.2%	55.5%	40.7%	0.245	0.384
92	68.8%	4.7%	73.5%	24.1%	0.198	0.361	87.6%	3.5%	91.1%	8.3%	0.260	0.543
93	65.4%	9.6%	75.0%	22.9%	0.112	0.260	62.1%	10.4%	72.5%	25.4%	0.160	0.232
112	19.2%	3.3%	22.5%	73.7%	0.522	0.619	19.2%	3.3%	22.5%	73.7%	0.522	0.619
113	59.5%	6.7%	66.2%	31.8%	0.318	0.501	51.0%	5.1%	56.1%	41.2%	0.338	0.425
114	24.7%	3.7%	28.4%	68.8%	0.283	0.502	32.8%	4.4%	37.2%	60.3%	0.267	0.438
115	52.1%	7.0%	59.1%	36.9%	0.226	0.436	50.2%	6.0%	56.2%	38.6%	0.193	0.282
116	58.1%	7.3%	65.4%	27.2%	0.280	0.407	54.8%	8.0%	62.8%	29.6%	0.333	0.478
117	36.6%	5.4%	42.0%	54.5%	0.275	0.408	51.0%	7.2%	58.2%	39.0%	0.409	0.511
Avg					0.257	0.402					0.281	0.403

Table 17: In HD Atlanta, the enacted plan has 10 county splits and 2221 cut edges. Alt 1 maintains 10 county splits and improves to 1988 cut edges.

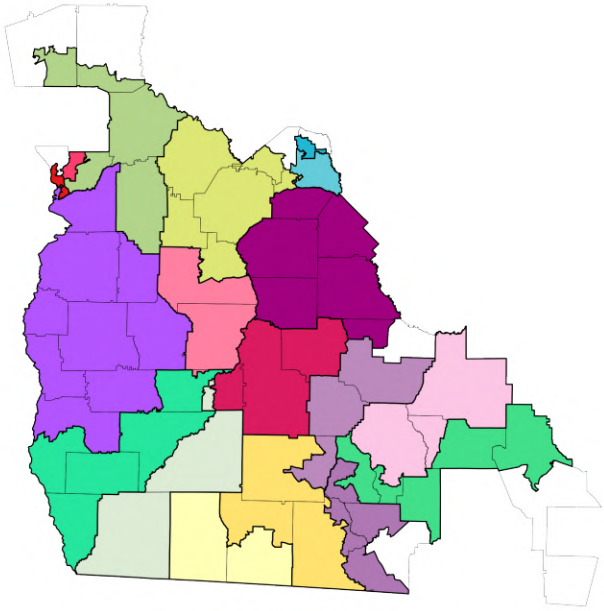
	HD Atlanta Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
61	74.3%	7.6%	81.9%	16.8%	0.198	0.247	47.4%	10.1%	57.5%	39.6%	0.290	0.276
64	30.7%	7.4%	38.1%	57.8%	0.361	0.365	50.5%	6.8%	57.3%	40.0%	0.201	0.271
65	62.0%	4.5%	66.5%	31.5%	0.172	0.454	67.6%	4.1%	71.7%	26.6%	0.302	0.458
66	53.4%	9.5%	62.9%	33.9%	0.246	0.356	51.2%	9.1%	60.3%	36.0%	0.336	0.407
67	58.9%	7.8%	66.7%	30.9%	0.122	0.357	90.4%	5.3%	95.7%	4.0%	0.131	0.428
68	55.7%	6.3%	62.0%	33.9%	0.172	0.318	58.2%	6.8%	65.0%	31.0%	0.168	0.329
69	63.6%	5.4%	69.0%	26.9%	0.247	0.403	54.6%	6.3%	60.9%	34.4%	0.310	0.538
71	19.9%	6.2%	26.1%	69.8%	0.352	0.441	19.9%	6.2%	26.1%	69.8%	0.352	0.441
73	12.1%	7.0%	19.1%	72.6%	0.198	0.278	11.9%	7.0%	18.9%	73.6%	0.373	0.498
74	25.5%	5.6%	31.1%	64.4%	0.247	0.496	12.8%	5.7%	18.5%	75.5%	0.192	0.320
75	74.4%	11.3%	85.7%	11.3%	0.285	0.420	61.4%	12.0%	73.4%	17.6%	0.225	0.404
76	67.2%	13.2%	80.4%	10.5%	0.509	0.524	70.4%	13.2%	83.6%	9.6%	0.352	0.416
77	76.1%	12.2%	88.3%	7.6%	0.211	0.396	77.0%	12.6%	89.6%	7.0%	0.491	0.510
78	71.6%	8.9%	80.5%	15.0%	0.194	0.210	68.6%	8.4%	77.0%	21.0%	0.325	0.540
79	71.6%	16.0%	87.6%	7.1%	0.209	0.498	73.1%	15.5%	88.6%	7.5%	0.357	0.549
90	58.5%	4.3%	62.8%	34.0%	0.286	0.359	58.5%	4.3%	62.8%	34.0%	0.286	0.359
91	70.0%	5.9%	75.9%	22.0%	0.202	0.447	53.0%	5.2%	58.2%	38.4%	0.231	0.369
92	68.8%	4.7%	73.5%	24.1%	0.198	0.361	69.6%	6.9%	76.5%	21.3%	0.174	0.330
93	65.4%	9.6%	75.0%	22.9%	0.112	0.260	85.5%	7.2%	92.7%	7.0%	0.201	0.329
112	19.2%	3.3%	22.5%	73.7%	0.522	0.619	19.2%	3.3%	22.5%	73.7%	0.522	0.619
113	59.5%	6.7%	66.2%	31.8%	0.318	0.501	53.9%	5.6%	59.5%	37.9%	0.153	0.355
114	24.7%	3.7%	28.4%	68.8%	0.283	0.502	24.9%	3.8%	28.7%	68.6%	0.235	0.487
115	52.1%	7.0%	59.1%	36.9%	0.226	0.436	50.3%	6.9%	57.2%	39.8%	0.304	0.475
116	58.1%	7.3%	65.4%	27.2%	0.280	0.407	53.2%	7.9%	61.1%	31.0%	0.382	0.452
117	36.6%	5.4%	42.0%	54.5%	0.275	0.408	50.1%	6.5%	56.6%	38.4%	0.155	0.323
Avg					0.257	0.402					0.282	0.419

Table 18: With 9 county splits and 1995 cut edges, Alt 2 dominates the enacted plan.

7.3.2 HD Southwest



Enacted 6/6/6



Alt 1 8/8/8

Figure 13: HD Southwest (18 districts).

	HD Southwest Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
137	52.1%	4.5%	56.6%	40.8%	0.165	0.328	51.7%	3.7%	55.4%	42.0%	0.143	0.259
140	57.6%	8.0%	65.6%	31.7%	0.192	0.289	57.1%	7.9%	65.0%	32.4%	0.197	0.257
141	57.5%	6.6%	64.1%	31.8%	0.200	0.261	53.6%	6.7%	60.3%	35.5%	0.299	0.423
146	27.6%	4.7%	32.3%	61.8%	0.195	0.257	23.3%	4.9%	28.2%	64.4%	0.208	0.468
147	30.1%	7.2%	37.3%	55.3%	0.261	0.331	31.8%	7.2%	39.0%	55.1%	0.220	0.341
148	34.0%	3.1%	37.1%	60.4%	0.235	0.438	38.6%	3.4%	42.0%	56.1%	0.388	0.590
150	53.6%	6.1%	59.7%	38.3%	0.275	0.439	51.2%	5.3%	56.5%	41.5%	0.250	0.544
151	42.4%	7.3%	49.7%	47.2%	0.222	0.528	51.0%	7.5%	58.5%	38.6%	0.275	0.424
152	26.1%	2.3%	28.4%	67.9%	0.297	0.394	34.2%	3.2%	37.4%	58.7%	0.314	0.473
153	67.9%	2.5%	70.4%	27.7%	0.297	0.298	52.9%	2.7%	55.6%	43.0%	0.400	0.536
154	54.8%	1.7%	56.5%	42.2%	0.332	0.410	50.1%	2.1%	52.2%	45.7%	0.175	0.261
169	29.0%	7.7%	36.7%	61.0%	0.226	0.283	24.0%	9.0%	33.0%	64.6%	0.296	0.456
170	24.2%	8.7%	32.9%	64.2%	0.342	0.531	26.8%	12.5%	39.3%	57.9%	0.223	0.285
171	39.6%	4.6%	44.2%	53.9%	0.368	0.347	51.0%	4.0%	55.0%	43.4%	0.249	0.275
172	23.3%	13.4%	36.7%	61.0%	0.316	0.437	25.1%	9.4%	34.5%	63.1%	0.217	0.375
173	36.3%	5.4%	41.7%	55.7%	0.378	0.564	35.4%	5.6%	41.0%	56.4%	0.412	0.424
175	24.2%	5.0%	29.2%	66.5%	0.374	0.472	21.0%	5.7%	26.7%	68.7%	0.143	0.273
176	22.7%	8.2%	30.9%	66.2%	0.160	0.335	23.8%	6.2%	30.0%	67.1%	0.116	0.227
Avg					0.269	0.386					0.252	0.383

Table 19: HD Southwest Alt 1 splits 12 counties within the cluster, to the state's 10 split counties. Its 2290 cut edges are more than the state's 2094, though the Reock scores are nearly identical.

7.3.3 HD East Black Belt

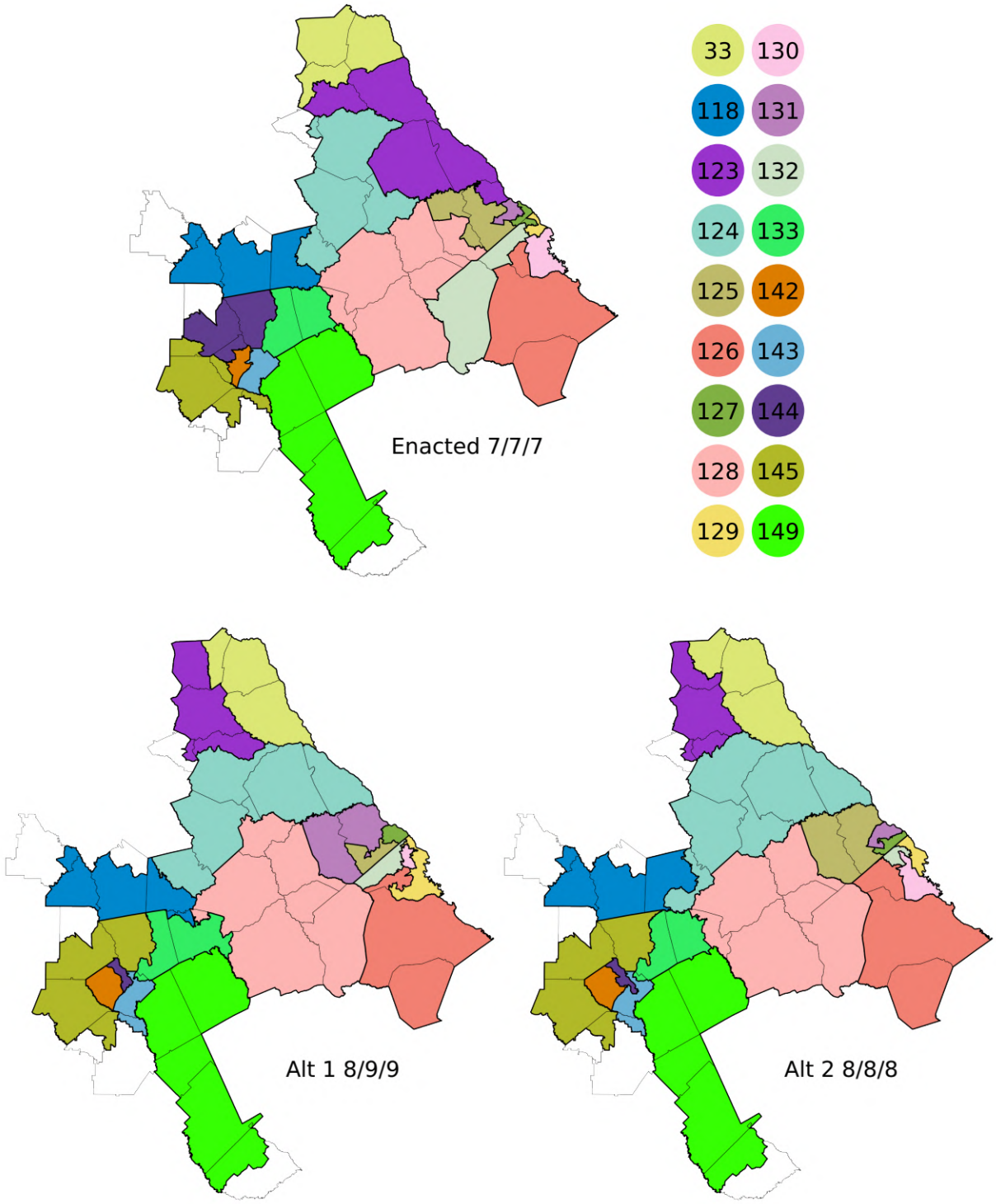


Figure 14: HD East Black Belt (18 districts).

	HD East Black Belt Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
33	11.2%	3.1%	14.3%	82.3%	0.371	0.487	18.7%	3.8%	22.5%	74.6%	0.405	0.343
118	23.6%	3.7%	27.3%	69.7%	0.223	0.350	23.2%	3.1%	26.3%	70.6%	0.218	0.329
123	24.3%	4.3%	28.6%	68.1%	0.178	0.295	13.3%	5.8%	19.1%	76.3%	0.281	0.357
124	25.6%	6.2%	31.8%	65.0%	0.233	0.442	28.4%	4.7%	33.1%	64.4%	0.224	0.362
125	23.7%	7.7%	31.4%	63.0%	0.173	0.409	24.1%	8.0%	32.1%	61.5%	0.255	0.328
126	54.5%	3.2%	57.7%	40.0%	0.414	0.516	52.5%	3.5%	56.0%	41.6%	0.322	0.534
127	18.5%	4.8%	23.3%	68.1%	0.201	0.351	14.6%	4.9%	19.5%	70.1%	0.585	0.546
128	50.4%	1.7%	52.1%	46.5%	0.319	0.601	50.1%	1.6%	51.7%	46.7%	0.357	0.628
129	54.9%	4.3%	59.2%	37.2%	0.254	0.482	51.9%	3.5%	55.4%	40.7%	0.108	0.314
130	59.9%	3.9%	63.8%	33.7%	0.255	0.508	54.4%	4.3%	58.7%	38.7%	0.253	0.451
131	17.6%	5.9%	23.5%	68.2%	0.283	0.377	27.1%	5.1%	32.2%	63.3%	0.285	0.604
132	52.3%	7.8%	60.1%	35.6%	0.296	0.270	53.6%	8.2%	61.8%	33.1%	0.293	0.243
133	36.8%	2.1%	38.9%	58.4%	0.415	0.543	48.7%	2.0%	50.7%	47.2%	0.178	0.385
142	59.5%	3.7%	63.2%	34.8%	0.229	0.353	50.8%	3.7%	54.5%	42.3%	0.539	0.605
143	60.8%	4.7%	65.5%	32.3%	0.299	0.502	52.4%	6.3%	58.7%	38.4%	0.176	0.332
144	29.3%	2.6%	31.9%	63.0%	0.325	0.510	50.4%	4.3%	54.7%	41.3%	0.299	0.298
145	35.7%	5.9%	41.6%	55.1%	0.194	0.376	23.1%	2.8%	25.9%	71.1%	0.204	0.422
149	32.1%	5.7%	37.8%	61.0%	0.223	0.325	32.1%	5.7%	37.8%	61.0%	0.223	0.325
Avg					0.271	0.428					0.289	0.411

Table 20: The Alt 1 map has 10 split counties within the HD East Black Belt cluster, while the enacted plan has 9. Its 1775 cut edges improves on the state's 1887, while also being more compact by Polsby-Popper.

	HD East Black Belt Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
33	11.2%	3.1%	14.3%	82.3%	0.371	0.487	18.3%	3.5%	21.8%	75.2%	0.370	0.323
118	23.6%	3.7%	27.3%	69.7%	0.223	0.350	27.0%	4.1%	31.1%	65.9%	0.229	0.342
123	24.3%	4.3%	28.6%	68.1%	0.178	0.295	13.7%	6.0%	19.7%	75.8%	0.293	0.395
124	25.6%	6.2%	31.8%	65.0%	0.233	0.442	25.5%	3.8%	29.3%	68.1%	0.234	0.381
125	23.7%	7.7%	31.4%	63.0%	0.173	0.409	30.2%	6.1%	36.3%	60.1%	0.396	0.670
126	54.5%	3.2%	57.7%	40.0%	0.414	0.516	50.7%	4.2%	54.9%	42.3%	0.394	0.494
127	18.5%	4.8%	23.3%	68.1%	0.201	0.351	17.6%	6.2%	23.8%	67.2%	0.267	0.264
128	50.4%	1.7%	52.1%	46.5%	0.319	0.601	50.2%	1.5%	51.7%	46.8%	0.409	0.672
129	54.9%	4.3%	59.2%	37.2%	0.254	0.482	50.4%	3.6%	54.0%	41.8%	0.248	0.323
130	59.9%	3.9%	63.8%	33.7%	0.255	0.508	57.1%	4.7%	61.8%	35.4%	0.231	0.325
131	17.6%	5.9%	23.5%	68.2%	0.283	0.377	17.6%	5.7%	23.3%	67.8%	0.318	0.373
132	52.3%	7.8%	60.1%	35.6%	0.296	0.270	54.4%	7.1%	61.5%	34.1%	0.219	0.278
133	36.8%	2.1%	38.9%	58.4%	0.415	0.543	46.6%	2.1%	48.7%	49.0%	0.296	0.438
142	59.5%	3.7%	63.2%	34.8%	0.229	0.353	50.1%	3.8%	53.9%	42.9%	0.436	0.605
143	60.8%	4.7%	65.5%	32.3%	0.299	0.502	52.9%	6.3%	59.2%	38.0%	0.143	0.316
144	29.3%	2.6%	31.9%	63.0%	0.325	0.510	51.0%	4.2%	55.2%	40.8%	0.226	0.243
145	35.7%	5.9%	41.6%	55.1%	0.194	0.376	23.1%	2.8%	25.9%	71.1%	0.190	0.359
149	32.1%	5.7%	37.8%	61.0%	0.223	0.325	32.1%	5.7%	37.8%	61.0%	0.223	0.325
Avg					0.271	0.428					0.285	0.396

Table 21: Alt 2 eliminates one county split relative to the enacted plan and has a sharply improved 1604 cut edges.

7.3.4 HD Southeast

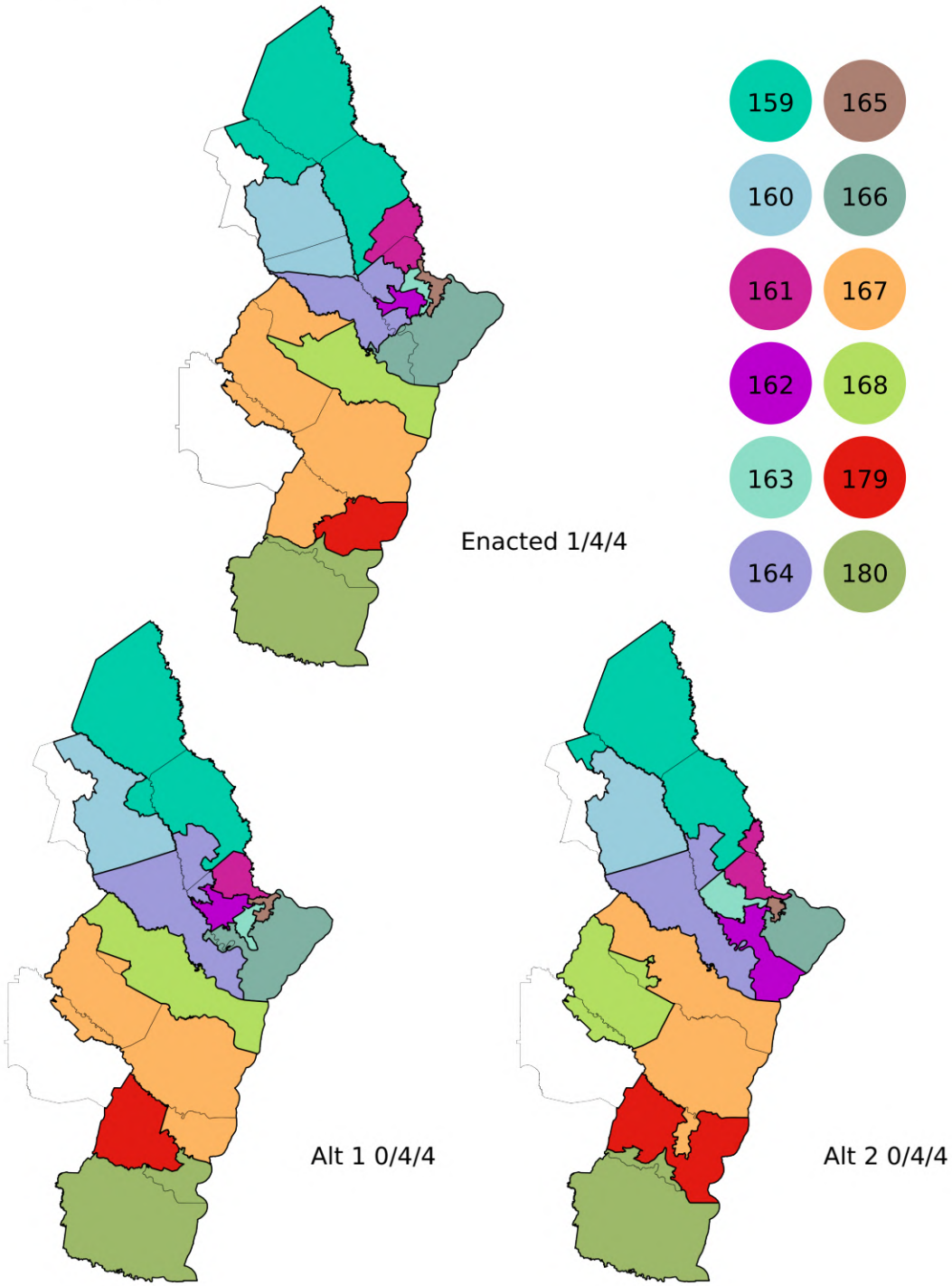


Figure 15: HD Southeast (12 districts).

	HD Southeast Enacted						**HD Alt 1**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
159	24.5%	2.9%	27.4%	69.4%	0.219	0.345	22.2%	3.7%	25.9%	70.5%	0.204	0.358
160	22.6%	5.0%	27.6%	68.5%	0.369	0.483	26.6%	5.1%	31.7%	64.7%	0.242	0.373
161	27.1%	6.8%	33.9%	60.2%	0.306	0.511	42.1%	8.8%	50.9%	42.7%	0.359	0.475
162	43.7%	9.6%	53.3%	40.6%	0.211	0.366	39.9%	10.5%	50.4%	42.6%	0.147	0.372
163	45.5%	7.4%	52.9%	41.9%	0.175	0.271	44.0%	6.9%	50.9%	43.7%	0.244	0.335
164	23.5%	8.5%	32.0%	60.6%	0.167	0.299	12.9%	5.1%	18.0%	76.5%	0.143	0.309
165	50.3%	5.3%	55.6%	39.2%	0.162	0.230	47.3%	4.7%	52.0%	42.9%	0.189	0.380
166	5.7%	4.1%	9.8%	84.7%	0.364	0.429	7.2%	4.7%	11.9%	82.4%	0.245	0.459
167	22.3%	7.4%	29.7%	66.0%	0.192	0.417	20.0%	6.2%	26.2%	70.1%	0.266	0.327
168	46.3%	10.3%	56.6%	39.3%	0.258	0.243	45.9%	10.7%	56.6%	39.2%	0.236	0.246
179	27.0%	6.4%	33.4%	63.7%	0.417	0.451	32.0%	7.5%	39.5%	56.9%	0.433	0.539
180	18.2%	5.6%	23.8%	71.2%	0.396	0.606	17.0%	5.4%	22.4%	72.8%	0.348	0.594
Avg					0.270	0.388					0.255	0.397

Table 22: HD Southeast Alt 1 has fewer county splits (5 vs. 6) and a better cut edges score (1122 vs. 1245) than the enacted plan.

	HD Southeast Enacted						**HD Alt 2**					
HD	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock	Black VAP	Hisp VAP	BH VAP	White VAP	Polsby Popper	Reock
159	24.5%	2.9%	27.4%	69.4%	0.219	0.345	22.0%	3.6%	25.6%	70.7%	0.192	0.356
160	22.6%	5.0%	27.6%	68.5%	0.369	0.483	26.3%	5.1%	31.4%	64.9%	0.333	0.515
161	27.1%	6.8%	33.9%	60.2%	0.306	0.511	41.6%	10.0%	51.6%	42.2%	0.180	0.332
162	43.7%	9.6%	53.3%	40.6%	0.211	0.366	43.0%	8.5%	51.5%	42.5%	0.191	0.341
163	45.5%	7.4%	52.9%	41.9%	0.175	0.271	42.7%	7.7%	50.4%	43.1%	0.282	0.411
164	23.5%	8.5%	32.0%	60.6%	0.167	0.299	13.4%	5.5%	18.9%	75.6%	0.168	0.290
165	50.3%	5.3%	55.6%	39.2%	0.162	0.230	45.5%	5.0%	50.5%	44.4%	0.229	0.501
166	5.7%	4.1%	9.8%	84.7%	0.364	0.429	7.2%	4.1%	11.3%	83.0%	0.391	0.653
167	22.3%	7.4%	29.7%	66.0%	0.192	0.417	36.5%	7.4%	43.9%	52.5%	0.204	0.331
168	46.3%	10.3%	56.6%	39.3%	0.258	0.243	40.9%	10.8%	51.7%	44.3%	0.327	0.555
179	27.0%	6.4%	33.4%	63.7%	0.417	0.451	18.7%	6.0%	24.7%	71.6%	0.196	0.454
180	18.2%	5.6%	23.8%	71.2%	0.396	0.606	18.6%	5.7%	24.3%	70.7%	0.346	0.577
Avg					0.270	0.388					0.253	0.443

Table 23: Alt 2 also has just 5 county splits, to go with 1263 cut edges.

8 Secondary population estimates for coalition districts

Above, in §3.2, I described my construction of an estimated citizen voting age population for the state of Georgia. In this section, I confirm that nearly all of the majority-BHVAP districts in my alternative plans are still majority districts by BHCVAP.

	CD enacted	
CD	BH VAP	BH CVAP
1	34.5%	33.4%
2	54.0%	53.5%
3	28.3%	27.2%
4	63.9%	63.3%
5	55.6%	55.8%
6	18.7%	16.6%
7	50.2%	46.6%
8	35.8%	34.5%
9	23.0%	18.2%
10	28.8%	27.2%
11	28.7%	25.1%
12	41.2%	40.7%
13	76.3%	76.0%
14	24.6%	20.5%

	CD Alt	
CD	BH VAP	BH CVAP
1	36.6%	35.6%
2	51.8%	51.6%
3	57.7%	57.1%
4	58.0%	57.7%
5	60.6%	59.8%
6	24.0%	21.6%
7	55.5%	52.4%
8	33.8%	32.0%
9	15.9%	11.0%
10	24.2%	22.5%
11	24.7%	22.6%
12	43.2%	43.1%
13	57.9%	57.0%
14	18.3%	13.9%

Table 24: The enacted Congressional plan has 5 majority-BHVAP districts, but only four majority districts by BHCVAP. My alternative Congressional plan has 6 majority-BH districts by both either basis of population.

Next, I will present the statistics for the Alt Eff 1 and Alt Eff 2 plans in Senate and House, which use the Alt 1 and Alt 2 Gingles demonstrative plans above and add more modular effectiveness-boosting changes.

	SD enacted	
SD	BH VAP	BH CVAP
1	31.9%	31.2%
2	53.8%	54.0%
3	27.1%	24.8%
4	28.6%	27.1%
5	70.4%	65.7%
6	31.5%	30.3%
7	37.2%	34.7%
8	36.3%	35.4%
9	47.4%	44.4%
10	75.7%	75.8%
11	38.4%	36.2%
12	61.2%	60.7%
13	32.8%	31.2%
14	30.5%	26.8%
15	59.8%	59.8%
16	27.5%	26.7%
17	36.6%	35.4%
18	34.6%	33.8%
19	33.7%	31.2%
20	34.5%	34.2%
21	16.0%	13.5%
22	61.2%	61.3%
23	39.6%	39.0%
24	24.0%	23.4%
25	36.8%	36.3%
26	60.8%	60.6%
27	15.0%	11.6%
28	25.6%	24.3%
29	31.0%	30.8%
30	26.6%	24.8%
31	27.7%	25.4%
32	24.9%	21.8%
33	65.1%	61.5%
34	81.2%	80.9%
35	78.5%	78.3%
36	57.7%	57.6%
37	27.5%	24.7%
38	72.9%	73.3%
39	65.6%	67.1%
40	40.2%	33.0%
41	68.5%	69.1%
42	38.9%	37.4%
43	70.5%	69.8%
44	79.0%	79.3%
45	31.1%	28.7%
46	23.6%	22.0%
47	26.8%	24.0%
48	16.1%	16.1%
49	29.6%	20.2%
50	14.3%	10.5%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	73.6%	73.2%
56	15.0%	13.2%

	SD Alt Eff 1	
SD	BH VAP	BH CVAP
1	31.8%	31.2%
2	53.7%	54.0%
3	26.9%	24.8%
4	28.6%	27.2%
5	53.9%	45.2%
6	55.5%	55.4%
7	30.6%	28.6%
8	36.2%	35.4%
9	55.1%	51.6%
10	69.4%	68.9%
11	38.4%	36.2%
12	61.1%	60.7%
13	32.8%	31.2%
14	28.8%	26.0%
15	59.7%	59.8%
16	55.6%	54.6%
17	56.8%	56.4%
18	34.5%	33.8%
19	33.6%	31.2%
20	39.1%	38.4%
21	15.9%	13.5%
22	53.6%	53.8%
23	28.0%	27.7%
24	28.3%	27.5%
25	53.5%	53.5%
26	53.4%	53.5%
27	14.7%	11.4%
28	56.7%	56.1%
29	31.0%	30.8%
30	19.2%	17.3%
31	26.4%	24.3%
32	24.8%	21.8%
33	67.5%	65.0%
34	82.6%	83.2%
35	58.0%	56.8%
36	54.9%	55.3%
37	27.4%	24.7%
38	42.4%	40.2%
39	55.9%	56.1%
40	66.6%	64.4%
41	66.4%	66.3%
42	44.6%	44.3%
43	58.2%	57.2%
44	64.5%	65.2%
45	31.3%	28.8%
46	21.2%	19.8%
47	25.2%	23.0%
48	16.1%	15.4%
49	32.4%	22.2%
50	11.4%	8.9%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	62.6%	60.9%
56	14.9%	13.2%

	SD Alt Eff 2	
SD	BH VAP	BH CVAP
1	31.8%	31.2%
2	53.7%	54.0%
3	26.9%	24.8%
4	28.5%	27.1%
5	58.6%	52.2%
6	42.0%	39.8%
7	46.2%	43.2%
8	36.2%	35.4%
9	53.1%	50.5%
10	68.5%	68.5%
11	38.4%	36.2%
12	61.1%	60.7%
13	32.8%	31.2%
14	26.5%	24.6%
15	59.7%	59.8%
16	53.7%	52.7%
17	51.2%	50.3%
18	34.5%	33.8%
19	33.6%	31.2%
20	37.0%	36.4%
21	15.9%	13.5%
22	53.3%	53.5%
23	51.1%	51.2%
24	28.1%	27.8%
25	32.4%	31.4%
26	53.9%	53.9%
27	15.0%	11.6%
28	21.6%	20.3%
29	31.0%	30.8%
30	22.0%	19.4%
31	32.0%	30.3%
32	24.8%	21.8%
33	67.7%	65.4%
34	65.4%	64.4%
35	67.4%	66.8%
36	59.9%	60.5%
37	27.4%	24.7%
38	55.8%	56.4%
39	90.9%	91.5%
40	44.9%	35.6%
41	69.8%	70.6%
42	27.0%	23.7%
43	61.0%	60.3%
44	78.6%	79.0%
45	27.2%	24.9%
46	21.2%	19.5%
47	27.2%	24.7%
48	19.3%	17.7%
49	30.7%	20.6%
50	12.6%	10.3%
51	5.5%	3.9%
52	21.1%	18.1%
53	8.2%	6.7%
54	26.2%	16.7%
55	64.9%	64.7%
56	14.9%	13.2%

Table 25: The enacted Senate plan has 17 coalition districts, whether by VAP or CVAP. Both alternative plans add numerous districts, finding additional majority districts in several areas of the state.

	HD enacted	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.6%	21.3%
16	20.1%	16.7%
17	29.4%	27.4%
18	10.3%	9.4%
19	30.4%	28.8%
20	18.1%	14.5%
21	12.3%	10.0%
22	26.2%	22.6%
23	20.5%	14.1%
24	17.1%	14.1%
25	10.8%	11.0%
26	14.6%	11.0%
27	13.2%	9.5%
28	15.2%	10.6%
29	52.9%	37.6%
30	24.0%	18.9%
31	26.3%	19.6%
32	12.7%	10.7%
33	14.3%	13.4%
34	23.2%	20.2%
35	38.7%	34.8%
36	23.1%	21.6%
37	46.1%	41.2%
38	65.9%	64.0%
39	73.2%	70.6%
40	38.1%	38.6%
41	67.2%	63.0%
42	50.2%	47.9%
43	39.9%	38.6%
44	22.1%	20.2%
45	9.9%	9.1%
46	15.1%	14.0%
47	17.8%	18.2%
48	23.8%	20.0%
49	14.8%	13.5%
50	18.3%	18.4%
51	36.4%	30.0%
52	23.0%	24.5%
53	21.5%	19.6%
54	27.7%	23.8%
55	59.7%	60.2%
56	50.7%	53.6%
57	25.6%	23.8%
58	67.5%	67.9%
59	73.8%	73.9%
60	68.3%	68.1%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.5%	21.3%
16	20.0%	16.7%
17	29.3%	27.4%
18	10.2%	9.4%
19	30.2%	28.8%
20	14.4%	11.7%
21	12.3%	10.1%
22	34.4%	31.3%
23	20.4%	14.1%
24	12.9%	10.8%
25	11.5%	11.8%
26	14.2%	11.6%
27	13.2%	9.5%
28	15.2%	10.6%
29	54.8%	39.4%
30	21.8%	16.7%
31	26.2%	19.6%
32	12.7%	10.7%
33	22.4%	21.7%
34	19.5%	17.2%
35	31.9%	29.3%
36	26.5%	24.8%
37	52.9%	47.2%
38	51.9%	50.3%
39	61.7%	58.8%
40	50.7%	50.5%
41	52.5%	50.3%
42	54.9%	50.5%
43	51.0%	51.1%
44	27.5%	22.5%
45	12.7%	11.5%
46	14.0%	13.0%
47	23.0%	23.9%
48	17.9%	16.2%
49	11.3%	10.1%
50	19.2%	19.3%
51	43.3%	36.2%
52	19.5%	19.2%
53	26.3%	22.5%
54	23.0%	20.8%
55	56.0%	58.6%
56	50.7%	52.4%
57	25.2%	23.8%
58	57.2%	57.6%
59	93.5%	93.5%
60	64.5%	64.6%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
1	6.2%	5.7%
2	10.6%	7.4%
3	6.2%	4.7%
4	49.2%	34.8%
5	17.0%	11.1%
6	13.4%	7.8%
7	6.1%	3.7%
8	4.1%	2.9%
9	6.2%	4.9%
10	13.6%	9.2%
11	6.0%	4.8%
12	15.7%	12.6%
13	29.8%	25.8%
14	12.6%	10.4%
15	23.5%	21.3%
16	20.0%	16.7%
17	29.3%	27.4%
18	10.2%	9.4%
19	30.2%	28.8%
20	15.3%	11.6%
21	12.3%	10.1%
22	36.0%	32.4%
23	20.4%	14.1%
24	14.8%	12.6%
25	10.6%	10.6%
26	14.1%	11.6%
27	13.2%	9.5%
28	15.2%	10.6%
29	52.8%	37.6%
30	22.4%	17.0%
31	26.2%	19.6%
32	12.7%	10.7%
33	21.7%	21.1%
34	16.7%	14.9%
35	34.1%	30.8%
36	23.3%	19.5%
37	56.2%	50.6%
38	53.4%	51.3%
39	60.7%	58.3%
40	51.0%	50.8%
41	52.6%	50.6%
42	54.6%	50.3%
43	51.7%	50.7%
44	25.1%	24.5%
45	10.5%	10.0%
46	13.8%	13.2%
47	22.9%	23.6%
48	18.9%	16.8%
49	11.3%	10.1%
50	18.4%	18.2%
51	40.6%	34.0%
52	20.7%	21.0%
53	27.8%	23.5%
54	20.6%	18.5%
55	95.7%	95.9%
56	50.5%	52.6%
57	26.1%	25.0%
58	52.6%	54.3%
59	64.4%	64.8%
60	55.7%	55.7%

	HD enacted	
HD	BH VAP	BH CVAP
61	81.0%	80.4%
62	78.2%	78.3%
63	77.8%	77.3%
64	37.6%	36.2%
65	65.7%	65.8%
66	62.0%	60.6%
67	66.1%	65.3%
68	61.4%	61.5%
69	68.2%	68.2%
70	35.4%	33.4%
71	25.8%	23.6%
72	27.4%	24.9%
73	18.8%	17.9%
74	30.6%	29.2%
75	84.5%	84.9%
76	79.6%	80.9%
77	87.3%	87.4%
78	79.4%	79.2%
79	86.5%	86.7%
80	36.6%	28.0%
81	42.1%	34.5%
82	23.2%	22.2%
83	43.0%	28.0%
84	75.7%	76.6%
85	67.9%	71.9%
86	78.5%	80.9%
87	78.8%	79.0%
88	72.5%	73.5%
89	65.3%	65.6%
90	62.2%	62.2%
91	75.0%	74.7%
92	72.7%	72.4%
93	74.1%	73.2%
94	75.3%	75.8%
95	74.0%	73.5%
96	58.1%	52.9%
97	45.0%	42.0%
98	74.8%	68.4%
99	22.9%	23.0%
100	19.6%	18.1%
101	41.6%	39.4%
102	57.8%	53.8%
103	33.0%	29.2%
104	27.8%	25.3%
105	44.9%	42.5%
106	46.7%	45.3%
107	59.6%	55.6%
108	35.9%	30.2%
109	67.4%	64.6%
110	56.7%	55.0%
111	30.6%	28.2%
112	22.3%	21.9%
113	65.5%	64.6%
114	28.1%	26.8%
115	58.2%	57.0%
116	64.4%	64.2%
117	41.5%	40.7%
118	27.1%	26.0%
119	23.6%	21.0%
120	21.2%	19.3%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
61	59.3%	57.1%
62	88.0%	88.6%
63	65.4%	64.8%
64	56.6%	55.9%
65	85.5%	86.8%
66	58.9%	58.1%
67	94.2%	94.5%
68	19.9%	19.2%
69	59.7%	58.8%
70	35.3%	33.4%
71	25.7%	23.6%
72	27.4%	24.9%
73	17.9%	17.0%
74	56.7%	55.1%
75	60.9%	60.2%
76	80.5%	80.4%
77	93.4%	94.0%
78	74.3%	75.6%
79	86.6%	87.1%
80	60.6%	50.4%
81	51.6%	40.1%
82	16.9%	15.9%
83	22.6%	21.7%
84	80.0%	80.5%
85	58.2%	60.3%
86	94.3%	94.4%
87	63.3%	64.8%
88	68.1%	67.6%
89	68.8%	69.6%
90	62.0%	62.2%
91	54.9%	54.1%
92	90.1%	90.5%
93	71.4%	70.4%
94	85.0%	85.2%
95	56.4%	55.6%
96	52.2%	50.1%
97	58.5%	50.7%
98	68.8%	63.7%
99	24.5%	24.6%
100	20.5%	18.6%
101	37.4%	35.3%
102	54.7%	52.1%
103	30.0%	26.3%
104	26.7%	24.2%
105	52.8%	50.2%
106	57.5%	53.1%
107	54.4%	50.2%
108	53.5%	51.3%
109	56.0%	51.2%
110	52.6%	50.9%
111	31.2%	29.5%
112	22.3%	21.9%
113	55.3%	54.3%
114	36.7%	35.4%
115	55.2%	54.9%
116	61.8%	61.6%
117	57.2%	56.6%
118	26.1%	25.2%
119	23.5%	21.0%
120	21.1%	19.3%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
61	56.7%	54.2%
62	87.5%	88.1%
63	70.8%	70.5%
64	56.5%	55.8%
65	70.9%	71.4%
66	59.2%	58.2%
67	94.6%	95.0%
68	64.3%	64.4%
69	59.9%	59.6%
70	35.3%	33.4%
71	25.7%	23.6%
72	27.4%	24.9%
73	18.6%	17.6%
74	18.1%	17.0%
75	72.3%	73.0%
76	82.6%	83.5%
77	88.2%	88.6%
78	75.6%	75.0%
79	87.2%	87.6%
80	58.5%	50.1%
81	51.1%	36.6%
82	18.4%	17.6%
83	25.4%	23.5%
84	78.2%	79.2%
85	71.3%	75.0%
86	64.5%	65.9%
87	92.8%	93.2%
88	59.8%	57.8%
89	67.7%	68.8%
90	62.0%	62.2%
91	57.4%	56.7%
92	75.4%	74.9%
93	91.6%	92.0%
94	84.8%	85.0%
95	58.0%	57.3%
96	54.0%	50.0%
97	53.5%	47.3%
98	68.8%	63.7%
99	26.3%	26.2%
100	27.9%	26.4%
101	54.7%	50.4%
102	53.0%	50.6%
103	24.4%	19.5%
104	30.3%	28.2%
105	42.3%	41.4%
106	51.8%	50.7%
107	54.3%	50.4%
108	56.2%	50.4%
109	55.1%	50.4%
110	51.8%	50.4%
111	22.9%	20.4%
112	22.3%	21.9%
113	58.7%	58.1%
114	28.3%	27.0%
115	56.1%	55.6%
116	60.0%	59.8%
117	55.6%	55.2%
118	30.9%	29.9%
119	23.5%	21.0%
120	21.1%	19.3%

	HD enacted	
HD	BH VAP	BH CVAP
121	15.0%	13.8%
122	39.9%	36.6%
123	28.4%	27.9%
124	31.6%	29.3%
125	30.6%	29.6%
126	57.2%	57.2%
127	22.9%	22.1%
128	51.9%	51.9%
129	58.5%	58.9%
130	63.2%	63.1%
131	23.0%	23.1%
132	59.5%	59.5%
133	38.7%	38.7%
134	37.1%	36.5%
135	25.4%	24.9%
136	32.2%	32.0%
137	55.9%	56.1%
138	22.4%	21.9%
139	26.2%	25.8%
140	64.8%	64.9%
141	63.1%	63.6%
142	62.6%	62.4%
143	65.1%	65.0%
144	31.7%	31.6%
145	41.2%	40.3%
146	32.0%	32.0%
147	36.9%	36.1%
148	36.9%	36.3%
149	37.1%	34.2%
150	59.5%	58.7%
151	49.4%	47.5%
152	28.3%	27.9%
153	70.2%	70.2%
154	56.2%	56.1%
155	37.9%	37.8%
156	37.0%	35.1%
157	33.4%	30.9%
158	35.5%	34.3%
159	27.2%	26.8%
160	27.3%	25.4%
161	33.4%	32.2%
162	52.6%	52.6%
163	52.5%	52.5%
164	31.4%	30.4%
165	55.2%	55.7%
166	9.6%	8.4%
167	29.2%	28.2%
168	55.2%	55.3%
169	36.5%	34.9%
170	32.7%	30.2%
171	44.0%	42.8%
172	36.6%	32.3%
173	41.4%	39.6%
174	25.2%	21.3%
175	29.0%	28.5%
176	30.7%	28.2%
177	59.4%	59.4%
178	19.7%	18.2%
179	33.1%	30.8%
180	23.5%	22.1%

	HD Alt Eff 1	
HD	BH VAP	BH CVAP
121	14.9%	13.8%
122	39.8%	36.6%
123	19.0%	17.0%
124	32.9%	31.6%
125	31.2%	29.9%
126	55.5%	55.6%
127	19.1%	19.2%
128	51.5%	51.6%
129	54.7%	55.2%
130	58.0%	58.0%
131	31.5%	31.5%
132	60.8%	61.1%
133	50.4%	50.5%
134	37.0%	36.5%
135	25.4%	24.9%
136	32.1%	32.0%
137	54.9%	55.1%
138	22.4%	21.9%
139	26.1%	25.8%
140	64.0%	64.5%
141	59.1%	59.4%
142	53.9%	53.9%
143	58.2%	57.6%
144	54.2%	54.4%
145	25.6%	25.2%
146	27.8%	27.5%
147	38.4%	37.8%
148	41.7%	41.1%
149	37.0%	34.2%
150	56.2%	55.6%
151	58.0%	56.9%
152	37.1%	36.6%
153	55.3%	54.9%
154	51.9%	51.7%
155	37.8%	37.8%
156	36.9%	35.1%
157	33.4%	30.9%
158	35.4%	34.3%
159	25.6%	24.9%
160	31.2%	29.6%
161	50.1%	50.0%
162	49.7%	49.6%
163	50.3%	50.1%
164	17.6%	16.8%
165	51.5%	52.5%
166	11.6%	10.5%
167	25.6%	25.1%
168	55.0%	55.2%
169	32.9%	30.3%
170	39.1%	35.7%
171	54.8%	54.1%
172	34.3%	31.4%
173	40.7%	38.8%
174	24.7%	21.3%
175	26.3%	25.8%
176	29.8%	28.3%
177	59.4%	59.4%
178	19.7%	18.2%
179	39.0%	36.8%
180	22.0%	20.6%

	HD Alt Eff 2	
HD	BH VAP	BH CVAP
121	14.9%	13.8%
122	39.8%	36.6%
123	19.5%	17.6%
124	29.1%	27.9%
125	35.6%	35.0%
126	54.4%	54.4%
127	23.2%	22.5%
128	51.5%	51.6%
129	53.2%	53.7%
130	61.1%	61.0%
131	22.7%	22.7%
132	60.6%	61.1%
133	48.4%	48.4%
134	37.0%	36.5%
135	25.4%	24.9%
136	32.1%	32.0%
137	51.4%	51.5%
138	22.4%	21.9%
139	26.1%	25.8%
140	70.8%	71.4%
141	55.0%	55.3%
142	53.3%	53.4%
143	58.6%	58.0%
144	54.7%	54.9%
145	25.7%	25.2%
146	29.4%	29.2%
147	37.2%	36.5%
148	43.9%	43.2%
149	37.0%	34.2%
150	56.9%	56.3%
151	52.6%	51.2%
152	36.2%	35.7%
153	63.9%	63.9%
154	64.1%	63.7%
155	37.8%	37.8%
156	36.9%	35.1%
157	33.4%	30.9%
158	35.4%	34.3%
159	25.3%	24.6%
160	30.9%	29.3%
161	50.9%	50.0%
162	50.8%	50.6%
163	49.8%	50.5%
164	18.4%	17.7%
165	49.9%	50.7%
166	11.2%	10.0%
167	43.1%	42.5%
168	50.2%	50.1%
169	35.6%	34.2%
170	35.2%	33.4%
171	40.1%	37.7%
172	39.0%	35.8%
173	34.4%	33.1%
174	24.7%	21.3%
175	22.5%	21.7%
176	32.2%	29.6%
177	59.4%	59.4%
178	19.7%	18.2%
179	24.4%	22.3%
180	23.9%	22.5%

Table 26: Overall, the enacted House plan has 62 majority-BHVAP districts, dropping to 60 majority districts by BHCVAP. Both Gingles 1 demonstrative alternatives add to the count significantly.

9 Effectiveness-oriented demonstration plans

In §7 above, I presented a number of alternative plans as Gingles 1 demonstrative maps. Each of these plans increases the number of majority districts for the coalition of Black and Latino Georgians, while simultaneously ensuring that traditional districting principles are highly respected and that the new majority districts are likely to provide effective opportunity-to-elect.

In this section, I will offer an additional set of alternative plans—one new example per legislative cluster—that illustrate that my notion of effectiveness is capable of identifying opportunity districts short of the Gingles 1 demographic threshold of 50%+1. Indeed, the existence of crossover support for Black and Latino candidates of choice by Asian-American, White, and other voters is a certainty. The ease of finding alternative plans that draw on broader voting coalitions will bolster the racial gerrymandering discussion below in §10. That is, in the enacted plans, the state has not just avoided majority districts but has even conspicuously limited the number of districts providing effective opportunity-to-elect well below the level that is easily attainable from a race-neutral mapping process.

9.1 Congressional effectiveness

As a matter of mapmaking, it is extremely easy to improve on the very limited number of effective districts—just five—in the state's enacted plan (see Table 4). To do this involves relieving the packing and cracking from the enacted plan.

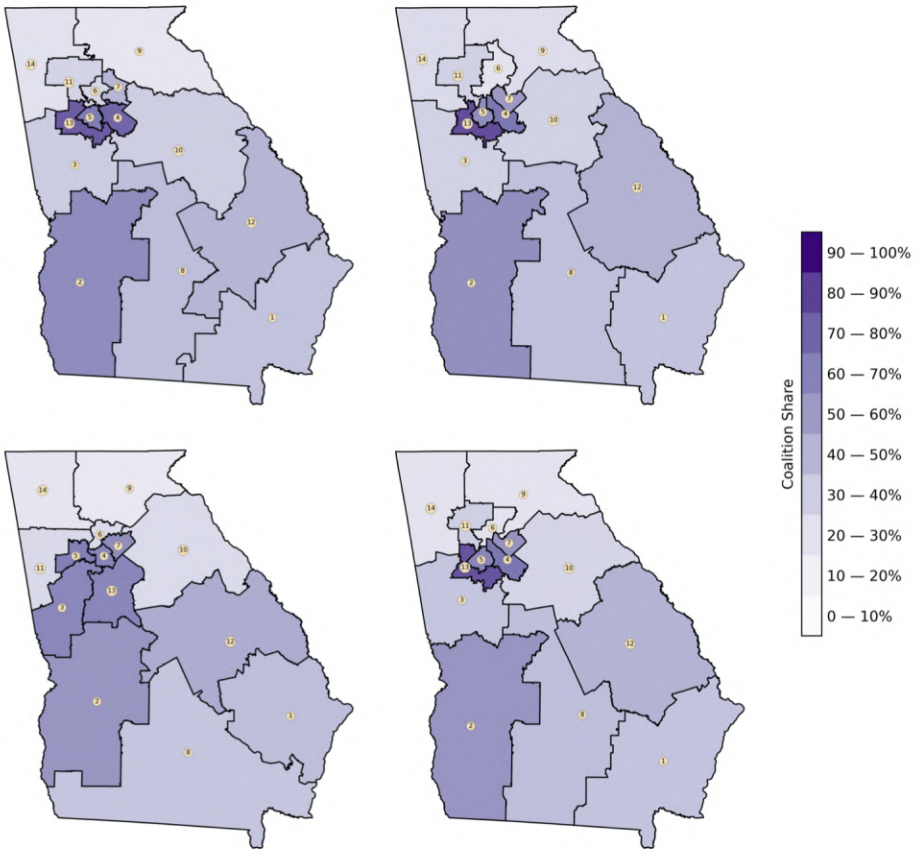


Figure 16: The benchmark plan (top left), the enacted plan (top right), and the Duncan-Kennedy plan (bottom right) all exhibit a pronounced pattern of packing and cracking relative to the alternative Congressional plan presented here (CD Alt, bottom left).

9.2 State Senate alternatives

The "Alt Eff 3" plans shown here are another set of effective alternatives; these cover the entire state, working modularly in the clusters from Atlanta, Gwinnett, Southwest, East Black Belt, Southeast, and Northwest Georgia.

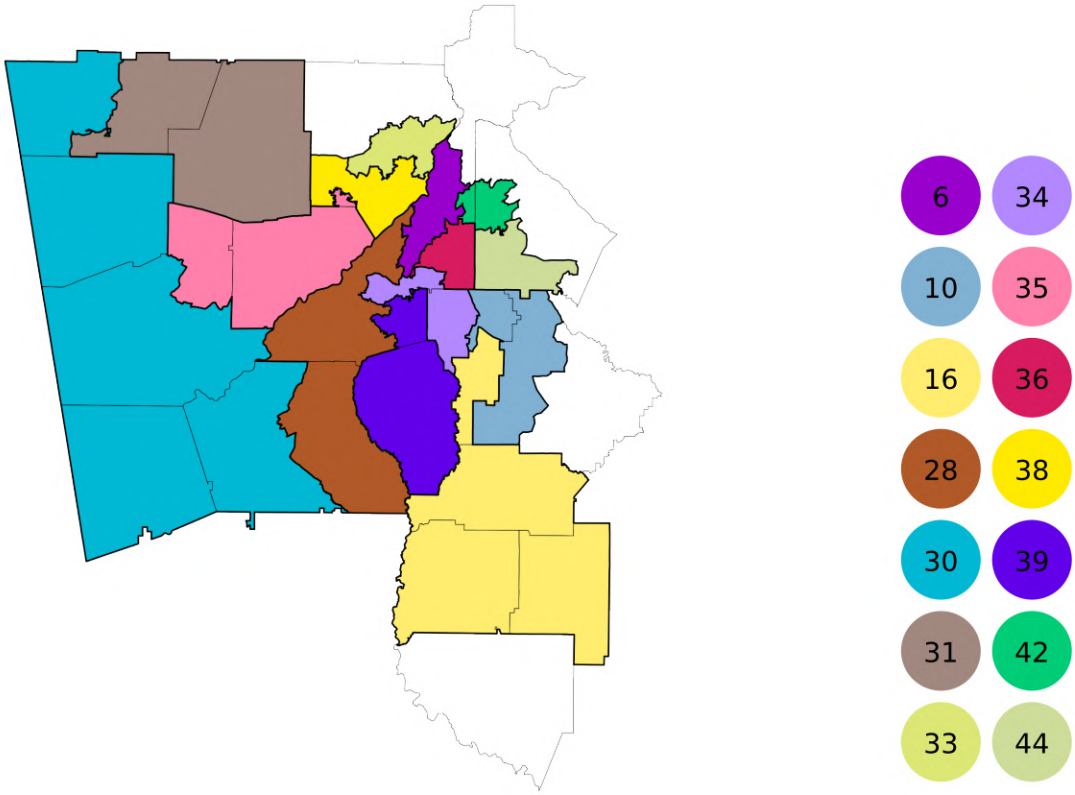


Figure 17: SD Atlanta alternative effective plan.

	SD Atlanta Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
6	23.9%	32.1%	0	8
10	71.5%	76.7%	4	8
16	22.7%	27.7%	3	0
28	19.5%	25.9%	2	0
30	20.9%	27.0%	2	0
31	20.7%	28.1%	3	0
33	43.0%	65.9%	4	8
34	69.5%	82.2%	4	8
35	71.9%	79.4%	4	8
36	51.3%	58.4%	3	8
38	65.3%	73.7%	4	8
39	60.7%	66.3%	3	8
42	30.8%	39.4%	0	8
44	71.3%	79.9%	4	8

	SD Atlanta Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
6	43.8%	50.3%	3	8
10	60.7%	70.3%	4	8
16	47.5%	53.4%	4	8
28	51.9%	57.5%	4	8
30	17.3%	24.2%	1	0
31	21.6%	27.6%	3	0
33	30.3%	50.2%	3	8
34	76.8%	88.7%	4	8
35	42.8%	51.4%	4	8
36	60.1%	66.4%	3	8
38	46.3%	59.2%	3	8
39	49.7%	55.6%	3	8
42	17.2%	27.3%	0	8
44	76.9%	80.1%	3	8

Table 27: SD Atlanta (14 districts).

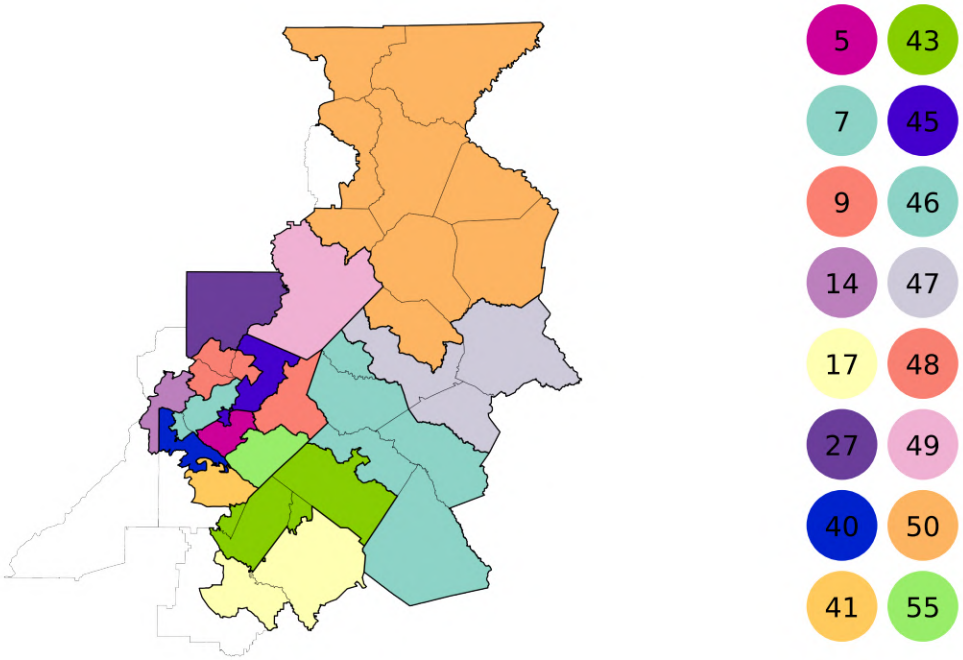


Figure 18: SD Gwinnett alternative effective plan.

	SD Gwinnett Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
5	29.9%	71.6%	3	8
7	21.4%	38.0%	3	8
9	29.5%	48.3%	3	8
14	19.0%	31.1%	0	8
17	32.0%	37.1%	3	0
27	5.0%	15.2%	0	0
40	19.2%	40.8%	0	8
41	62.6%	69.3%	3	8
43	64.3%	71.2%	4	8
45	18.6%	31.7%	3	0
46	16.9%	23.9%	1	0
47	17.4%	27.0%	3	0
48	9.5%	16.5%	1	0
49	8.0%	29.9%	1	0
50	5.6%	14.4%	1	0
55	66.0%	74.7%	4	8

	SD Gwinnett Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
5	25.2%	61.5%	3	8
7	20.2%	46.4%	3	8
9	32.1%	49.2%	3	6
14	19.0%	31.1%	0	8
17	46.9%	52.7%	4	7
27	4.7%	14.9%	0	0
40	25.6%	39.1%	0	8
41	84.8%	89.6%	4	8
43	45.4%	51.8%	4	7
45	22.4%	42.0%	3	5
46	12.0%	19.4%	1	0
47	18.8%	27.5%	2	7
48	9.9%	16.3%	2	0
49	8.2%	32.8%	1	0
50	5.3%	11.3%	1	0
55	44.0%	54.8%	4	8

Table 28: SD Gwinnett (16 districts).

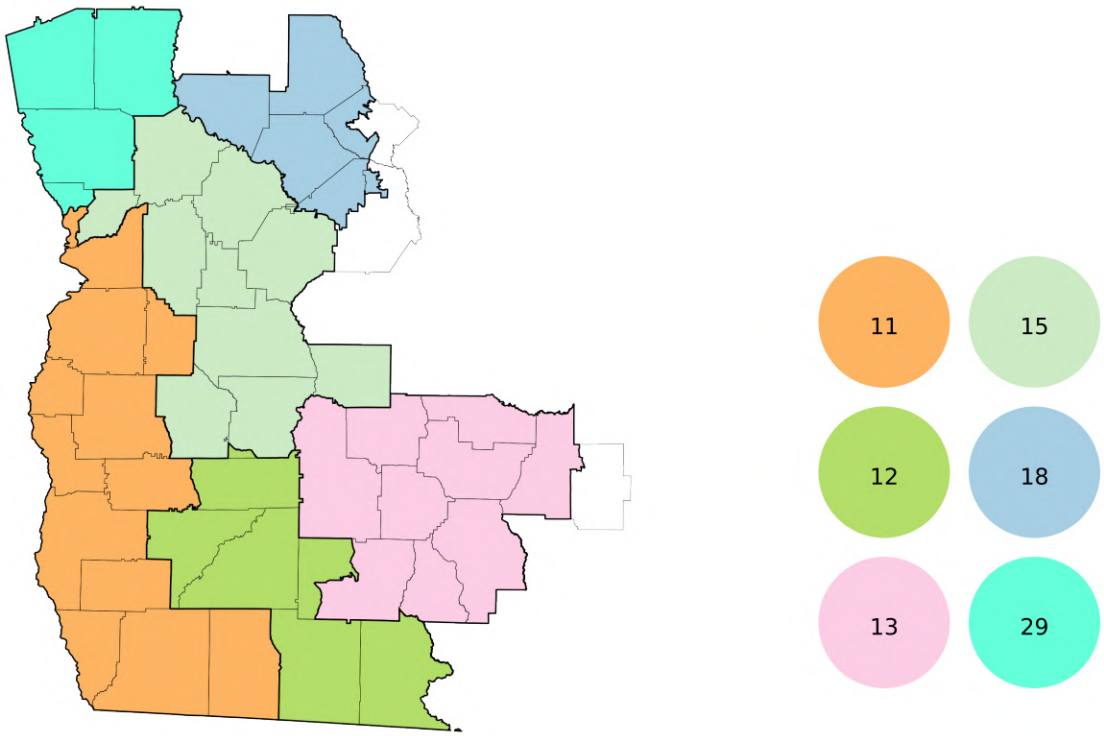


Figure 19: SD Southwest alternative effective plan.

	SD Southwest Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
11	31.0%	38.6%	4	0
12	58.0%	61.5%	4	8
13	27.0%	33.0%	4	0
15	54.0%	60.6%	4	8
18	30.4%	34.9%	3	0
29	26.9%	31.4%	3	0

	SD Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
11	44.0%	50.9%	4	6
12	50.1%	53.4%	4	7
13	25.6%	34.7%	4	0
15	50.4%	54.7%	4	8
18	30.4%	34.9%	3	0
29	27.3%	31.9%	3	0

Table 29: SD Southwest (6 districts).

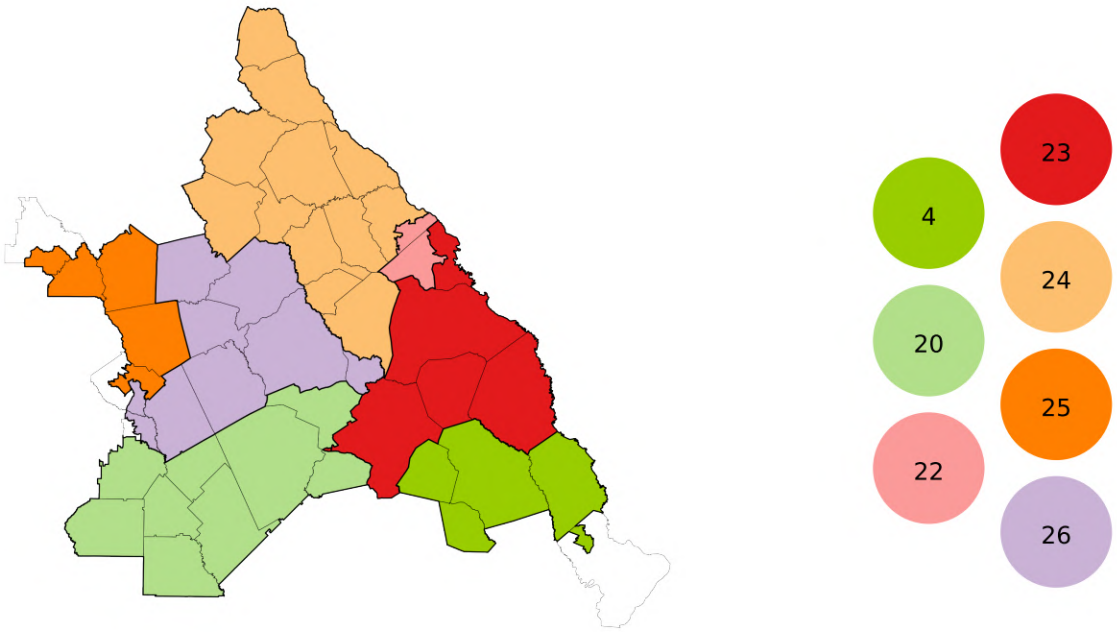


Figure 20: SD East Black Belt alternative effective plan.

	SD East Black Belt Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
4	23.4%	28.9%	3	0
20	31.3%	34.8%	3	0
22	56.5%	61.8%	4	8
23	35.5%	40.0%	3	0
24	19.9%	24.3%	3	0
25	33.5%	37.2%	3	0
26	57.0%	61.2%	3	8

	SD East Black Belt Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
4	23.4%	28.9%	3	0
20	32.0%	35.3%	3	0
22	39.1%	46.1%	4	8
23	46.1%	49.6%	3	7
24	26.5%	30.3%	3	0
25	45.7%	49.6%	3	8
26	44.0%	48.2%	3	5

Table 30: SD East Black Belt (7 districts).

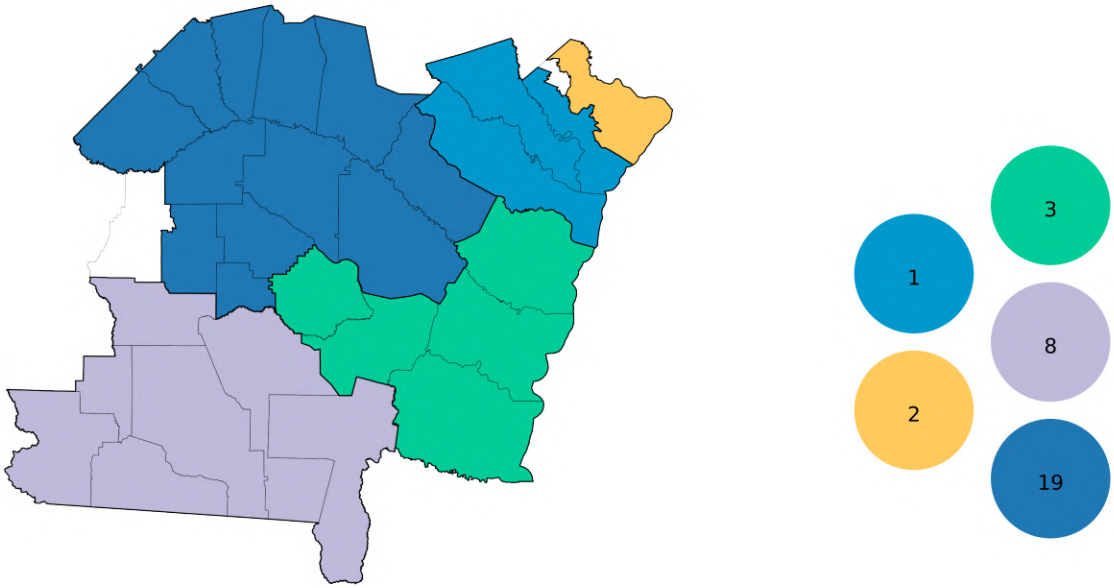


Figure 21: SD Southeast alternative effective plan.

	SD Southeast Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	25.1%	32.6%	3	0
2	46.9%	54.4%	4	8
3	21.2%	27.4%	3	0
8	30.4%	36.6%	4	0
19	25.7%	34.1%	4	0

	SD Southeast Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	34.8%	43.7%	4	6
2	37.4%	43.6%	3	8
3	19.1%	24.3%	3	0
8	32.5%	39.7%	4	0
19	25.5%	33.8%	4	0

Table 31: SD Southeast (5 districts).

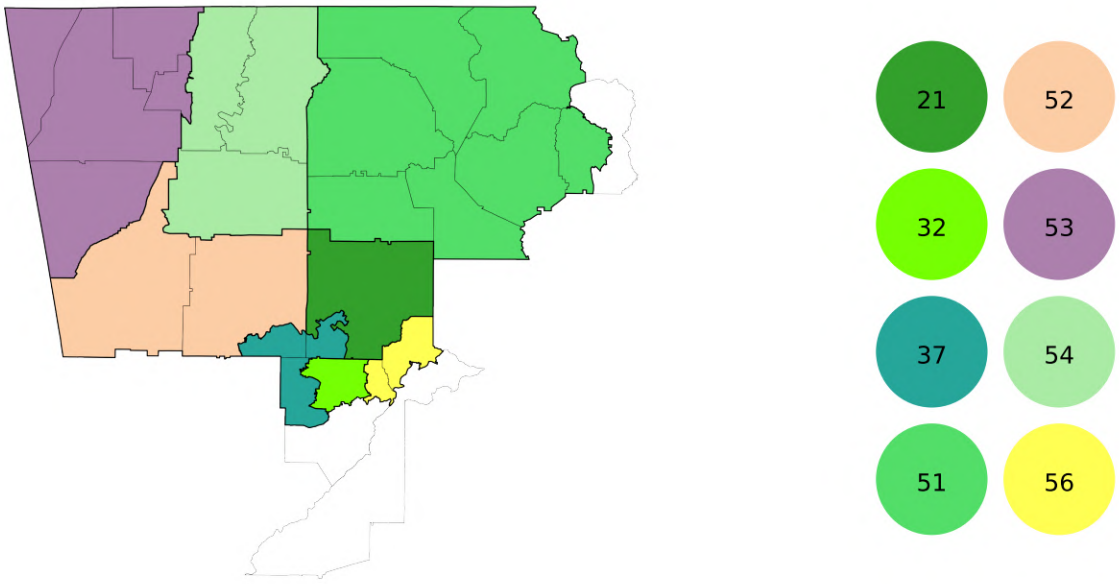


Figure 22: SD Northwest alternative plan that increases effectiveness by creating a competitive SD 32 that is well aligned with Black and Latino preferences in primary elections.

	SD Northwest Enacted			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	7.5%	16.3%	2	0
32	14.9%	25.4%	3	0
37	19.3%	28.0%	3	0
51	1.2%	5.5%	0	0
52	13.0%	21.2%	1	0
53	5.1%	8.3%	1	0
54	3.8%	26.4%	1	0
56	7.6%	15.3%	0	0

	SD Northwest Alt Eff 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	6.5%	16.5%	1	0
32	21.0%	31.2%	3	3
37	13.1%	22.1%	3	0
51	1.2%	5.5%	0	0
52	13.3%	22.0%	1	0
53	4.6%	7.5%	1	0
54	3.8%	26.6%	1	0
56	8.3%	14.6%	0	0

Table 32: SD Northwest (8 districts).

9.3 State House alternatives

The "Alt Eff" (alternative effective) districts in the House cover all of the regional clusters listed above: Atlanta, Cobb, DeKalb, Gwinnett, Southwest, East Black Belt, and Southeast Georgia.

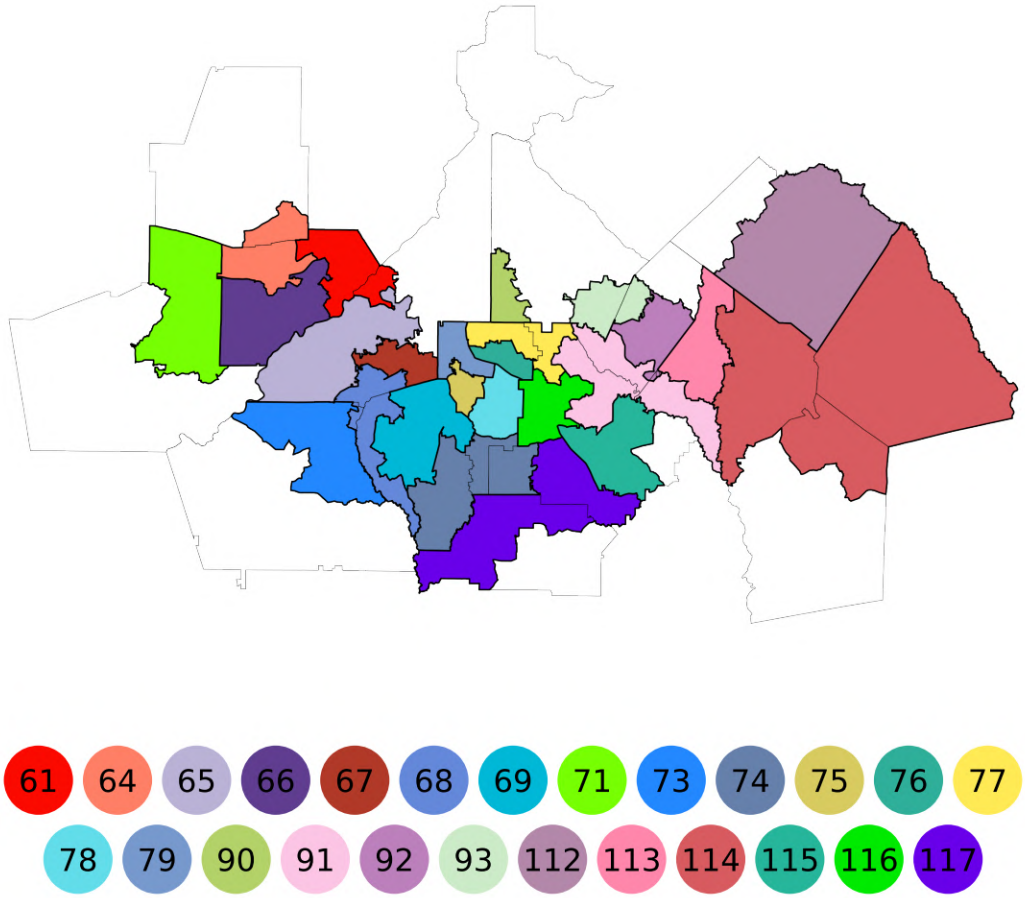


Figure 23: HD Atlanta Alt Eff 3 plan.

	HD Atlanta Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	74.3%	81.9%	4	8
64	30.7%	38.1%	3	0
65	62.0%	66.5%	4	8
66	53.4%	62.9%	4	8
67	58.9%	66.7%	4	8
68	55.7%	62.0%	4	8
69	63.6%	69.0%	4	8
71	19.9%	26.1%	3	0
73	12.1%	19.1%	2	0
74	25.5%	31.1%	3	0
75	74.4%	85.7%	4	8
76	67.2%	80.4%	4	8
77	76.1%	88.3%	4	8
78	71.6%	80.5%	4	8
79	71.6%	87.6%	4	8
90	58.5%	62.8%	2	8
91	70.0%	75.9%	4	8
92	68.8%	73.5%	4	8
93	65.4%	75.0%	4	8
112	19.2%	22.5%	1	0
113	59.5%	66.2%	4	8
114	24.7%	28.4%	3	0
115	52.1%	59.1%	4	8
116	58.1%	65.4%	4	8
117	36.6%	42.0%	3	0

	HD Atlanta Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	64.9%	74.5%	4	8
64	43.7%	52.4%	4	7
65	87.0%	90.2%	4	8
66	40.5%	48.1%	4	5
67	89.1%	94.7%	4	8
68	36.7%	44.4%	3	5
69	33.6%	40.3%	3	6
71	19.9%	26.1%	3	0
73	11.5%	17.9%	2	0
74	48.5%	54.7%	4	8
75	78.7%	90.0%	4	8
76	59.5%	76.4%	4	8
77	66.1%	80.0%	4	8
78	70.6%	79.9%	4	8
79	80.7%	91.3%	4	8
90	58.5%	62.8%	2	8
91	43.2%	48.3%	4	6
92	64.4%	71.2%	4	8
93	85.1%	92.0%	4	8
112	19.2%	22.5%	1	0
113	61.1%	66.9%	4	8
114	26.0%	30.0%	3	0
115	47.3%	53.9%	4	5
116	57.3%	65.3%	4	8
117	39.6%	45.8%	4	5

Table 33: HD Atlanta (25 districts).

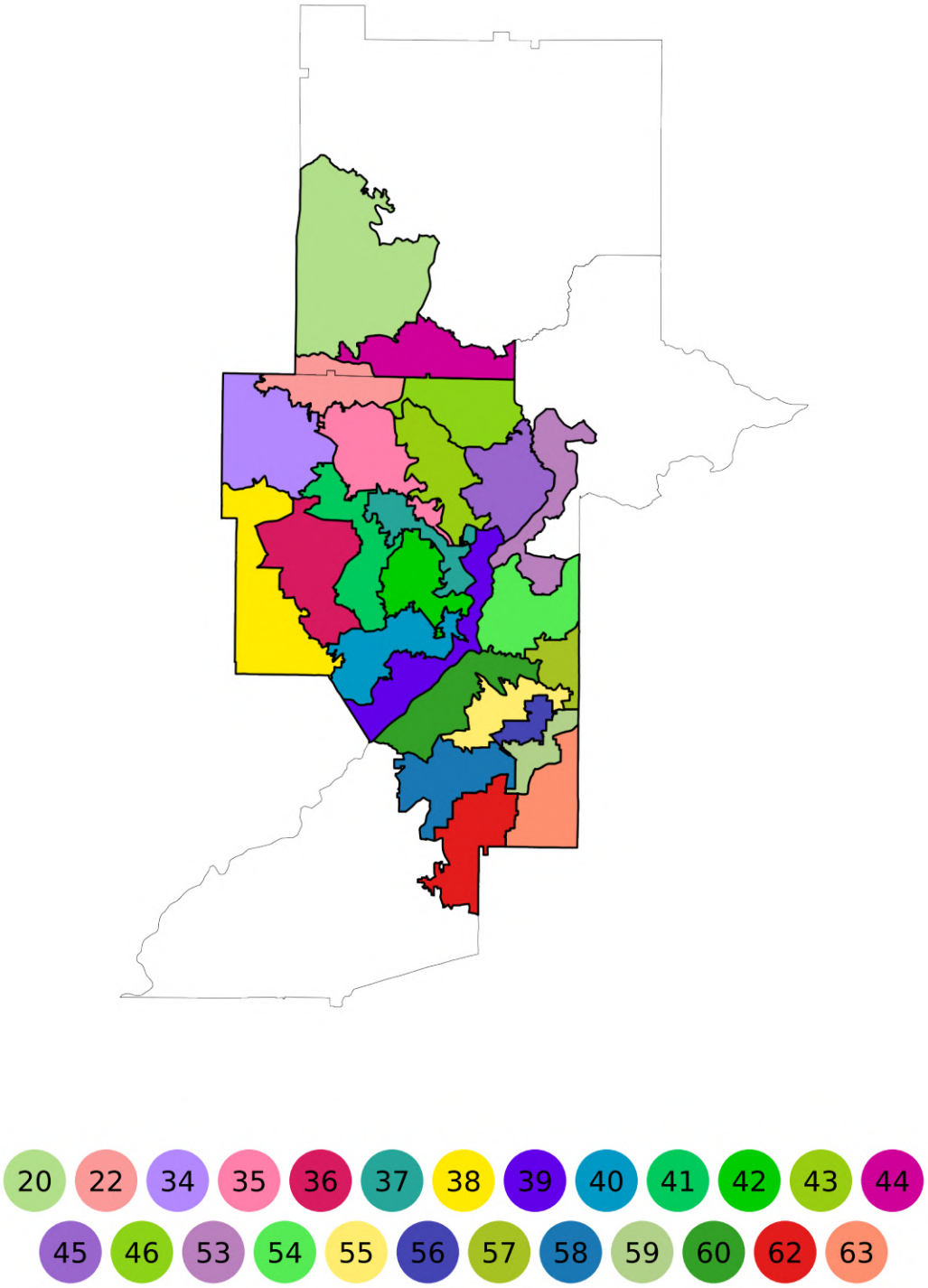


Figure 24: HD Cobb Alt Eff 3 plan.

	HD Cobb Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
20	9.3%	18.5%	1	0
22	15.1%	26.7%	3	0
34	15.7%	23.5%	3	0
35	28.4%	39.6%	3	8
36	17.0%	23.5%	3	0
37	28.2%	46.8%	3	8
38	54.2%	66.8%	4	8
39	55.3%	74.0%	4	8
40	33.0%	38.9%	3	8
41	39.4%	68.0%	4	8
42	33.7%	51.1%	3	8
43	26.5%	40.6%	3	8
44	12.0%	22.5%	2	0
45	5.3%	10.2%	0	0
46	8.1%	15.5%	0	0
53	14.5%	21.9%	0	1
54	15.5%	28.3%	0	7
55	55.4%	60.4%	3	8
56	45.5%	51.3%	3	8
57	18.1%	26.1%	0	8
58	63.0%	68.1%	3	8
59	70.1%	74.5%	3	8
60	63.9%	69.0%	3	8
62	72.3%	79.1%	3	8
63	69.3%	78.6%	3	8

	HD Cobb Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
20	6.9%	14.5%	1	0
22	22.9%	34.3%	3	5
34	15.5%	24.2%	3	0
35	31.2%	44.9%	3	8
36	38.9%	50.9%	3	8
37	33.7%	51.8%	3	8
38	41.9%	51.6%	3	8
39	45.5%	56.6%	3	8
40	39.9%	53.3%	3	8
41	32.3%	52.3%	3	8
42	28.4%	51.1%	3	8
43	16.2%	25.9%	3	5
44	11.2%	24.7%	1	0
45	5.0%	9.8%	0	0
46	9.2%	16.6%	0	0
53	17.5%	32.1%	0	7
54	12.4%	17.5%	0	1
55	50.6%	56.1%	3	8
56	44.2%	51.0%	3	8
57	18.9%	27.1%	0	8
58	93.1%	95.3%	4	8
59	51.2%	56.1%	3	8
60	57.0%	63.1%	3	8
62	81.5%	88.7%	3	8
63	61.6%	70.8%	3	8

Table 34: HD Cobb (25 districts).

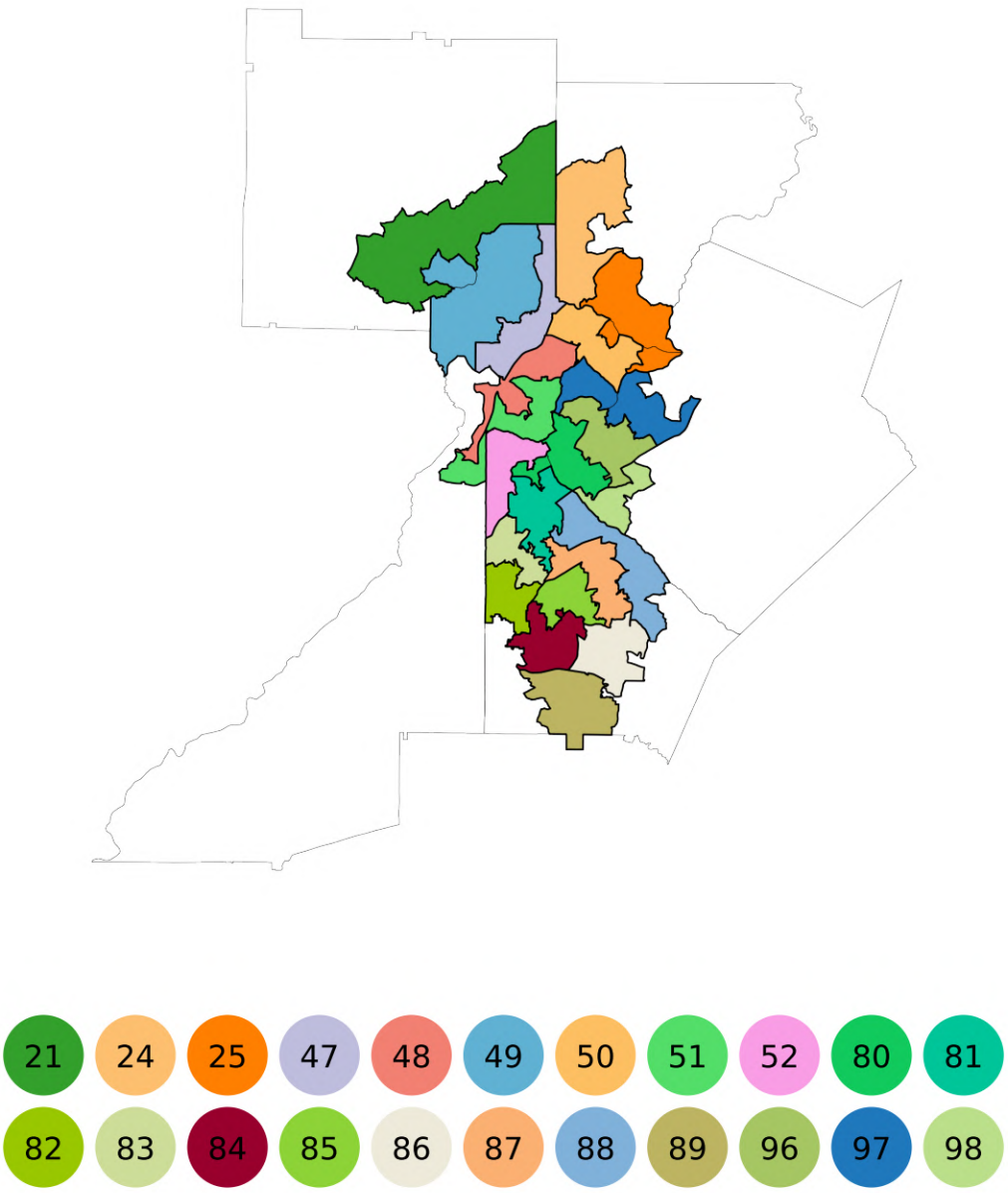


Figure 25: HD DeKalb Alt Eff 3 plan.

	HD DeKalb Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	5.1%	12.5%	1	0
24	7.0%	17.3%	1	0
25	5.9%	11.0%	0	0
47	10.7%	18.1%	2	0
48	11.8%	24.2%	0	1
49	8.4%	15.1%	0	0
50	12.4%	18.8%	2	8
51	23.7%	37.0%	0	8
52	16.0%	23.4%	0	8
80	14.2%	37.3%	0	8
81	21.8%	42.7%	0	8
82	16.8%	23.6%	0	8
83	15.1%	43.6%	0	8
84	73.7%	76.7%	3	8
85	62.7%	68.6%	3	8
86	75.1%	79.4%	3	8
87	73.1%	79.8%	4	8
88	63.3%	73.3%	3	8
89	62.5%	65.9%	2	8
96	23.0%	59.0%	3	8
97	26.8%	46.0%	3	8
98	23.2%	76.0%	3	8

	HD DeKalb Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
21	5.1%	12.4%	1	0
24	7.0%	17.3%	1	0
25	5.9%	10.7%	0	0
47	15.7%	31.4%	3	5
48	20.8%	32.2%	3	8
49	5.8%	11.0%	0	0
50	12.6%	19.7%	2	7
51	16.1%	24.4%	0	6
52	10.9%	16.4%	0	7
80	27.2%	60.1%	3	8
81	16.0%	49.2%	0	8
82	16.9%	23.2%	0	8
83	15.0%	36.5%	0	8
84	62.6%	67.7%	3	8
85	54.8%	59.4%	3	8
86	90.8%	94.5%	4	8
87	60.6%	68.7%	3	8
88	45.9%	59.3%	3	8
89	94.7%	97.0%	4	8
96	20.5%	50.2%	3	8
97	19.0%	32.8%	3	8
98	24.4%	71.2%	3	8

Table 35: HD DeKalb (22 districts).

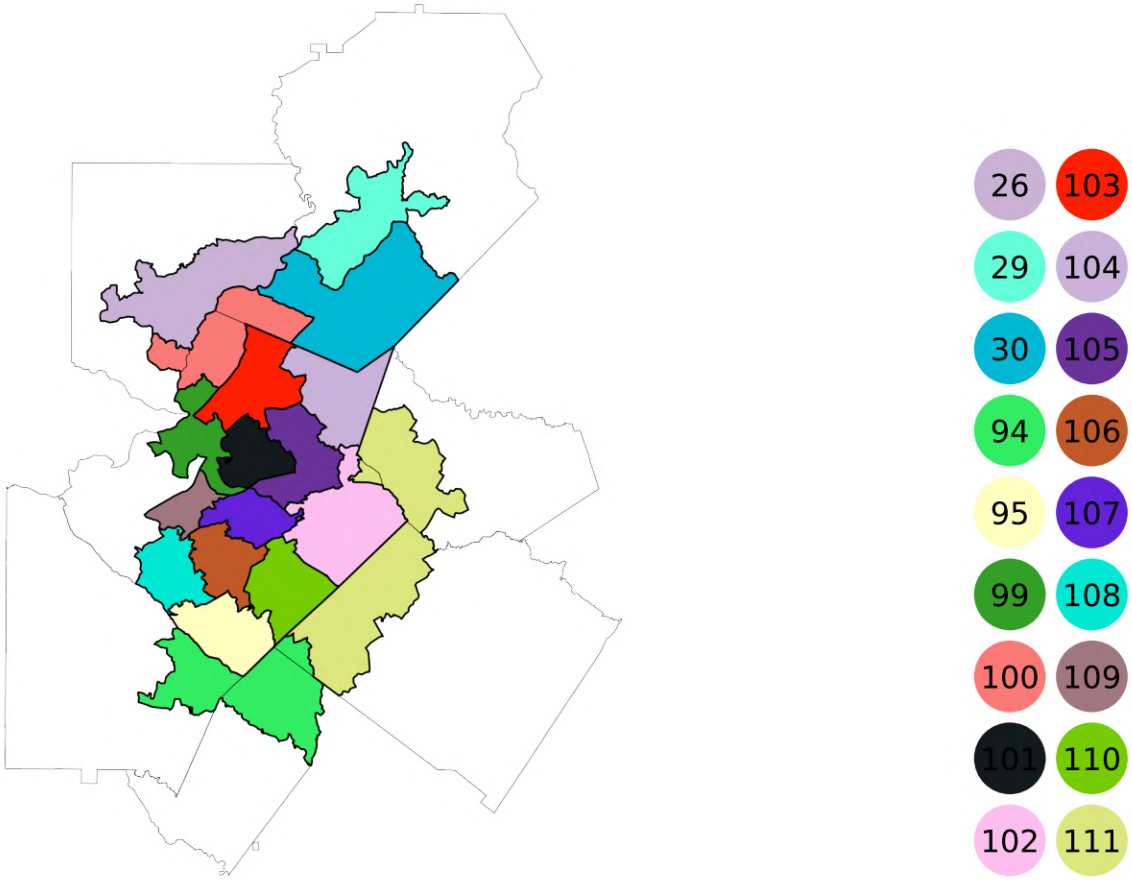


Figure 26: HD Gwinnett Alt Eff 3 plan.

	HD Gwinnett Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
26	4.0%	14.8%	0	0
29	13.6%	53.3%	2	0
30	8.1%	24.2%	0	0
94	69.0%	76.3%	4	8
95	67.2%	75.1%	4	8
99	14.7%	23.4%	3	3
100	10.0%	20.0%	1	0
101	24.2%	42.4%	3	7
102	37.6%	58.9%	3	8
103	16.8%	33.7%	3	0
104	17.0%	28.1%	3	0
105	29.0%	45.8%	3	6
106	36.3%	47.4%	3	7
107	29.6%	60.7%	3	8
108	18.4%	36.6%	3	6
109	32.5%	68.6%	3	8
110	47.2%	57.7%	4	8
111	22.3%	31.1%	3	0

	HD Gwinnett Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
26	4.1%	14.8%	0	0
29	13.6%	53.3%	2	0
30	6.6%	22.7%	0	0
94	79.8%	84.3%	4	8
95	59.7%	71.1%	4	8
99	16.9%	27.3%	3	5
100	10.1%	21.3%	2	0
101	24.4%	41.9%	3	7
102	40.2%	53.3%	4	7
103	19.5%	35.8%	3	3
104	18.9%	29.3%	3	0
105	33.2%	53.2%	3	8
106	25.4%	40.4%	3	6
107	30.2%	55.7%	3	8
108	19.8%	39.6%	3	6
109	33.5%	72.2%	4	8
110	47.5%	58.8%	4	8
111	14.1%	23.0%	3	0

Table 36: HD Gwinnett (18 districts).

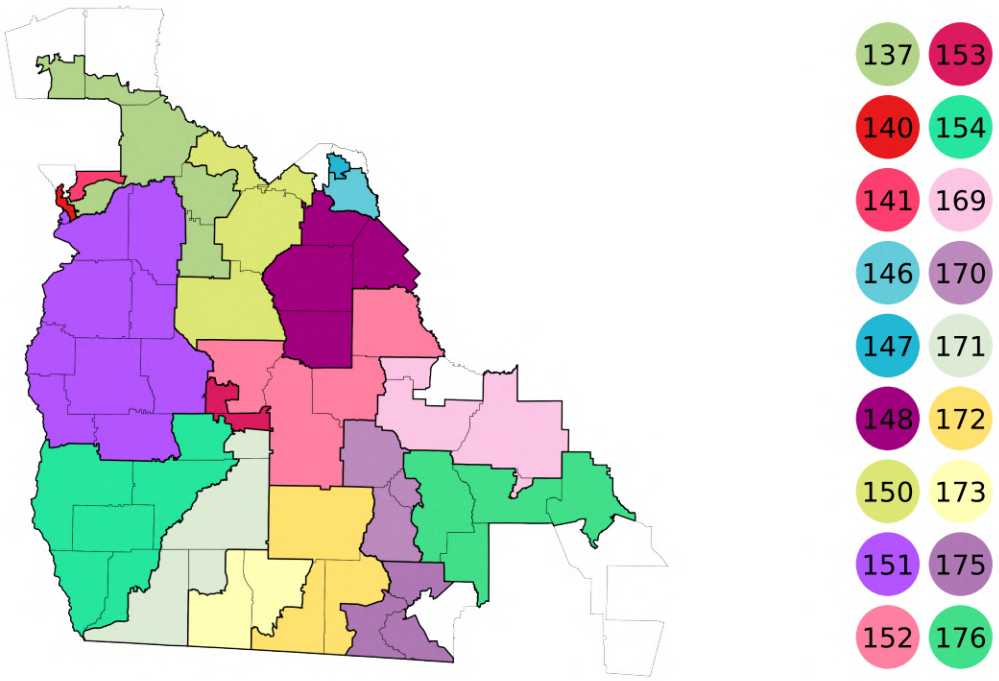


Figure 27: HD Southwest Alt Eff 3 plan.

	HD Southwest Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
137	52.1%	56.6%	4	8
140	57.6%	65.6%	4	8
141	57.5%	64.1%	4	8
146	27.6%	32.3%	4	0
147	30.1%	37.3%	4	0
148	34.0%	37.1%	4	0
150	53.6%	59.7%	4	8
151	42.4%	49.7%	4	0
152	26.1%	28.4%	4	0
153	67.9%	70.4%	4	8
154	54.8%	56.5%	4	7
169	29.0%	36.7%	3	0
170	24.2%	32.9%	3	0
171	39.6%	44.2%	4	0
172	23.3%	36.7%	4	0
173	36.3%	41.7%	4	0
175	24.2%	29.2%	4	0
176	22.7%	30.9%	4	0

	HD Southwest Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
137	55.2%	58.4%	4	8
140	59.3%	66.9%	4	8
141	49.2%	56.1%	4	8
146	23.9%	29.4%	4	0
147	31.2%	38.0%	4	0
148	39.2%	42.4%	4	0
150	55.0%	60.9%	4	8
151	45.7%	54.0%	4	7
152	28.3%	30.7%	4	0
153	60.3%	62.8%	4	8
154	50.7%	52.9%	4	6
169	27.2%	37.2%	3	0
170	27.7%	36.6%	2	0
171	47.5%	51.8%	4	0
172	23.2%	36.2%	4	0
173	34.5%	39.9%	4	0
175	24.1%	29.5%	4	0
176	20.3%	25.7%	4	0

Table 37: HD Southwest (18 districts).

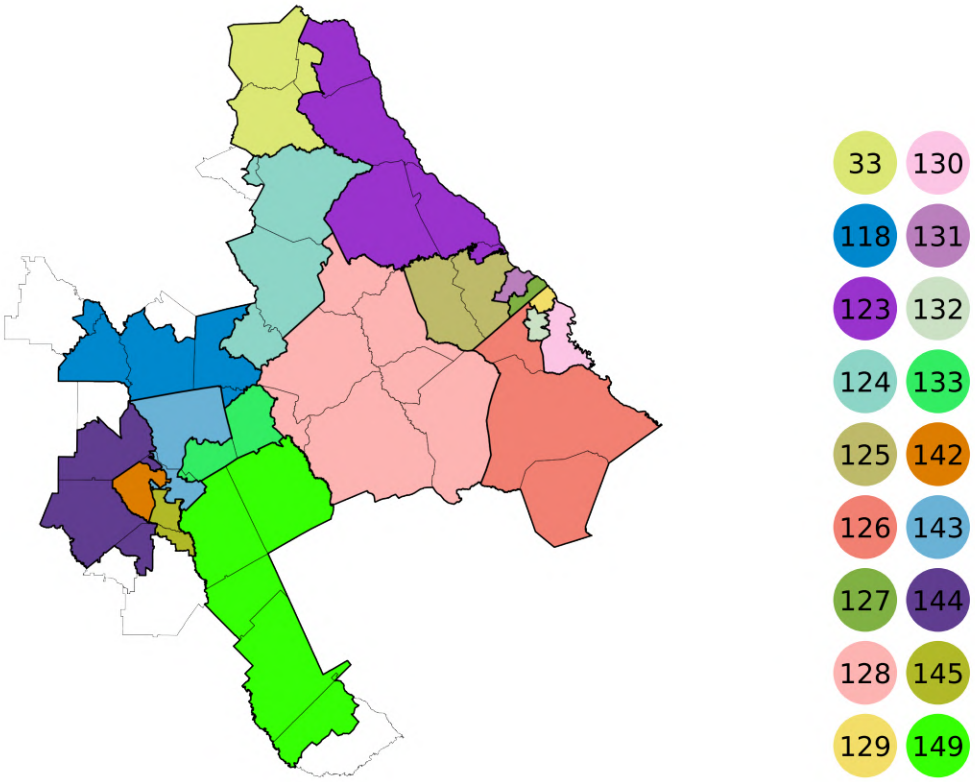


Figure 28: HD East Black Belt Alt Eff 3 plan.

	HD East Black Belt Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
33	11.2%	14.3%	3	0
118	23.6%	27.3%	3	0
123	24.3%	28.6%	3	0
124	25.6%	31.8%	2	0
125	23.7%	31.4%	3	0
126	54.5%	57.7%	4	8
127	18.5%	23.3%	3	0
128	50.4%	52.1%	2	4
129	54.9%	59.2%	3	8
130	59.9%	63.8%	4	8
131	17.6%	23.5%	3	0
132	52.3%	60.1%	4	8
133	36.8%	38.9%	3	0
142	59.5%	63.2%	3	8
143	60.8%	65.5%	3	8
144	29.3%	31.9%	3	0
145	35.7%	41.6%	3	0
149	32.1%	37.8%	2	0

	HD East Black Belt Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
33	9.3%	13.8%	3	0
118	22.8%	26.2%	3	0
123	25.5%	28.5%	3	0
124	25.3%	31.7%	2	0
125	30.7%	36.6%	3	0
126	41.0%	47.5%	4	8
127	17.2%	23.4%	3	0
128	51.9%	53.4%	2	7
129	38.2%	43.1%	3	5
130	60.6%	63.9%	4	8
131	18.0%	24.0%	3	0
132	74.7%	79.5%	4	8
133	45.4%	47.6%	3	8
142	42.1%	45.1%	3	6
143	54.8%	58.7%	3	8
144	26.0%	29.3%	3	0
145	55.1%	62.0%	4	8
149	32.1%	37.8%	2	0

Table 38: HD East Black Belt (18 districts).

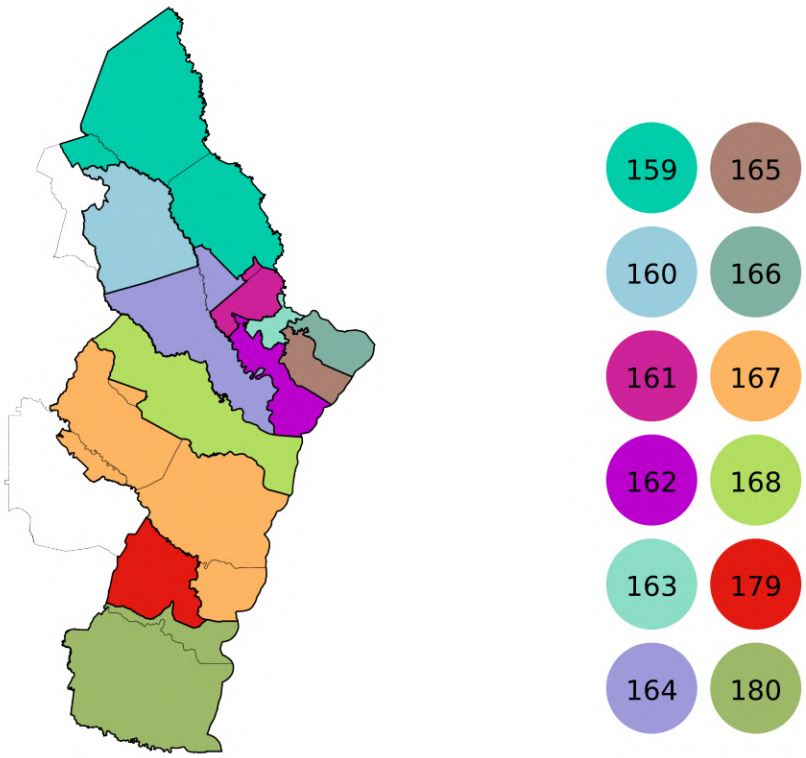


Figure 29: HD Southeast Alt Eff 3 plan.

	HD Southeast Enacted			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
159	24.5%	27.4%	2	0
160	22.6%	27.6%	2	0
161	27.1%	33.9%	4	0
162	43.7%	53.3%	4	8
163	45.5%	52.9%	3	8
164	23.5%	32.0%	3	0
165	50.3%	55.6%	4	8
166	5.7%	9.8%	3	0
167	22.3%	29.7%	3	0
168	46.3%	56.6%	4	8
179	27.0%	33.4%	3	0
180	18.2%	23.8%	3	0

	HD Southeast Alt Eff 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
159	22.3%	25.8%	3	0
160	26.4%	31.5%	1	0
161	34.1%	42.7%	4	6
162	38.9%	47.3%	4	8
163	50.0%	59.4%	4	8
164	13.6%	19.2%	3	0
165	27.1%	32.2%	3	5
166	29.9%	33.7%	3	8
167	18.7%	24.5%	3	0
168	45.9%	56.6%	4	8
179	31.8%	39.4%	4	0
180	18.2%	23.8%	3	0

Table 39: HD Southeast (12 districts).

10 Racial gerrymandering

10.1 Retention, displacement, and district disruption

In this section, I will examine the *core retention*, or conversely, the *population displacement*, of the districts in the enacted plan—that is, how much of the population retains the same district assignment before and after the redistricting? I will pay particular attention to the tendency to use racially imbalanced transfers of population in rebalancing the districts, and to the impact on the districts' effectiveness for electing Black and Latino candidates of choice.

10.1.1 Congress

In Congress, the ideal district population is 765,136. Of the fourteen districts, twelve are at least reasonably similar to their benchmark configuration, i.e., at least 2/3 of their population had been assigned to the same district before redistricting. The two with more than one-in-three new voters are districts 6 and 7.

District 6 was nearly at ideal size before the redistricting, having 771,431 residents enumerated in the Census—less than seven thousand off from the target size. However, it was subjected to major reconfiguration, with at least 40,000 people from the benchmark district reassigned to each of districts 4, 5, 7, and 11, while at least 40,000 different people were drawn in from each of districts 7, 9, and 11. In all, this represents reassignment of several hundred thousand people.

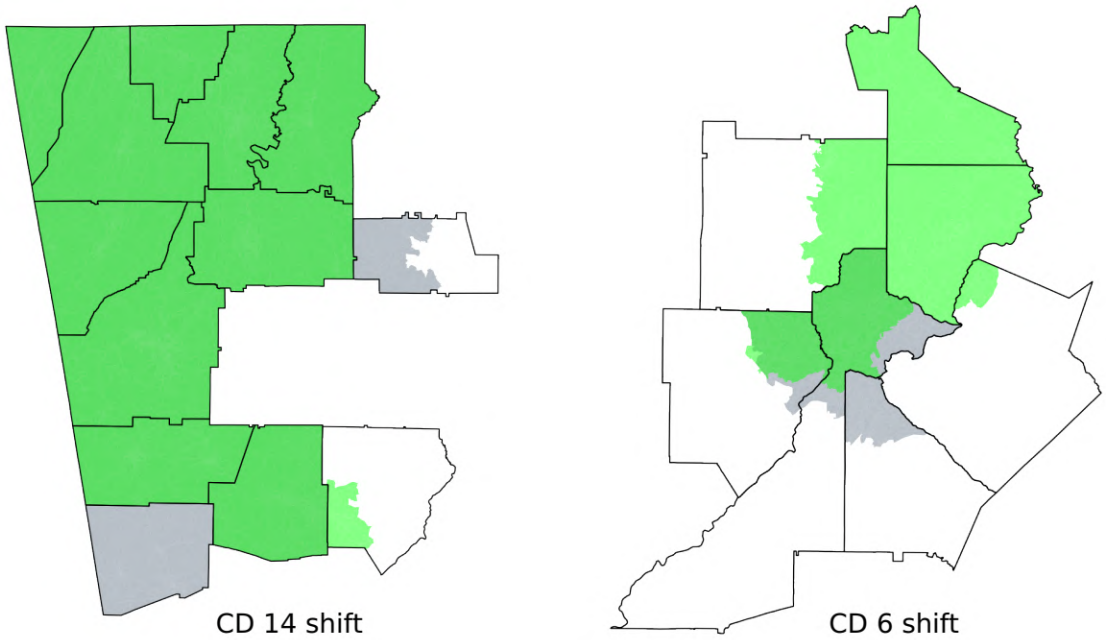


Figure 30: These before-and-after plots show benchmark configurations in gray, while new district placement is in light green. We can see that CD 14 made a new incursion into Cobb County while shedding rural Haralson and part of Pickens County. Meanwhile, CD 6 went sharply the other way, withdrawing from its metro Atlanta coverage and picking up rural counties to the north. Compare to Figure 31.

These swaps transfer more urban, more Black and Hispanic neighborhoods out of CD 6, while bringing in Whiter suburban areas. For instance, the largest reassignment out of the district goes from CD 6 to CD 4, and the largest reassignment into the district goes from CD 7 to CD 6—each of those moves roughly 200,000 Georgians to a new district, which is a massive shift. But the CD 6 to CD 4 transfer is 37.5% Black or Latino Georgians; by contrast, the CD 7 to CD 6 transfer is 16.1% Black or Latino. Since CD 6 was a performing district for the coalition of Black and Latino voters before its transformation, and none of the transfers improves representational prospects in non-performing districts, this transition looks to be plainly dilutive of voting power.

Meanwhile, the changes to CD 14 are smaller in terms of land area but are distinctive in terms of density and racial composition. CD 14 has expanded into Cobb to include two majority-Black cities—Powder Springs and Austell. Besides the further fracturing of Cobb County, Figure 31 makes it clear that the movement of those areas of Cobb into the district can't be justified in terms of compactness or respect for urban/rural communities of interest. (See §10.3 for references to the public record of community testimony.)

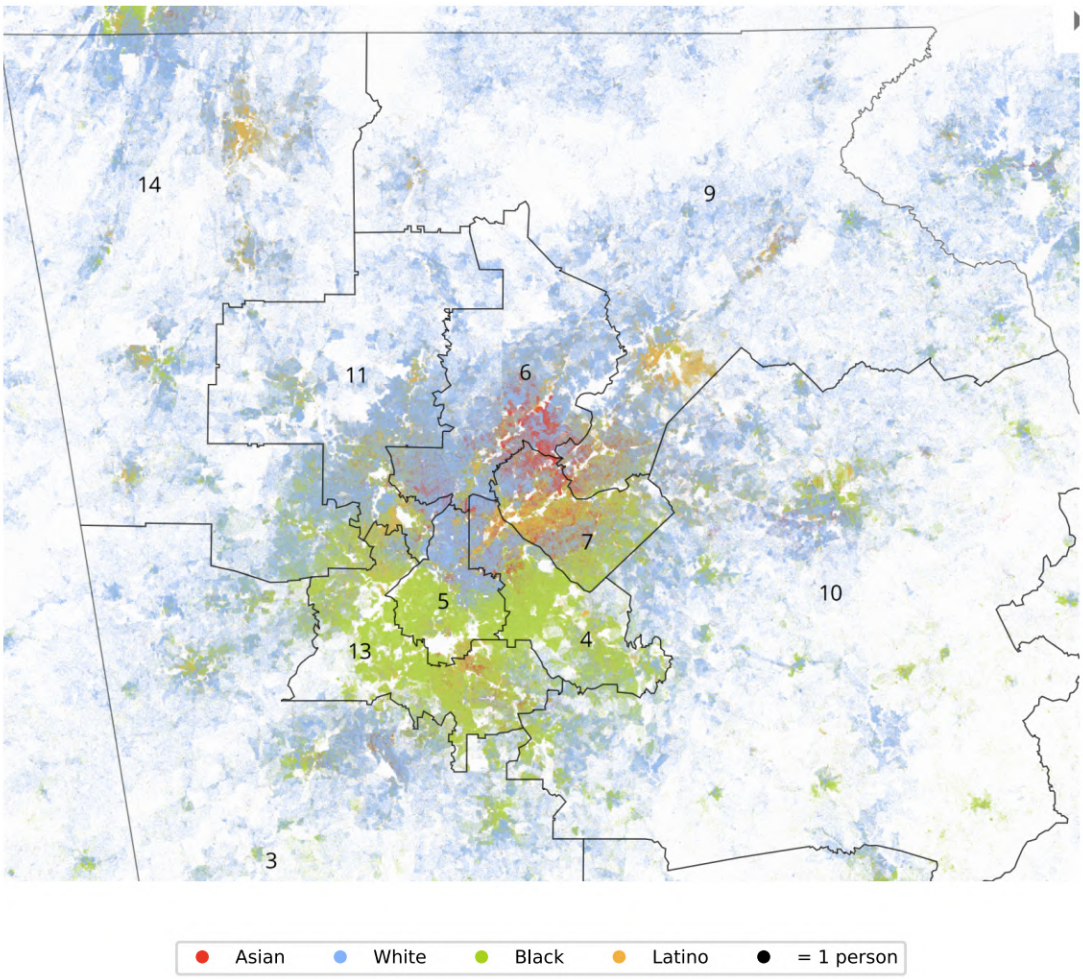


Figure 31: This dot density plot makes it clear—through thicker arrangement of dots, with green dots predominating—that dense African-American neighborhoods in Cobb were brought in at the southern tip of CD 14. These voters were therefore submerged among more numerous, dissimilar communities from CD 14. Meanwhile, the changes to district 6 added suburban/exurban/rural areas—seen with the sparsity at the north of CD 6 in the the dot density plot—unlike the bulk of the district.

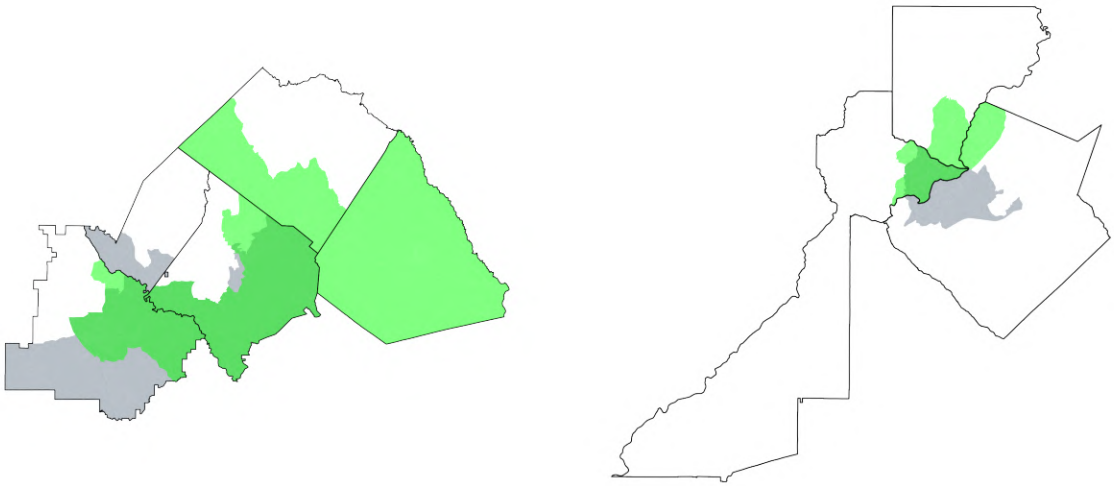
This incursion of CD 14 into Cobb is emphatically not required by adherence to traditional districting principles. For one vivid illustration of that, consider the comparison between the Duncan-Kennedy draft map and the map that was ultimately enacted. The benchmark plan from ten years ago had split Pickens County and included Haralson County in its construction of CD 14. Duncan-Kennedy retains Haralson, keeps Pickens whole in CD 9, and splits (low-density, mostly White) Bartow County to achieve population balance. Thus the shift in the final enacted plan—submerging a dense, majority-Black segment of Cobb in CD 14—was not necessary to balance population while keeping Pickens intact.

10.1.2 State Senate

When we move to smaller and more numerous districts in the Senate (ideal population 191,284), we might reasonably expect somewhat less core retention as line-drawers balance the traditional principles. However, the disruption in some cases is more than we would expect if retention were a highly prioritized goal. In the Senate, SD 7 and SD 14 have zero overlap with their previous population in the Benchmark configuration, and four other districts—SD 6, 32, 48, and 56—have less than half of their population retained.

New SD 14 is largely composed of benchmark SD 56, which was represented by Republican John Albers. The previous SD 56, which had become competitive over time (with four Republican victories and four Democratic victories across the elections in our probative dataset), was completely moved off of itself, to a new position that gave Biden only 43.7% support. Thus Albers could stay in the district numbered 56, facing largely new but very Republican-leaning voters, and win easily. This was achieved by racially imbalanced shifts: 56 → 14 has 35.5% BHVAP (substantial but still failing to secure electoral alignment in SD 14 with Black and Latino candidates of choice), while each group moved into SD 56 has under 19% BHVAP.

Another consequential district disruption occurred in benchmark district 48, which was represented by Democrat Michelle Au. Roughly two-thirds of the previous population of SD 48 was reassigned into SD 7 (see Figure 32 for geographical displacement). But the 7th district was already Democratic-controlled and was now facing the candidacy of progressive Nabilah Islam, who had been endorsed by civil rights groups including GALEO. The new SD 48 was built to be highly ineffective for Black and Latino preferences (aligned in only one of four primaries and zero of eight general elections from our probative dataset). Rather than run in the new district, Au switched to a run for the lower chamber, ultimately winning HD 50 in 2022. This district makeover was carried out with highly racially imbalanced transfers of population. Of more than 130,000 people moved from SD 48 to SD 7, 37.8% are Black and Latino, while the retained population has only 17.8% BHVAP share; and no territory reassigned into the district has BHVAP share exceeding 23.5%.



SD 17 shift SD 48 shift

Figure 32: These before-and-after plots show benchmark configurations in gray, while new district placement is in light green. The new configurations are clearly not made to improve compactness, and they increase the number of county traversals.

SD 17 also underwent a makeover: the district had become mildly overpopulated but was changed much more than needed, retaining only about half of its residents. (See, again, Figure 32.) Meanwhile, the district was transformed from effective (4/4 primaries, 5/8 generals) to ineffective (3/4 primaries, 0/8 generals). Outgoing population was roughly half Black and Latino (17 → 10 has 52.6% BHVAP, 17 → 25 has 49.0%, and 17 → 43 has 51.3%) while the significant incoming reassignments have much lower shares (25 → 17 has 20.9% and 46 → 17 has 23.8%). Notably, none of the districts that received population from SD 17 thereby became effective.

10.1.3 State House

At the House level, the ideal district size of just 59,511 necessitates substantial shifts to the districts, but once again the state's enacted map is highly disruptive, well beyond what is required. Fully 57 districts out of 180 were moved to positions completely disjoint from their benchmark locations. Furthermore, a startling 32 districts were not only moved or relabeled but effectively *dismantled*, with fewer than 30,000 prior residents assigned to any single district, so that no candidate can have the usual benefits of incumbency in terms of familiarity to their voters.

One notable category within these "dismantled" districts is those for which the ten-year demographic shifts had made the benchmark districts amenable to political swings, so that candidates from each major party would have won 2-6 out of 8 general contests in the dataset of probative elections. This includes seven districts: HD 35, 44, 48, 49, 52, 104, and 109. *Zero* of these remain in this "swingy" category after redrawing. Yet five are rebuilt to be ineffective for Black and Latino voters, while only two are made effective. Those that are rebuilt to be ineffective are subjected to racially imbalanced population transfers.

Benchmark HD	Outward	Inward
44	.425 (to HD 35)	.226 (from HD 20)
48	.464 (to HD 51)	.201 (from HD 49)
49	.227 (to HD 47)	.127 (from HD 48)
52	.436 (to HD 54)	.245 (from HD 79)
104	.715 (to HD 102)	.363 (from HD 103)

Table 40: This table records the BHVAP share of the largest district-to-district reassignment for the five "dismantled" House districts that were formerly swingy, now made ineffective. Compare Figure 33.

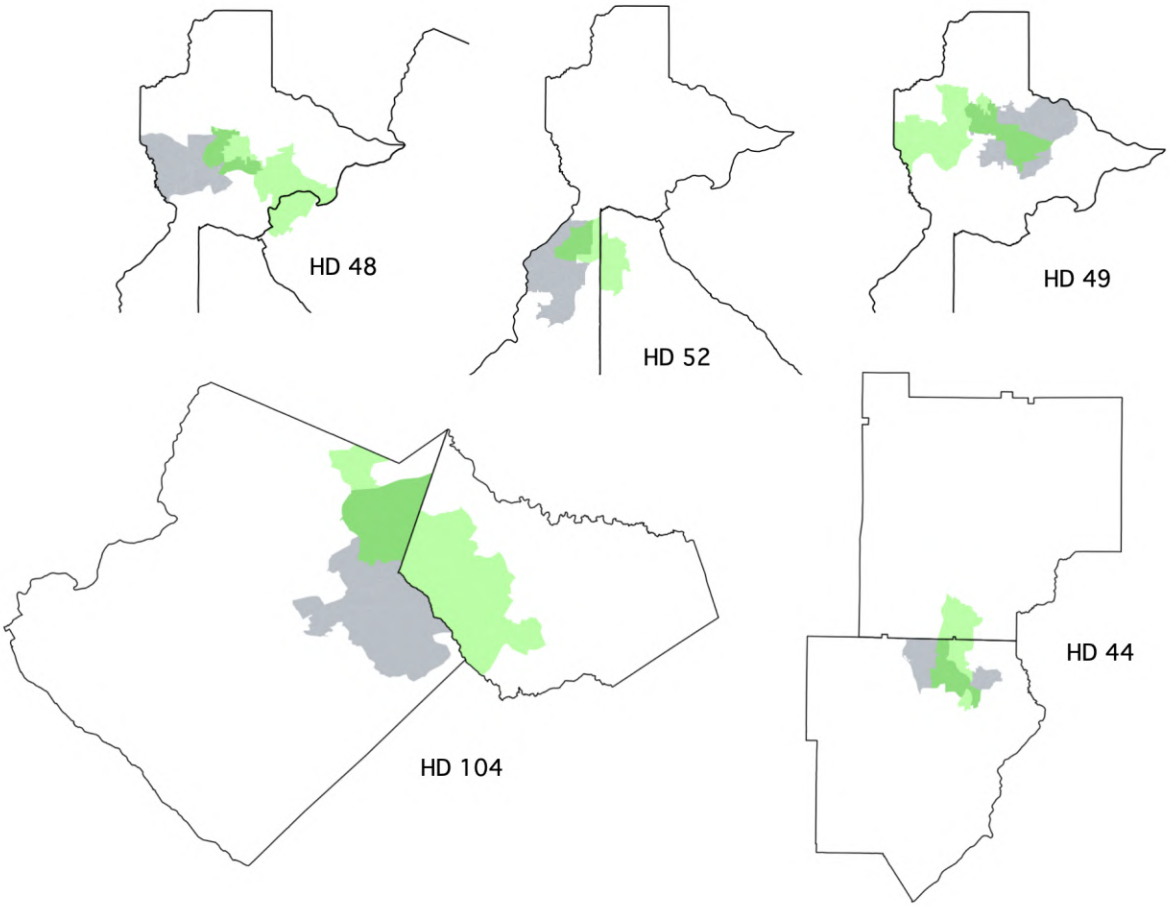


Figure 33: Each of these "dismantled" House districts from the metro Atlanta area (Table 40) was moved in such a way that the previous residents are scattered across multiple districts in the new plan. These districts had become politically swingy in the time since the last Census but are now rebuilt to be likely out of reach for Black and Latino voters' candidates of choice. The images make it clear that the shifts are not explained by traditional districting principles like compactness or respect for county lines. They is not explained by respect for municipal boundaries, as the new locations split small and midsized cities.

10.2 Splitting of geographical units

10.2.1 Congress

Most counties that are split in the enacted plan show marked racial disparity across the pieces. For instance, Cobb County is split across four districts, with CD 13 and 14 receiving parts of Cobb that are collectively over 60% Black and Latino by voting age population, while CD 6 contains a part of Cobb that is about 18.5% BHVAP—consistent with a packing and cracking strategy. Fayette, Fulton, Douglas, Newton, Gwinnett, Muscogee, and Bibb are likewise all split in a way that puts pieces into different districts with at least 20 percentage points disparity in BHVAP across the split.

County	District	BVAP	BHVAP
Bibb	CD 2	.6349	.6710
	CD 8	.3098	.3394

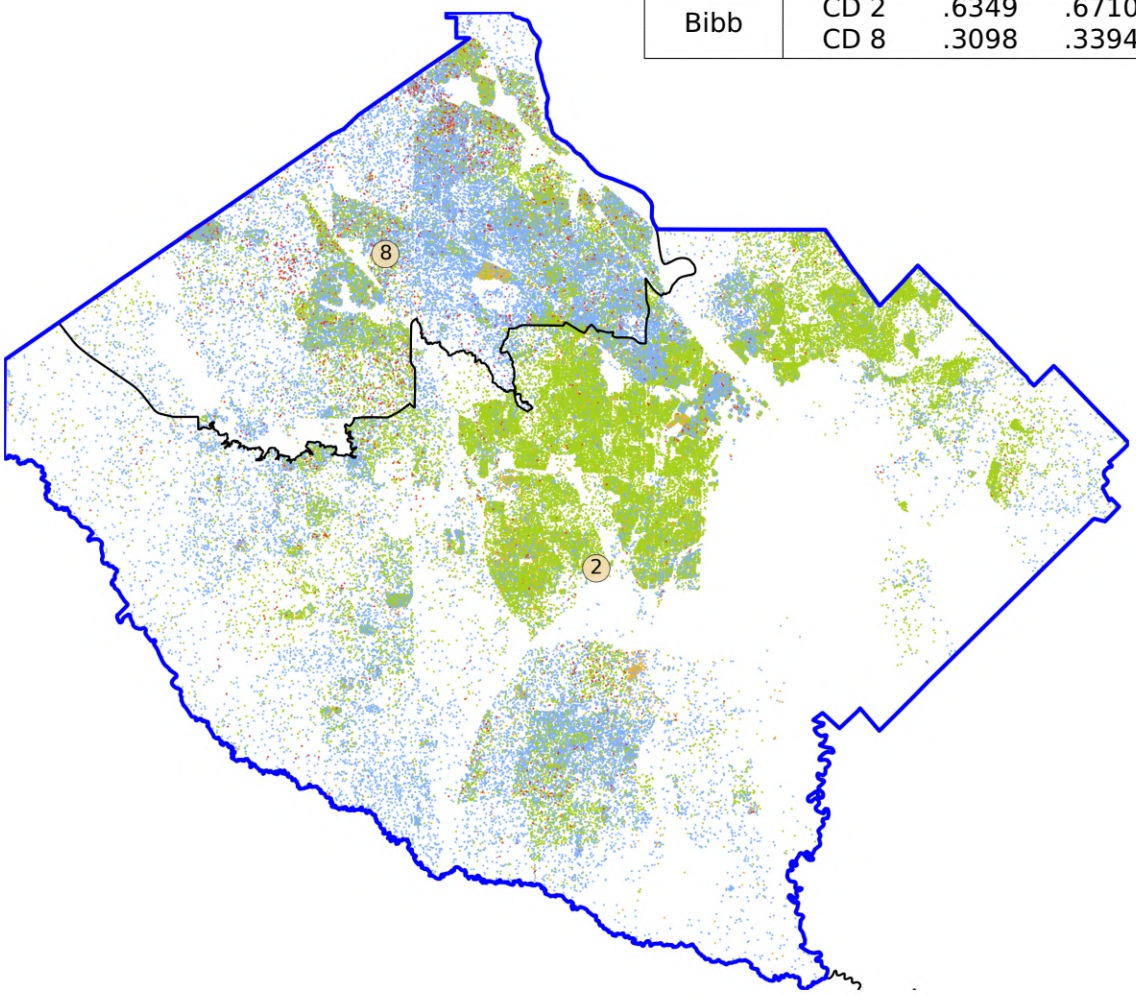


Figure 34: Minutely race-conscious decisions are evident along the boundary of CD 2 and CD 8 in Bibb County.

County	District	BVAP	BHVAP
Cherokee	CD 6	.0304	.0814
	CD 11	.0817	.1902
Clayton	CD 5	.7280	.8649
	CD 13	.7190	.8266
Cobb	CD 6	.1092	.1848
	CD 11	.2654	.3850
	CD 13	.4458	.6271
	CD 14	.4646	.5644
Douglas	CD 3	.2970	.3719
	CD 13	.5762	.6647
Fayette	CD 3	.2094	.2720
	CD 13	.5762	.6647
Fulton	CD 5	.4769	.5379
	CD 6	.1574	.2568
	CD 7	.1175	.1777
	CD 13	.8829	.9171
Gwinnett	CD 6	.1336	.2645
	CD 7	.3234	.5450
	CD 9	.2061	.3433
Henry	CD 3	.4678	.5259
	CD 10	.4414	.4948
	CD 13	.5710	.6324
Muscogee	CD 2	.5262	.5851
	CD 3	.1909	.2578

Table 41: All county splits involving CD 3, 6, 13, and 14. With the exception of the Clayton split, which is unremarkable in demographic terms, each of these is consistent with an overall pattern of cracking in CD 3 and CD 6, packing in CD 13, and submerging a small and diverse urban community in CD 14. See Appendix C for a complete list of county splits.

County	District	BVAP	BHVAP
Newton	CD 4	.6098	.6644
	CD 10	.2631	.2960

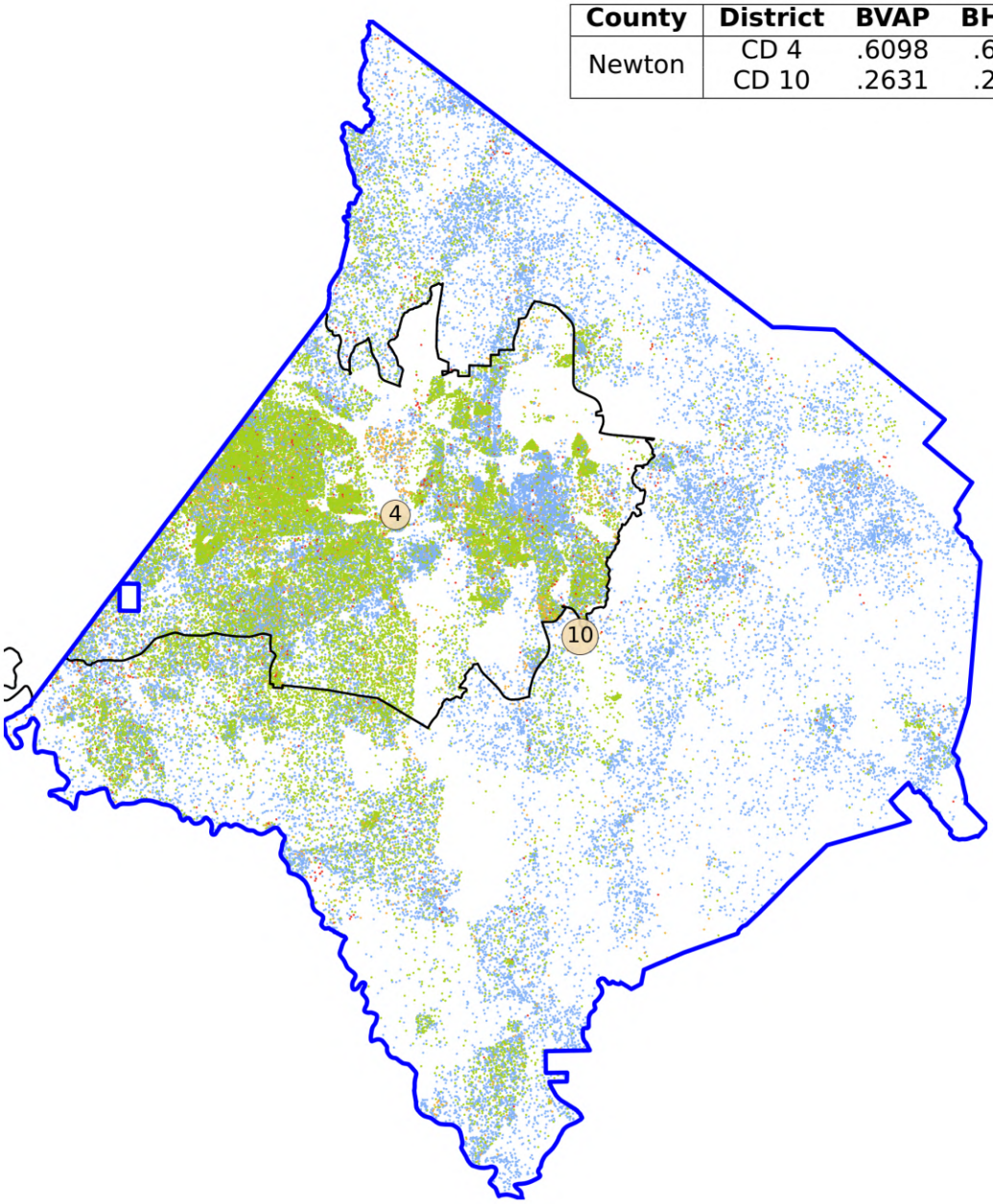


Figure 35: In Newton County, CD 4 and CD 10 are divided by a line that is consistent with packing the former district and cracking the latter.

For the purposes of investigating racial gerrymandering, the splits to state precincts can be especially revealing: these are the units at which cast votes are reported, so finer divisions are usually made in view of demographics but not voting behavior—that is, these highlight the predominance of race over even partisan concerns.[12]

Several pairs of bordering districts show significant demographic disparity across precinct splits in the Congressional plan, especially on the border of CD 4 and CD 10 (in Newton County, as in Figure 35), and on the border of CD 6 and CD 11 (in Cobb and Cherokee counties).

In particular, each precinct split with a sizeable demographic gap on the CD 6/11 border is consistent with the overall theme that CD 6 was targeted to reduce electoral opportunity for Black and Latino voters—and for Black voters, in particular.

State precinct	District	BVAP	BHVAP
MARIETTA 5A	CD 6	.1975	.4938
	CD 11	.4232	.5803
MARIETTA 6A	CD 6	.1391	.6607
	CD 11	.4738	.5464
SEWELL MILL 03	CD 6	.2225	.3042
	CD 11	.4064	.5548

Table 42: Three examples of split precincts on the CD 6 / CD 11 border that show significant racial disparity, consistent with an effort to diminish the electoral effectiveness of CD 6 for Black voters. (Note that CD 6 receives a higher share of BHVAP in Marietta 6A, but a far lower share of BVAP.)

Though the disparity in numbers is suggestive, the previous splits are geographically unremarkable. By contrast, several precinct splits on the CD 4 / CD 10 border stand out both in demographic and geographic terms.

State precinct	District	BVAP	BHVAP
ALCOVY	CD 4	.4010	.4499
	CD 10	.0512	.0620
CITY POND	CD 4	.5912	.6554
	CD 10	.3923	.4192
OXFORD	CD 4	.6444	.6932
	CD 10	.0929	.1213
DOWNS	CD 4	.6429	.7024
	CD 10	.4429	.4930

Table 43: Four examples of split precincts on the CD 4 / CD 10 border, all consistent with packing of CD 4 and cracking of CD 10.

[12] Of course, it is possible to incorporate registered voter data at the block level or to purchase commercial products with partisan modeling, but official state mappers frequently claim not to use this more fine-grained data.

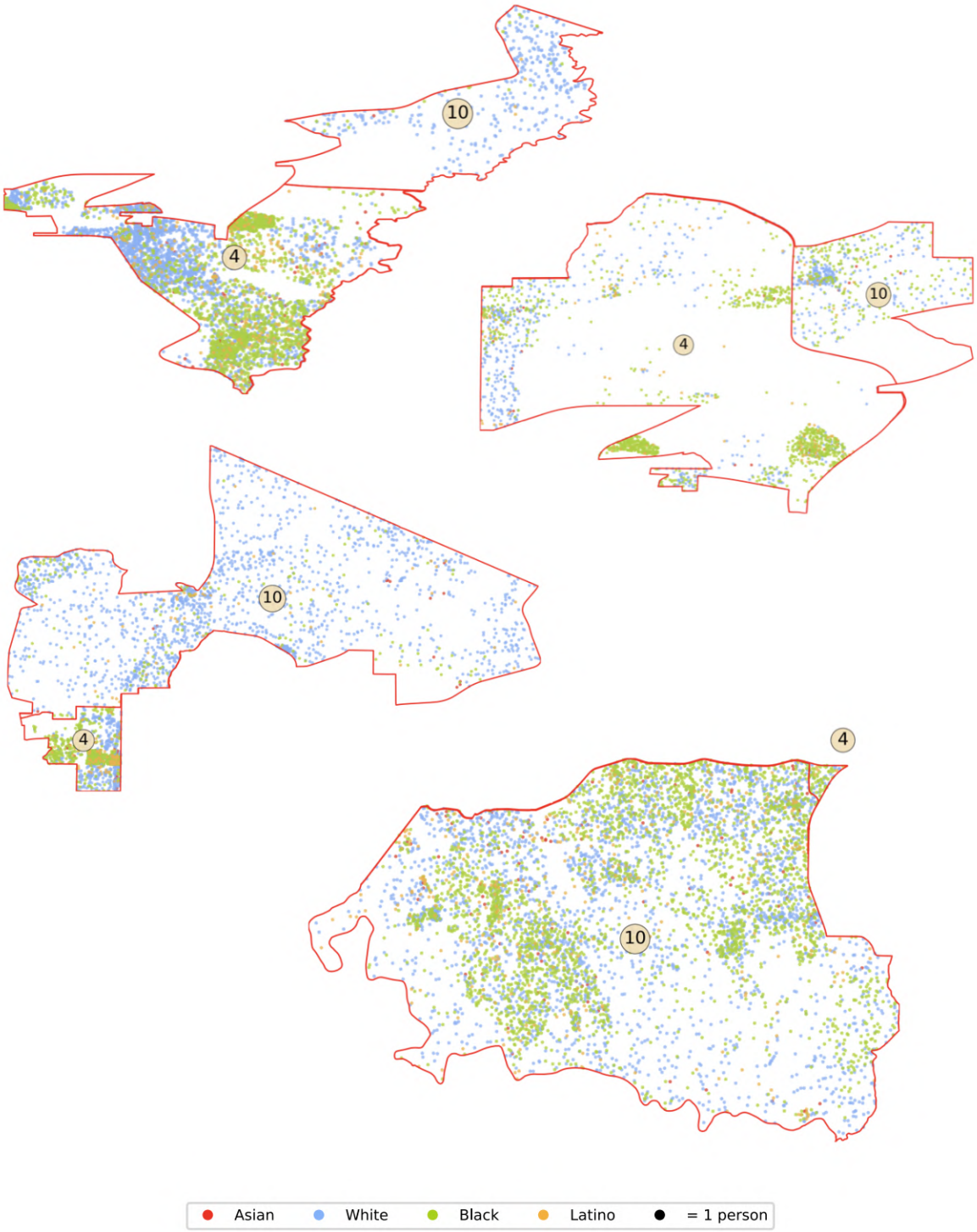


Figure 36: Split precincts on the CD 4 / CD 10 border.

10.2.2 State Senate

Similarly, numerous counties are split into unnecessarily many pieces in the Senate plan. Fourteen counties have at least a 20-point disparity in the BHVAP across the splits: Fulton (10 pieces), Gwinnett (9 pieces), DeKalb (7 pieces), Cobb (6 pieces), Bibb, Chatham, Douglas, and Houston (3 pieces each), and Newton, Clarke, Hall, Muscogee, Fayette, and Richmond (2 pieces each). Thirteen state precincts are split with a significant racial disparity between the pieces placed in different districts.

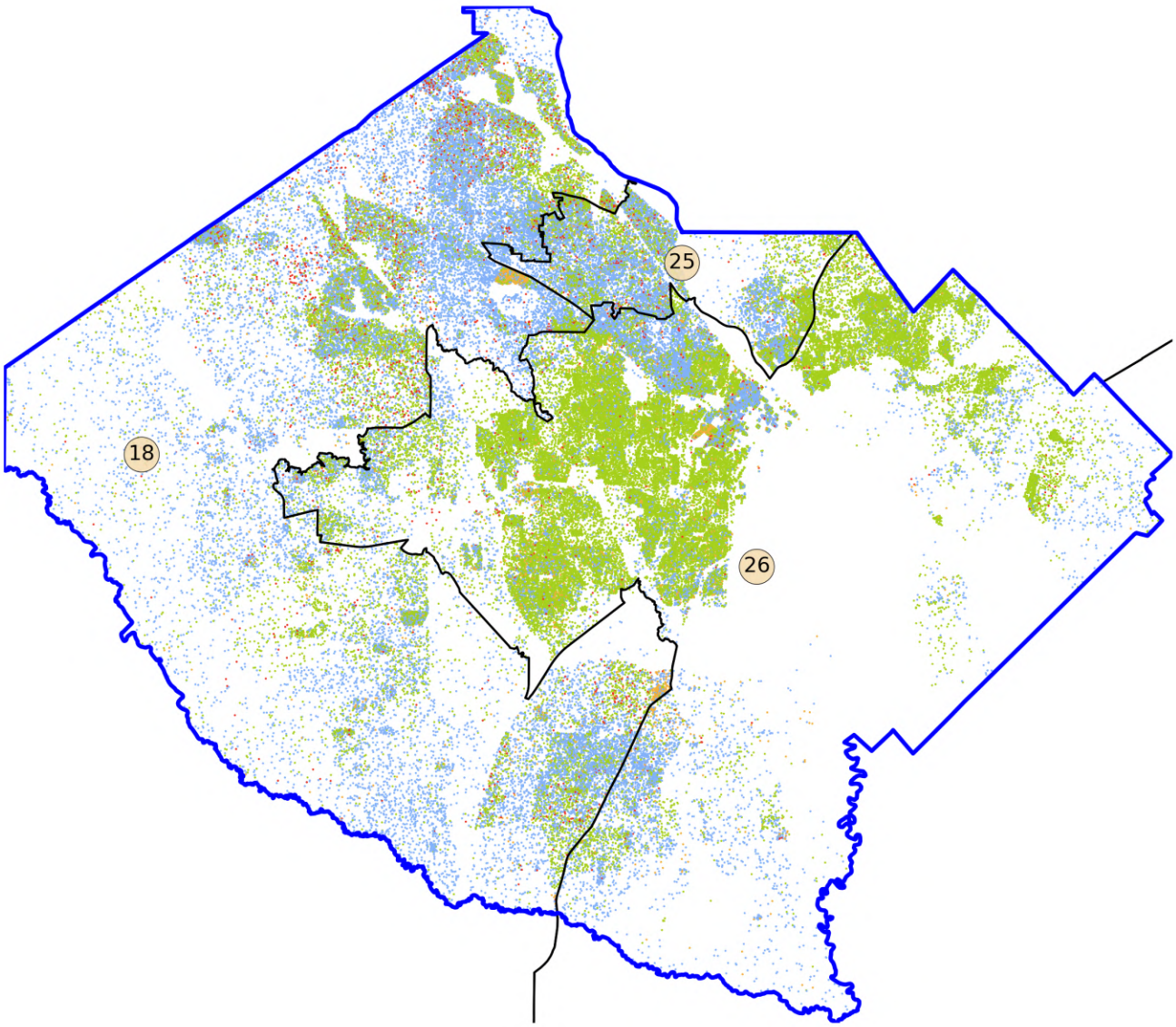


Figure 37: This figure shows the separation of Bibb County in a way that packs SD 26.

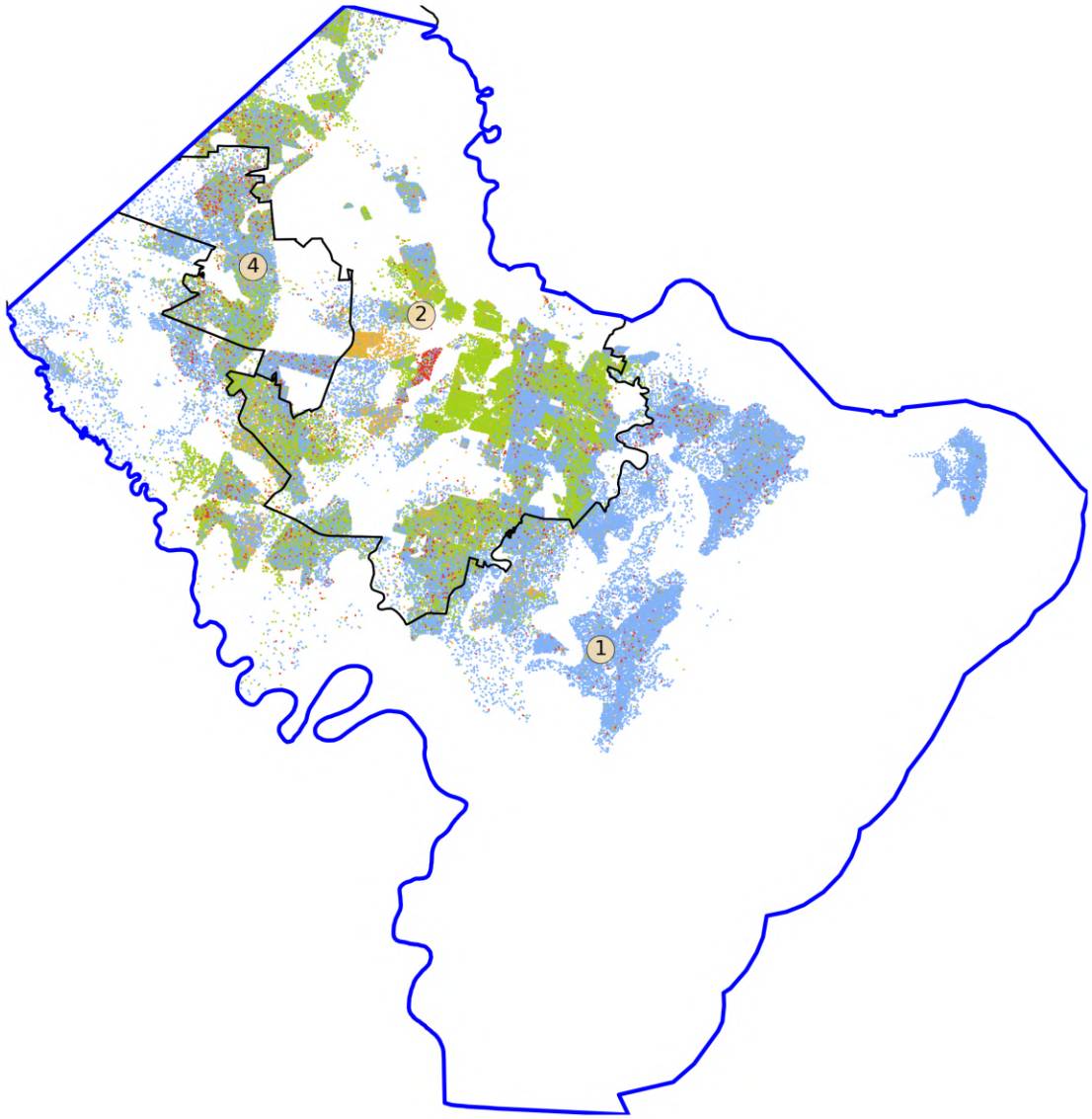


Figure 38: The pieces of Chatham County look to be clearly racially sorted into Senate districts in a way that ensures that Black and Latino voters can only have effective influence in one of the constituent districts. Indeed, SD 2 is an effective district, while SD 1 and SD 4 are not.

10.2.3 State House

In the enacted House plan, thirty counties are fractured in a racially sorted way. Besides the large counties that take the brunt of the splitting—Fulton (22 pieces), Gwinnett (21 piecees), DeKalb (17 pieces), Cobb (14 pieces)—there are also Chatham, Henry, Muscogee, Richmond, Hall, Paulding, Houston, Bibb, Coweta, Douglas, Fayette, Lowndes, Newton, Whitfield, Floyd, Rockdale, Carroll, Dougherty, Troup, Thomas, Tift, Peach, Gradie, McDuffie, Lamar, and Telfair, each with 2-7 pieces.

A striking number of state precincts—47 of them—are split with a heavy racial disparity across the division. In the case of dividing up state precincts, legislators can't use cast votes to choose a splitting optimized for partisan performance, so racially distinctive precinct splits provide particularly strong evidence that race has predominated over other principles in the creation of the map.

10.3 Community narratives

There was voluminous public input into the record when it comes to the communities of interest around the state and the impacts of redistricting decisions on their access to effective representation.

At the highest level, **County** identity and **Urban** versus **Rural** interests were the most frequent themes of the testimony, with thousands of mentions in the record. Geographically delimited regions that received frequent mention included the **Mountain** region in the Northwest and the **Black Belt** across the state's middle. Less specific geographic terms like **Lake** and **River** recur as well. **University** (or **College**) and specifically **HBCU** get plentiful mentions, and **Language** (in the sense of language accessibility) is a frequent concern.

Other frequent keywords recur in patterns that largely disaggregate by urban/suburban/rural focus. Here is a sample of terms that occur ten or more times and fall largely along lines of that classification.

- Urban: Rent/Renters, Affordable, Housing, Utilities (esp. Water)
- Urban: Poverty, Healthcare, Safety
- Urban: MARTA, Transit
- Suburban/Exurban: Corridor, Car
- Suburban/Exurban: Family, Diversity, Immigrant
- Suburban/Exurban: Park, Church, Restaurant
- Rural: Agriculture, Poultry/Chicken, Onion (incl. Vidalia, Onion Belt)
- Rural: Manufacturing, Carpet, Flooring, Industry
- Rural: Hospital, Internet, Elderly

These community testimonials are helpful for clarifying the issues around the changes to CD 6 and CD 14 that have received considerable attention above. New areas brought in to CD 6 on its north side (all of Forsyth and Dawson counties and half of Cherokee) cite interests frequently cited in suburban areas, blending to rural. By contrast, CD 6 shed population from Fulton and the northern tip of DeKalb County.

- Forsyth, Cherokee, Dawson: road infrastructure, Lake Lanier, Army Corps of Engineers, immigration (esp. Asian) and language, rural identity
- Fulton, DeKalb: public transportation, MARTA, safety net, COVID disparities, food insecurity

As we have seen, the shift in CD 14 is arguably a ripple effect from the targeting of CD 6, and residents of the new district are likewise vocal, with a sharp split between the narrative elements in the core of CD 14 and in its new protrusion into Cobb.

- Northwest counties: mountain, rural, flooring, agriculture, manufacturing
- Western Cobb: urban, metro Atlanta, housing, living wage

These community testimonies make it clear that the changes to CD 6 and CD 14 lack justification by community-of-interest reasoning, in addition to the shortfalls in other traditional districting principles detailed above.

References

[1] Amariah Becker, Moon Duchin, Dara Gold, and Sam Hirsch, *Computational Redistricting and the Voting Rights Act*. **Election Law Journal**, Volume 20, Number 4 (2021), 407–441.

[2] Erin Chambers, Moon Duchin, Ranthony Edmonds, Parker Edwards, JN Matthews, Anthony Pizzimenti, Chanel Richardson, Parker Rule, and Ari Stern, *Aggregating Community Maps*. **ACM Conference on Advances in Geographic Information Systems (SIGSPATIAL)**, 2022.

[3] Daryl DeFord, Moon Duchin, and Justin Solomon, *Recombination: A family of Markov chains for redistricting.* **Harvard Data Science Review**, Issue 3.1, Winter 2021.

[4] Daryl DeFord, Moon Duchin, and Justin Solomon, *A computational approach to measuring vote elasticity and competitiveness.* **Statistics and Public Policy**. Vol 7, No. 1 (2020), 69–86.

[5] Moon Duchin and Doug Spencer, *Models, Race, and the Law*. **Yale Law Journal Forum**, Volume 130 (March 2021), 744–797.

[6] MGGG Redistricting Lab, *GerryChain Python Library*. GitHub Repository. `github.com/mggg/gerrychain`

A Race, ethnicity, and citizenship

In this report, I have used the abbreviation BVAP to denote the share of voting age population that is Black alone or in combination, sometimes called "Any Part Black" (or APB). I have similarly used BHVAP for the share of VAP that is Black and/or Latino, which corresponds to the coalition of Black and Hispanic voters (sometimes called the "BH Coalition") identified in the Georgia NAACP complaint. WVAP refers to non-Hispanic single-race White population, and POCVAP is the broader designation for people of color, i.e., the complement of WVAP.

To be precise, I construct use two data columns directly from the Table P4 of the 2020 Decennial PL 94-171 block-level summary files and construct two more data columns as combinations. Hispanic voting age population ("HVAP") and non-Hispanic single-race White voting age population ("WVAP") are directly found in the P4. The combination columns are non-Hispanic (Any Part) Black VAP ("BVAP") and Other VAP, i.e., VAP not covered by any of these other categories ("OVAP"). By construction, these columns are exhaustive and non-overlapping: they sum to total VAP on each geographic unit.

- HVAP: `P4_002N`
- WVAP: `P4_005N`
- BVAP: `P4_006N, P4_013N, P4_018N, P4_019N, P4_020N, P4_021N, P4_029N, P4_030N, P4_031N, P4_032N, P4_039N, P4_040N, P4_041N, P4_042N, P4_043N, P4_044N, P4_050N, P4_051N, P4_052N, P4_053N, P4_054N, P4_055N, P4_060N, P4_061N, P4_062N, P4_063N, P4_066N, P4_067N, P4_068N, P4_069N, P4_071N, P4_073N`
- OVAP: `P4_007N, P4_008N, P4_009N, P4_010N, P4_014N, P4_015N, P4_016N, P4_017N, P4_022N, P4_023N, P4_024N, P4_025N, P4_026N, P4_027N, P4_033N, P4_034N, P4_035N, P4_036N, P4_037N, P4_038N, P4_045N, P4_046N, P4_047N, P4_048N, P4_056N, P4_057N, P4_058N, P4_059N, P4_064N, P4_070N`

To provide the best available estimate of 2020 citizen voting age population (CVAP) at the Census block level, I am using a method based combining 2020 Decennial block-level data and 2016–2020 American Community Survey (ACS) tract-level data. Any use of CVAP with block-based districting plans will require some process of estimation and disaggregation, since no ACS data product is released at that fine of a geographical resolution.

To estimate CVAP within each census block, I have applied a fractional ratio to each of these VAP columns using the citizenship rate pulled from the ACS data on the tract containing that block. Because the ACS race and ethnicity categories are different from the PL, computing this ratio requires the use of slightly different categories. All of this is done at the tract level.

- Black citizenship ratios are computed by dividing Black-alone VAP from Table B01001B by Black-alone CVAP from Table B05003B.
- Hispanic citizenship ratios are computed by dividing Hispanic VAP from Table B03002 by Black-alone CVAP from Table B05003I.
- White citizenship ratios are computed by dividing non-Hispanic White-alone VAP obtained from Table B01001H by non-Hispanic White-alone CVAP from Table B05003H.
- Citizenship ratios for the remaining ("Other") population are computed by dividing VAP from Tables B01001C (American Indian and Alaska Native alone), B01001D (Asian alone), B01001E (Native Hawaiian and Other Pacific Islander alone), B01001F (some other race alone), and B01001G (two or more races) by CVAP from Tables B05003C (American Indian and Alaska Native alone), B05003D (Asian alone), B05003E (Native Hawaiian and Other Pacific Islander alone), B05003F (some other race alone), and B05003G (two or more races).

B Electoral alignment in enacted legislative districts

SD	James18P	Thornton18P	Thornton18R	Robinson18P
overall	0.4475	0.4387	0.5914	0.6286
1	0.4433	0.4957	0.7139	0.6752
2	0.5568	0.5374	0.7615	0.7245
3	0.4584	0.4566	0.6166	0.6647
4	0.4623	0.4170	0.6421	0.6800
5	0.4936	0.4604	0.6270	0.6329
6	0.2972	0.3624	0.4717	0.4602
7	0.3938	0.4327	0.5822	0.5709
8	0.5279	0.4223	0.6146	0.7182
9	0.4538	0.4486	0.6139	0.6232
10	0.5598	0.5108	0.6838	0.7221
11	0.5288	0.4219	0.5478	0.7098
12	0.5799	0.4771	0.6412	0.7634
13	0.5179	0.4354	0.6145	0.6956
14	0.3038	0.3703	0.4698	0.4570
15	0.5986	0.4502	0.5850	0.7338
16	0.4067	0.3965	0.5079	0.6065
17	0.4657	0.4581	0.6708	0.6715
18	0.4640	0.4891	0.6682	0.6932
19	0.5054	0.3997	0.6575	0.7214
20	0.4927	0.4921	0.6914	0.7050
21	0.2963	0.3435	0.5124	0.5157
22	0.5166	0.4377	0.6833	0.8227
23	0.4968	0.4249	0.6008	0.7456
24	0.4130	0.4463	0.7078	0.6693
25	0.4637	0.4260	0.6856	0.6932
26	0.4774	0.4439	0.6412	0.7312
27	0.2496	0.3162	0.4106	0.4904
28	0.4009	0.4143	0.4920	0.6198
29	0.4688	0.4364	0.5429	0.6639
30	0.3894	0.4034	0.4942	0.5762
31	0.4240	0.4460	0.5191	0.6237
32	0.3194	0.3952	0.5222	0.5230
33	0.5027	0.5156	0.6489	0.6470
34	0.5442	0.4912	0.6096	0.7214
35	0.6049	0.5417	0.7203	0.7344
36	0.3695	0.4134	0.5483	0.5050
37	0.3844	0.4495	0.5609	0.5796
38	0.5098	0.5168	0.7062	0.6948
39	0.4440	0.4444	0.6169	0.6187
40	0.2682	0.3327	0.4241	0.4099
41	0.4428	0.4385	0.5589	0.5968
42	0.2535	0.3351	0.4253	0.3403
43	0.5653	0.5018	0.6758	0.7202
44	0.5251	0.4527	0.5758	0.6902
45	0.4180	0.4387	0.6042	0.6031
46	0.3485	0.3946	0.5390	0.4958
47	0.3936	0.4419	0.6317	0.5378
48	0.3193	0.3488	0.5000	0.5144
49	0.2888	0.3402	0.4099	0.5269
50	0.2810	0.3220	0.4726	0.5497
51	0.2086	0.2667	0.3339	0.4437
52	0.3299	0.3271	0.4704	0.5792
53	0.3509	0.2385	0.3498	0.5729
54	0.3703	0.2679	0.3982	0.5208
55	0.5590	0.5016	0.6908	0.6938
56	0.2273	0.3277	0.4283	0.4432

Table 44: Vote shares for the minority candidate of choice across enacted Senate districts, in probative primary and primary runoff elections.

SD	Clinton16	Abrams18	Thornton18	Biden20	Blackman20	Ossoff21	Warnock21	Abrams22
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
1	0.3977	0.4165	0.3963	0.4339	0.4099	0.4311	0.4331	0.3858
2	0.7278	0.7447	0.7248	0.7304	0.7221	0.7420	0.7434	0.7147
3	0.3229	0.3285	0.3163	0.3399	0.3273	0.3382	0.3379	0.2963
4	0.3117	0.3132	0.2988	0.3342	0.3181	0.3377	0.3379	0.2911
5	0.7486	0.7767	0.7503	0.7347	0.7395	0.7698	0.7727	0.7034
6	0.5632	0.5785	0.5153	0.6174	0.5559	0.5662	0.5799	0.5438
7	0.5212	0.5621	0.5250	0.5855	0.5618	0.5848	0.5909	0.5308
8	0.3339	0.3362	0.3253	0.3520	0.3407	0.3507	0.3507	0.3009
9	0.5277	0.5723	0.5426	0.6035	0.5873	0.6158	0.6215	0.5702
10	0.7684	0.8024	0.7852	0.7981	0.8013	0.8195	0.8220	0.8060
11	0.3484	0.3360	0.3236	0.3526	0.3418	0.3512	0.3511	0.3039
12	0.5805	0.5771	0.5618	0.5816	0.5746	0.5894	0.5903	0.5448
13	0.2836	0.2791	0.2623	0.2964	0.2821	0.3023	0.3036	0.2581
14	0.5421	0.5624	0.5077	0.6012	0.5528	0.5666	0.5763	0.5314
15	0.6650	0.6714	0.6544	0.6680	0.6621	0.6801	0.6822	0.6461
16	0.3199	0.3332	0.3126	0.3586	0.3371	0.3568	0.3615	0.3225
17	0.3337	0.3650	0.3507	0.3978	0.3870	0.4080	0.4110	0.3883
18	0.3656	0.3743	0.3608	0.3893	0.3766	0.3965	0.3990	0.3559
19	0.2458	0.2345	0.2314	0.2516	0.2459	0.2568	0.2574	0.2109
20	0.3251	0.3238	0.3122	0.3437	0.3311	0.3499	0.3523	0.3094
21	0.2865	0.3041	0.2721	0.3369	0.3009	0.3235	0.3316	0.2773
22	0.6911	0.7080	0.6884	0.7123	0.7013	0.7168	0.7189	0.6855
23	0.4069	0.4078	0.3962	0.4254	0.4125	0.4307	0.4322	0.3864
24	0.3010	0.2990	0.2907	0.3274	0.3034	0.3240	0.3249	0.2740
25	0.3816	0.3938	0.3806	0.4089	0.3982	0.4205	0.4234	0.3818
26	0.6410	0.6479	0.6326	0.6434	0.6399	0.6560	0.6585	0.6157
27	0.2306	0.2612	0.2360	0.3076	0.2768	0.2975	0.3039	0.2511
28	0.2846	0.2997	0.2817	0.3250	0.3060	0.3286	0.3331	0.2939
29	0.3501	0.3549	0.3378	0.3749	0.3569	0.3773	0.3798	0.3372
30	0.2961	0.3061	0.2948	0.3150	0.3076	0.3274	0.3314	0.2807
31	0.2768	0.3101	0.3029	0.3328	0.3244	0.3459	0.3490	0.3132
32	0.3634	0.4061	0.3744	0.4355	0.4082	0.4287	0.4363	0.3836
33	0.6767	0.7146	0.6898	0.7124	0.7092	0.7252	0.7293	0.6895
34	0.8201	0.8472	0.8304	0.8271	0.8331	0.8498	0.8518	0.8280
35	0.7785	0.8159	0.7983	0.8186	0.8210	0.8382	0.8411	0.8255
36	0.9069	0.9164	0.8686	0.8962	0.8771	0.8925	0.8996	0.8846
37	0.3742	0.4120	0.3838	0.4453	0.4177	0.4387	0.4462	0.4002
38	0.8220	0.8415	0.8121	0.8282	0.8156	0.8320	0.8379	0.8082
39	0.8862	0.8936	0.8506	0.8816	0.8621	0.8753	0.8824	0.8574
40	0.5980	0.6152	0.5592	0.6483	0.5997	0.6141	0.6255	0.5808
41	0.8169	0.8319	0.8047	0.8254	0.8228	0.8350	0.8393	0.8062
42	0.8317	0.8430	0.7839	0.8482	0.8179	0.8295	0.8377	0.8234
43	0.6835	0.7249	0.7088	0.7349	0.7364	0.7558	0.7580	0.7420
44	0.8673	0.8878	0.8682	0.8702	0.8751	0.8906	0.8928	0.8748
45	0.3367	0.3775	0.3525	0.4139	0.3932	0.4170	0.4229	0.3773
46	0.3751	0.3889	0.3666	0.4078	0.3816	0.4034	0.4088	0.3555
47	0.3959	0.4052	0.3904	0.4072	0.3912	0.4156	0.4199	0.3668
48	0.4010	0.4363	0.3920	0.4836	0.4411	0.4685	0.4762	0.4131
49	0.2335	0.2530	0.2350	0.2763	0.2523	0.2718	0.2773	0.2211
50	0.1716	0.1672	0.1626	0.1855	0.1710	0.1867	0.1898	0.1443
51	0.1568	0.1558	0.1503	0.1751	0.1617	0.1759	0.1790	0.1420
52	0.2450	0.2550	0.2437	0.2659	0.2519	0.2723	0.2767	0.2241
53	0.1837	0.1858	0.1826	0.2012	0.1916	0.2054	0.2045	0.1628
54	0.2193	0.2168	0.2098	0.2346	0.2247	0.2371	0.2374	0.1745
55	0.7579	0.7925	0.7743	0.7945	0.7936	0.8113	0.8143	0.7873
56	0.3639	0.3944	0.3503	0.4373	0.3894	0.4108	0.4210	0.3738

Table 45: Vote shares for the minority candidate of choice across enacted Senate districts, in probative general and general runoff elections.

SD	Primaries out of 4	Generals out of 8	Effective?
1	3	0	N
2	4	8	Y
3	3	0	N
4	3	0	N
5	3	8	Y
6	0	8	N
7	3	8	Y
8	4	0	N
9	3	8	Y
10	4	8	Y
11	4	0	N
12	4	8	Y
13	4	0	N
14	0	8	N
15	4	8	Y
16	3	0	N
17	3	0	N
18	3	0	N
19	4	0	N
20	3	0	N
21	2	0	N
22	4	8	Y
23	3	0	N
24	3	0	N
25	3	0	N
26	3	8	Y
27	0	0	N
28	2	0	N
29	3	0	N
30	2	0	N
31	3	0	N
32	3	0	N
33	4	8	Y
34	4	8	Y
35	4	8	Y
36	3	8	Y
37	3	0	N
38	4	8	Y
39	3	8	Y
40	0	8	N
41	3	8	Y
42	0	8	N
43	4	8	Y
44	4	8	Y
45	3	0	N
46	1	0	N
47	3	0	N
48	1	0	N
49	1	0	N
50	1	0	N
51	0	0	N
52	1	0	N
53	1	0	N
54	1	0	N
55	4	8	Y
56	0	0	N

Table 46: By the standard of requiring that the candidate of choice could win or advance in at least three out of four primaries and win or advance in at least five out of eight generals, the enacted plan has 19 districts that present an effective opportunity.

HD	James18P	Thornton18P	Thornton18R	Robinson18P
overall	0.4475	0.4387	0.5914	0.6286
1	0.3468	0.2773	0.4029	0.5806
2	0.3558	0.2650	0.3670	0.5476
3	0.3294	0.2937	0.3945	0.5330
4	0.3601	0.2721	0.5187	0.5229
5	0.3824	0.2760	0.4076	0.5266
6	0.3668	0.2496	0.3206	0.5430
7	0.2157	0.2572	0.3352	0.4173
8	0.2022	0.2644	0.3595	0.4717
9	0.1832	0.2701	0.3345	0.4496
10	0.2252	0.3163	0.4472	0.5031
11	0.2662	0.2961	0.3401	0.4568
12	0.3671	0.1692	0.3117	0.6227
13	0.3179	0.3260	0.4630	0.5670
14	0.3256	0.3317	0.5040	0.5218
15	0.3293	0.3518	0.4445	0.5811
16	0.3558	0.3730	0.5240	0.6086
17	0.4020	0.4363	0.4991	0.6145
18	0.3103	0.3091	0.5047	0.5511
19	0.4618	0.4869	0.5659	0.6279
20	0.2834	0.3785	0.3855	0.5275
21	0.2883	0.3326	0.3384	0.5194
22	0.3529	0.4129	0.5129	0.5635
23	0.2889	0.3204	0.3621	0.5709
24	0.2767	0.3541	0.4194	0.5259
25	0.2764	0.2928	0.4603	0.4945
26	0.2398	0.2986	0.4209	0.4735
27	0.2327	0.3044	0.2517	0.5148
28	0.2492	0.3220	0.3758	0.4683
29	0.3352	0.3795	0.5442	0.5610
30	0.3077	0.3530	0.4525	0.4958
31	0.3087	0.3400	0.4837	0.5963
32	0.3446	0.3195	0.5192	0.6330
33	0.3395	0.4244	0.6565	0.5794
34	0.3583	0.4446	0.5187	0.5655
35	0.3881	0.4507	0.5930	0.5815
36	0.4031	0.4559	0.5856	0.5964
37	0.3663	0.4527	0.5860	0.5523
38	0.5367	0.5168	0.6730	0.6903
39	0.5356	0.5345	0.7106	0.6796
40	0.4201	0.4639	0.6151	0.5695
41	0.5164	0.5317	0.6492	0.6384
42	0.4493	0.4890	0.6054	0.5755
43	0.3315	0.4079	0.5049	0.5117
44	0.3052	0.3869	0.5337	0.5195
45	0.1732	0.3021	0.3752	0.3676
46	0.2382	0.3411	0.4515	0.4440
47	0.3159	0.3542	0.5339	0.5053
48	0.2947	0.3582	0.4743	0.4679
49	0.2675	0.3343	0.4887	0.4863
50	0.3267	0.3767	0.5004	0.5151
51	0.3394	0.3852	0.4882	0.4737
52	0.2679	0.3387	0.4328	0.4053
53	0.2273	0.3048	0.4342	0.3910
54	0.2550	0.3444	0.4524	0.4081
55	0.4218	0.4596	0.6718	0.6275
56	0.4356	0.4518	0.6229	0.6142
57	0.2056	0.3076	0.3972	0.2914
58	0.4452	0.4517	0.6291	0.6105
59	0.4683	0.4632	0.6531	0.6383
60	0.4578	0.4647	0.6671	0.6606

HD	James18P	Thornton18P	Thornton18R	Robinson18P
overall	0.4475	0.4387	0.5914	0.6286
61	0.5937	0.5530	0.7215	0.7307
62	0.4559	0.4616	0.6297	0.6200
63	0.4227	0.4396	0.5712	0.6002
64	0.4859	0.4774	0.5232	0.6528
65	0.5996	0.5377	0.7249	0.7187
66	0.5615	0.5117	0.6402	0.7097
67	0.5783	0.5225	0.7261	0.7275
68	0.5142	0.5104	0.6439	0.6898
69	0.5196	0.5166	0.6831	0.7079
70	0.4308	0.4351	0.5046	0.6431
71	0.3445	0.4125	0.5560	0.5556
72	0.3181	0.3598	0.4040	0.5030
73	0.3412	0.3844	0.4659	0.5790
74	0.4855	0.4752	0.6443	0.6397
75	0.5667	0.4732	0.5439	0.7273
76	0.5726	0.4532	0.5774	0.7483
77	0.5372	0.4834	0.6259	0.7376
78	0.5592	0.4792	0.5407	0.7231
79	0.5561	0.4554	0.5713	0.7240
80	0.2507	0.3075	0.3904	0.4083
81	0.2273	0.3192	0.4007	0.3411
82	0.1811	0.2948	0.3296	0.2414
83	0.2499	0.3328	0.4322	0.4258
84	0.4411	0.4548	0.6076	0.5958
85	0.4561	0.4392	0.5883	0.6138
86	0.4939	0.4612	0.6058	0.6512
87	0.5020	0.4629	0.5948	0.6599
88	0.4783	0.4613	0.6055	0.6211
89	0.3875	0.4030	0.5645	0.4889
90	0.3812	0.3969	0.5629	0.5003
91	0.5621	0.5012	0.7033	0.7132
92	0.5777	0.5069	0.6954	0.7293
93	0.5503	0.5024	0.6621	0.7124
94	0.5467	0.4912	0.6849	0.6899
95	0.5813	0.5091	0.7039	0.7160
96	0.4407	0.4533	0.6048	0.5762
97	0.3851	0.4260	0.5636	0.5440
98	0.4638	0.4516	0.6475	0.5829
99	0.3827	0.4466	0.5993	0.5637
100	0.3268	0.3356	0.4947	0.5489
101	0.4195	0.4367	0.5873	0.6026
102	0.4902	0.4578	0.6445	0.6531
103	0.3989	0.4094	0.5857	0.5902
104	0.4202	0.4445	0.5931	0.6166
105	0.4694	0.4604	0.6632	0.6422
106	0.4768	0.4844	0.6458	0.6273
107	0.4858	0.4463	0.6147	0.6542
108	0.3738	0.4246	0.5554	0.5502
109	0.4988	0.4650	0.5979	0.6304
110	0.5429	0.5042	0.6857	0.7014
111	0.4343	0.4549	0.6179	0.6180
112	0.3802	0.3856	0.4628	0.6032
113	0.5592	0.4986	0.6538	0.7211
114	0.3566	0.3820	0.5553	0.6116
115	0.5470	0.5100	0.6995	0.7163
116	0.5613	0.5113	0.6805	0.7260
117	0.4806	0.4765	0.6946	0.6856
118	0.4420	0.3747	0.5819	0.6716
119	0.3654	0.3998	0.4785	0.5577
120	0.3310	0.3982	0.5499	0.5099

HD	James18P	Thornton18P	Thornton18R	Robinson18P
overall	0.4475	0.4387	0.5914	0.6286
121	0.3056	0.3610	0.4634	0.4318
122	0.4470	0.4828	0.7316	0.5336
123	0.4482	0.4759	0.8210	0.6795
124	0.3929	0.3945	0.5134	0.6158
125	0.4979	0.4484	0.5532	0.7290
126	0.5713	0.4653	0.7136	0.8431
127	0.3885	0.4146	0.5601	0.6759
128	0.4836	0.3572	0.6819	0.7292
129	0.4788	0.4262	0.6829	0.7876
130	0.5291	0.4322	0.6676	0.8300
131	0.4561	0.4564	0.6071	0.6988
132	0.5114	0.4534	0.7072	0.8308
133	0.4708	0.4428	0.7327	0.7101
134	0.4537	0.3415	0.4744	0.6571
135	0.4414	0.3509	0.4942	0.6575
136	0.4119	0.4498	0.5770	0.6639
137	0.5831	0.4497	0.6210	0.7196
138	0.4087	0.4060	0.4642	0.6087
139	0.4801	0.3999	0.4545	0.6473
140	0.6020	0.4426	0.5277	0.7298
141	0.6424	0.4599	0.5801	0.7533
142	0.4658	0.4625	0.6520	0.7214
143	0.4642	0.4872	0.6748	0.7412
144	0.4126	0.4350	0.6166	0.6729
145	0.4565	0.5158	0.6740	0.7167
146	0.5166	0.5594	0.7649	0.6930
147	0.5096	0.5585	0.7068	0.6984
148	0.5185	0.4879	0.6815	0.6956
149	0.4570	0.3824	0.5110	0.6894
150	0.5420	0.5120	0.7376	0.7507
151	0.5465	0.4851	0.6725	0.7150
152	0.5542	0.4701	0.6164	0.7292
153	0.6069	0.4804	0.6392	0.7999
154	0.5679	0.4636	0.6112	0.7543
155	0.4790	0.4310	0.6517	0.6845
156	0.5283	0.4362	0.6620	0.7356
157	0.4885	0.3890	0.6939	0.7202
158	0.4889	0.3914	0.6253	0.7098
159	0.4596	0.3947	0.6056	0.6965
160	0.4117	0.3911	0.5455	0.6332
161	0.5543	0.5195	0.7135	0.7036
162	0.6043	0.5636	0.7874	0.7517
163	0.4945	0.5148	0.7413	0.6811
164	0.4995	0.5290	0.7585	0.6963
165	0.5689	0.5359	0.7661	0.7381
166	0.2755	0.4103	0.6313	0.5219
167	0.4840	0.4765	0.6980	0.7241
168	0.5505	0.5425	0.7834	0.7886
169	0.5063	0.3686	0.5592	0.6991
170	0.4510	0.4272	0.5020	0.6678
171	0.5049	0.4272	0.5864	0.7274
172	0.5519	0.4134	0.5872	0.6544
173	0.5511	0.4509	0.6016	0.7408
174	0.5238	0.3752	0.5566	0.6716
175	0.5392	0.3988	0.5253	0.7350
176	0.5464	0.4061	0.6065	0.7292
177	0.5448	0.4450	0.6370	0.7407
178	0.4627	0.4045	0.6920	0.6940
179	0.4151	0.4621	0.5945	0.6310
180	0.4609	0.4587	0.6255	0.6534

Table 47: Vote shares for the minority candidate of choice across enacted House districts, in probative primary and primary runoff elections.

HD	Clinton16	Abrams18	Thornton18	Biden20	Blackman20	Ossoff21	Warnock21	Abrams22
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
1	0.1933	0.1964	0.1938	0.2104	0.2009	0.2160	0.2146	0.1736
2	0.1696	0.1670	0.1635	0.1901	0.1768	0.1895	0.1876	0.1425
3	0.1908	0.2018	0.1943	0.2221	0.2099	0.2233	0.2222	0.1816
4	0.3589	0.3633	0.3440	0.3835	0.3672	0.3806	0.3808	0.2906
5	0.1716	0.1733	0.1685	0.1855	0.1785	0.1926	0.1950	0.1482
6	0.1564	0.1457	0.1481	0.1641	0.1586	0.1679	0.1671	0.1177
7	0.1661	0.1629	0.1575	0.1807	0.1687	0.1815	0.1850	0.1469
8	0.1659	0.1600	0.1576	0.1819	0.1701	0.1815	0.1840	0.1422
9	0.1473	0.1523	0.1457	0.1695	0.1522	0.1705	0.1732	0.1391
10	0.1672	0.1675	0.1588	0.1859	0.1688	0.1864	0.1913	0.1485
11	0.1461	0.1550	0.1446	0.1868	0.1694	0.1863	0.1912	0.1552
12	0.1978	0.1895	0.1887	0.1945	0.1906	0.2069	0.2083	0.1607
13	0.3298	0.3437	0.3215	0.3537	0.3310	0.3571	0.3629	0.3015
14	0.1708	0.1768	0.1703	0.1916	0.1809	0.1941	0.1984	0.1604
15	0.2542	0.2749	0.2634	0.2863	0.2749	0.2949	0.2993	0.2417
16	0.2016	0.2083	0.2047	0.2237	0.2152	0.2305	0.2332	0.1941
17	0.2784	0.3264	0.3170	0.3580	0.3498	0.3747	0.3780	0.3411
18	0.1598	0.1479	0.1441	0.1598	0.1563	0.1653	0.1678	0.1314
19	0.3142	0.3525	0.3443	0.3762	0.3661	0.3887	0.3918	0.3614
20	0.2608	0.2975	0.2696	0.3349	0.3055	0.3261	0.3332	0.2815
21	0.2096	0.2398	0.2148	0.2772	0.2455	0.2657	0.2720	0.2304
22	0.3498	0.4004	0.3760	0.4163	0.3967	0.4206	0.4264	0.3756
23	0.2017	0.2210	0.2039	0.2563	0.2340	0.2535	0.2591	0.2129
24	0.2901	0.3324	0.2988	0.3727	0.3386	0.3622	0.3678	0.2989
25	0.3541	0.3882	0.3448	0.4409	0.3962	0.4224	0.4298	0.3655
26	0.2422	0.2709	0.2435	0.3235	0.2896	0.3113	0.3189	0.2710
27	0.1564	0.1633	0.1496	0.1884	0.1667	0.1841	0.1893	0.1452
28	0.1767	0.1985	0.1815	0.2357	0.2110	0.2273	0.2329	0.1893
29	0.3920	0.4240	0.3990	0.4239	0.4015	0.4255	0.4307	0.3557
30	0.2252	0.2501	0.2331	0.2841	0.2603	0.2785	0.2838	0.2300
31	0.2004	0.2126	0.2029	0.2409	0.2226	0.2442	0.2488	0.1925
32	0.1592	0.1546	0.1529	0.1702	0.1564	0.1731	0.1750	0.1345
33	0.1991	0.1743	0.1765	0.1948	0.1799	0.1959	0.1953	0.1486
34	0.3454	0.3777	0.3462	0.4205	0.3864	0.4055	0.4157	0.3698
35	0.5063	0.5603	0.5316	0.5726	0.5567	0.5802	0.5855	0.5361
36	0.3216	0.3596	0.3321	0.4022	0.3696	0.3928	0.3994	0.3632
37	0.5623	0.5933	0.5531	0.6113	0.5847	0.5981	0.6078	0.5507
38	0.6765	0.7229	0.7053	0.7243	0.7253	0.7453	0.7473	0.7174
39	0.7614	0.7930	0.7682	0.7876	0.7846	0.7991	0.8049	0.7703
40	0.6071	0.6417	0.5949	0.6673	0.6238	0.6387	0.6495	0.6207
41	0.6887	0.7199	0.6951	0.7105	0.7106	0.7256	0.7296	0.6856
42	0.6871	0.7282	0.6885	0.7158	0.6889	0.7108	0.7182	0.6714
43	0.5624	0.5885	0.5483	0.6073	0.5730	0.5827	0.5927	0.5436
44	0.3820	0.4236	0.3907	0.4598	0.4305	0.4536	0.4613	0.4096
45	0.4039	0.4203	0.3637	0.4792	0.4134	0.4354	0.4477	0.3997
46	0.3774	0.4098	0.3682	0.4495	0.4039	0.4254	0.4351	0.3895
47	0.3868	0.4048	0.3595	0.4440	0.3963	0.4171	0.4276	0.3688
48	0.4381	0.4625	0.4120	0.5147	0.4624	0.4779	0.4885	0.4344
49	0.4092	0.4330	0.3806	0.4801	0.4246	0.4420	0.4538	0.4029
50	0.5185	0.5558	0.5026	0.5939	0.5521	0.5784	0.5861	0.5154
51	0.5509	0.5728	0.5274	0.6082	0.5683	0.5811	0.5899	0.5407
52	0.5759	0.5938	0.5291	0.6361	0.5801	0.5957	0.6081	0.5697
53	0.4972	0.4992	0.4281	0.5478	0.4745	0.4843	0.4998	0.4548
54	0.5540	0.5641	0.4946	0.6104	0.5455	0.5555	0.5673	0.5443
55	0.8132	0.8121	0.7562	0.8169	0.7764	0.7909	0.8021	0.7662
56	0.9113	0.9249	0.8807	0.8971	0.8775	0.8976	0.9038	0.8875
57	0.7942	0.8025	0.7157	0.8092	0.7539	0.7714	0.7843	0.7610
58	0.9398	0.9511	0.9154	0.9213	0.9117	0.9269	0.9321	0.9165
59	0.9503	0.9603	0.9291	0.9337	0.9292	0.9425	0.9466	0.9307
60	0.8139	0.8069	0.7617	0.8065	0.7758	0.7868	0.7968	0.7698

HD	Clinton16	Abrams18	Thornton18	Biden20	Blackman20	Ossoff21	Warnock21	Abrams22
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
61	0.8241	0.8575	0.8407	0.8504	0.8538	0.8683	0.8707	0.8555
62	0.9354	0.9434	0.9127	0.9254	0.9223	0.9341	0.9382	0.9188
63	0.9197	0.9279	0.8967	0.9085	0.9071	0.9182	0.9243	0.9017
64	0.3449	0.3899	0.3757	0.4259	0.4177	0.4440	0.4476	0.4247
65	0.6646	0.6994	0.6807	0.6976	0.6952	0.7127	0.7158	0.6883
66	0.6077	0.6610	0.6389	0.6899	0.6851	0.7115	0.7159	0.6952
67	0.6289	0.6633	0.6473	0.6617	0.6560	0.6770	0.6798	0.6488
68	0.5991	0.6305	0.6067	0.6502	0.6395	0.6468	0.6521	0.6215
69	0.7034	0.7388	0.7190	0.7409	0.7350	0.7550	0.7586	0.7380
70	0.3758	0.3878	0.3663	0.3830	0.3655	0.3904	0.3953	0.3484
71	0.3046	0.3209	0.3107	0.3286	0.3192	0.3466	0.3510	0.3045
72	0.2982	0.2866	0.2703	0.2858	0.2713	0.2873	0.2928	0.2350
73	0.2814	0.3012	0.2764	0.3612	0.3306	0.3509	0.3572	0.3125
74	0.3228	0.3558	0.3379	0.3842	0.3665	0.3878	0.3907	0.3604
75	0.8667	0.8906	0.8739	0.8644	0.8755	0.8929	0.8952	0.8733
76	0.8631	0.8796	0.8639	0.8499	0.8607	0.8808	0.8811	0.8610
77	0.9074	0.9236	0.9083	0.8944	0.9071	0.9221	0.9225	0.9037
78	0.7907	0.8215	0.8039	0.8163	0.8228	0.8375	0.8394	0.8223
79	0.8973	0.9123	0.8980	0.8806	0.8897	0.9056	0.9076	0.8831
80	0.5608	0.5777	0.5197	0.6162	0.5677	0.5827	0.5954	0.5473
81	0.6692	0.6877	0.6319	0.7157	0.6752	0.6884	0.6986	0.6678
82	0.7751	0.7927	0.7267	0.8052	0.7682	0.7819	0.7896	0.7828
83	0.6124	0.6329	0.5664	0.6586	0.5979	0.6178	0.6302	0.5951
84	0.9388	0.9450	0.9161	0.9332	0.9290	0.9364	0.9400	0.9210
85	0.9148	0.9267	0.9000	0.9007	0.9017	0.9161	0.9205	0.8964
86	0.9067	0.9202	0.9000	0.8970	0.9028	0.9143	0.9164	0.8891
87	0.8855	0.8969	0.8781	0.8808	0.8870	0.8973	0.9008	0.8691
88	0.8094	0.8265	0.8039	0.8184	0.8179	0.8302	0.8349	0.8024
89	0.9211	0.9255	0.8819	0.9191	0.9027	0.9116	0.9178	0.8978
90	0.9421	0.9516	0.9131	0.9405	0.9290	0.9385	0.9436	0.9290
91	0.7506	0.7869	0.7695	0.7855	0.7884	0.8036	0.8059	0.7915
92	0.6898	0.7382	0.7204	0.7609	0.7621	0.7773	0.7799	0.7717
93	0.7088	0.7398	0.7225	0.7465	0.7464	0.7659	0.7673	0.7439
94	0.7994	0.8186	0.8009	0.8198	0.8178	0.8312	0.8348	0.8076
95	0.7589	0.7961	0.7794	0.7942	0.7960	0.8103	0.8128	0.7867
96	0.6513	0.6831	0.6515	0.6687	0.6620	0.6836	0.6874	0.6247
97	0.6033	0.6323	0.5956	0.6397	0.6211	0.6376	0.6447	0.5854
98	0.7760	0.7949	0.7669	0.7465	0.7543	0.7825	0.7838	0.7174
99	0.4465	0.4861	0.4466	0.5278	0.4934	0.5205	0.5277	0.4671
100	0.3134	0.3485	0.3175	0.3988	0.3652	0.3912	0.3971	0.3392
101	0.4962	0.5465	0.5164	0.5636	0.5501	0.5769	0.5820	0.5249
102	0.5983	0.6426	0.6164	0.6569	0.6486	0.6771	0.6822	0.6240
103	0.3596	0.4033	0.3775	0.4331	0.4076	0.4308	0.4375	0.3809
104	0.2771	0.3149	0.2929	0.3617	0.3402	0.3650	0.3717	0.3332
105	0.4671	0.5206	0.4938	0.5442	0.5317	0.5602	0.5643	0.5130
106	0.4991	0.5508	0.5231	0.5940	0.5767	0.6043	0.6103	0.5715
107	0.6770	0.7132	0.6840	0.6943	0.6943	0.7215	0.7255	0.6621
108	0.4720	0.5095	0.4750	0.5523	0.5274	0.5540	0.5613	0.5046
109	0.7727	0.7966	0.7724	0.7461	0.7521	0.7864	0.7876	0.7234
110	0.5260	0.5994	0.5794	0.6408	0.6309	0.6597	0.6628	0.6410
111	0.2454	0.2958	0.2852	0.3471	0.3360	0.3544	0.3570	0.3372
112	0.2275	0.2296	0.2196	0.2397	0.2282	0.2442	0.2475	0.2099
113	0.6532	0.6987	0.6850	0.6957	0.6991	0.7251	0.7280	0.7106
114	0.2932	0.2988	0.2835	0.3142	0.2978	0.3200	0.3230	0.2860
115	0.5282	0.5709	0.5501	0.6104	0.6051	0.6234	0.6266	0.6147
116	0.6253	0.6895	0.6709	0.7015	0.7027	0.7221	0.7253	0.7196
117	0.3607	0.4204	0.4064	0.4769	0.4683	0.4937	0.4975	0.4951
118	0.2642	0.2664	0.2585	0.2726	0.2618	0.2850	0.2880	0.2507
119	0.2336	0.2457	0.2336	0.2721	0.2574	0.2797	0.2837	0.2422
120	0.4324	0.4353	0.4134	0.4490	0.4169	0.4440	0.4503	0.3964

HD	Clinton16	Abrams18	Thornton18	Biden20	Blackman20	Ossoff21	Warnock21	Abrams22
overall	0.4734	0.4930	0.4697	0.5013	0.4848	0.5061	0.5104	0.4620
121	0.4383	0.4382	0.4077	0.4598	0.4194	0.4425	0.4503	0.3852
122	0.7829	0.7982	0.7689	0.7877	0.7720	0.7958	0.8010	0.7655
123	0.3145	0.3023	0.3153	0.3195	0.3085	0.3193	0.3201	0.2736
124	0.3911	0.3841	0.3675	0.3980	0.3772	0.3936	0.3977	0.3395
125	0.3124	0.3380	0.3252	0.3750	0.3549	0.3784	0.3799	0.3423
126	0.6195	0.6212	0.6115	0.6197	0.6170	0.6298	0.6306	0.5894
127	0.3225	0.3389	0.3158	0.3749	0.3415	0.3649	0.3670	0.3174
128	0.5105	0.4989	0.4858	0.5025	0.4954	0.5098	0.5121	0.4545
129	0.6726	0.6733	0.6496	0.6856	0.6669	0.6835	0.6858	0.6342
130	0.6627	0.6813	0.6665	0.6839	0.6797	0.6947	0.6961	0.6730
131	0.2932	0.3217	0.2997	0.3670	0.3357	0.3639	0.3641	0.3232
132	0.6975	0.7065	0.6918	0.7024	0.6986	0.7175	0.7190	0.6724
133	0.4584	0.4527	0.4383	0.4561	0.4454	0.4705	0.4721	0.4204
134	0.3675	0.3622	0.3475	0.3672	0.3605	0.3794	0.3828	0.3402
135	0.2684	0.2653	0.2567	0.2640	0.2550	0.2713	0.2743	0.2254
136	0.3509	0.3549	0.3395	0.3499	0.3372	0.3571	0.3602	0.3056
137	0.5805	0.5883	0.5698	0.5897	0.5831	0.5999	0.6011	0.5656
138	0.2761	0.2729	0.2548	0.2985	0.2726	0.2949	0.2984	0.2546
139	0.3343	0.3473	0.3308	0.3915	0.3689	0.3872	0.3890	0.3475
140	0.7512	0.7692	0.7519	0.7471	0.7411	0.7654	0.7690	0.7451
141	0.7217	0.7419	0.7220	0.7370	0.7310	0.7494	0.7512	0.7280
142	0.6564	0.6705	0.6484	0.6687	0.6552	0.6724	0.6763	0.6316
143	0.7177	0.7223	0.7033	0.7099	0.7054	0.7228	0.7259	0.6915
144	0.3572	0.3620	0.3428	0.3923	0.3715	0.3905	0.3925	0.3457
145	0.4030	0.4083	0.3992	0.4182	0.4120	0.4290	0.4312	0.3886
146	0.3306	0.3558	0.3402	0.3840	0.3693	0.3930	0.3953	0.3570
147	0.3990	0.4414	0.4271	0.4662	0.4544	0.4793	0.4812	0.4429
148	0.3283	0.3167	0.2980	0.3276	0.3106	0.3286	0.3313	0.2913
149	0.3423	0.3256	0.3176	0.3348	0.3292	0.3441	0.3469	0.2964
150	0.5595	0.5496	0.5339	0.5455	0.5386	0.5543	0.5562	0.5107
151	0.4838	0.4720	0.4577	0.4809	0.4740	0.4877	0.4887	0.4452
152	0.2738	0.2855	0.2758	0.3017	0.2909	0.3123	0.3129	0.2793
153	0.6728	0.6798	0.6597	0.6825	0.6741	0.6887	0.6899	0.6593
154	0.5464	0.5383	0.5280	0.5377	0.5321	0.5504	0.5500	0.4931
155	0.3457	0.3279	0.3206	0.3489	0.3391	0.3541	0.3561	0.3130
156	0.2945	0.2829	0.2767	0.2976	0.2881	0.3012	0.3035	0.2486
157	0.2481	0.2370	0.2320	0.2511	0.2443	0.2572	0.2571	0.2076
158	0.3531	0.3412	0.3271	0.3492	0.3342	0.3512	0.3518	0.3047
159	0.3003	0.2928	0.2800	0.3045	0.2930	0.3104	0.3109	0.2651
160	0.3265	0.3052	0.2884	0.3178	0.2973	0.3121	0.3135	0.2560
161	0.3246	0.3679	0.3595	0.4068	0.3958	0.4200	0.4201	0.3897
162	0.6504	0.6870	0.6742	0.6721	0.6678	0.6893	0.6901	0.6576
163	0.7214	0.7313	0.7059	0.7266	0.7115	0.7291	0.7314	0.7008
164	0.3635	0.4190	0.4034	0.4286	0.4113	0.4347	0.4347	0.4062
165	0.7896	0.7899	0.7685	0.7803	0.7735	0.7851	0.7863	0.7540
166	0.3116	0.3135	0.2834	0.3470	0.3045	0.3300	0.3332	0.2844
167	0.3045	0.3125	0.3004	0.3268	0.3189	0.3377	0.3379	0.3008
168	0.6098	0.6350	0.6245	0.6225	0.6212	0.6460	0.6479	0.6024
169	0.2743	0.2641	0.2464	0.2767	0.2666	0.2806	0.2818	0.2370
170	0.2733	0.2610	0.2441	0.2846	0.2676	0.2881	0.2895	0.2362
171	0.3926	0.3819	0.3710	0.3957	0.3904	0.3953	0.3957	0.3469
172	0.2734	0.2564	0.2462	0.2732	0.2611	0.2760	0.2768	0.2273
173	0.4058	0.4008	0.3840	0.4191	0.4031	0.4133	0.4130	0.3706
174	0.2137	0.1984	0.1977	0.2076	0.2026	0.2085	0.2081	0.1994
175	0.3533	0.3524	0.3397	0.3565	0.3446	0.3541	0.3540	0.3100
176	0.2848	0.2806	0.2734	0.2866	0.2793	0.2936	0.2944	0.2505
177	0.5211	0.5375	0.5169	0.5718	0.5553	0.5697	0.5701	0.4892
178	0.1589	0.1447	0.1453	0.1585	0.1527	0.1624	0.1611	0.1272
179	0.3945	0.3937	0.3756	0.4203	0.4002	0.4030	0.4039	0.3524
180	0.3210	0.3373	0.3262	0.3423	0.3286	0.3438	0.3420	0.2955

Table 48: Vote shares for the minority candidate of choice across enacted House districts, in probative general and general runoff elections.

HD	Pri (4)	Gen (8)	Eff?
1	1	0	N
2	1	0	N
3	1	0	N
4	2	0	N
5	1	0	N
6	1	0	N
7	0	0	N
8	0	0	N
9	0	0	N
10	1	0	N
11	0	0	N
12	1	0	N
13	1	0	N
14	2	0	N
15	2	0	N
16	3	0	N
17	2	0	N
18	2	0	N
19	3	0	N
20	1	0	N
21	1	0	N
22	3	0	N
23	1	0	N
24	1	0	N
25	0	0	N
26	0	0	N
27	1	0	N
28	0	0	N
29	2	0	N
30	0	0	N
31	1	0	N
32	2	0	N
33	3	0	N
34	3	0	N
35	3	8	Y
36	3	0	N
37	3	8	Y
38	4	8	Y
39	4	8	Y
40	3	8	Y
41	4	8	Y
42	3	8	Y
43	3	8	Y
44	2	0	N
45	0	0	N
46	0	0	N
47	2	0	N
48	0	1	N
49	0	0	N
50	2	8	N
51	0	8	N
52	0	8	N
53	0	1	N
54	0	7	N
55	3	8	Y
56	3	8	Y
57	0	8	N
58	3	8	Y
59	3	8	Y
60	3	8	Y

HD	Pri (4)	Gen (8)	Eff?
61	4	8	Y
62	3	8	Y
63	3	8	Y
64	3	0	N
65	4	8	Y
66	4	8	Y
67	4	8	Y
68	4	8	Y
69	4	8	Y
70	3	0	N
71	3	0	N
72	1	0	N
73	2	0	N
74	3	0	N
75	4	8	Y
76	4	8	Y
77	4	8	Y
78	4	8	Y
79	4	8	Y
80	0	8	N
81	0	8	N
82	0	8	N
83	0	8	N
84	3	8	Y
85	3	8	Y
86	3	8	Y
87	4	8	Y
88	3	8	Y
89	2	8	N
90	2	8	N
91	4	8	Y
92	4	8	Y
93	4	8	Y
94	4	8	Y
95	4	8	Y
96	3	8	Y
97	3	8	Y
98	3	8	Y
99	3	3	N
100	1	0	N
101	3	7	Y
102	3	8	Y
103	3	0	N
104	3	0	N
105	3	6	Y
106	3	7	Y
107	3	8	Y
108	3	6	Y
109	3	8	Y
110	4	8	Y
111	3	0	N
112	1	0	N
113	4	8	Y
114	3	0	N
115	4	8	Y
116	4	8	Y
117	3	0	N
118	3	0	N
119	2	0	N
120	2	0	N

HD	Pri (4)	Gen (8)	Eff?
121	0	0	N
122	3	8	Y
123	3	0	N
124	2	0	N
125	3	0	N
126	4	8	Y
127	3	0	N
128	2	4	N
129	3	8	Y
130	4	8	Y
131	3	0	N
132	4	8	Y
133	3	0	N
134	1	0	N
135	1	0	N
136	3	0	N
137	4	8	Y
138	2	0	N
139	2	0	N
140	4	8	Y
141	4	8	Y
142	3	8	Y
143	3	8	Y
144	3	0	N
145	3	0	N
146	4	0	N
147	4	0	N
148	4	0	N
149	2	0	N
150	4	8	Y
151	4	0	N
152	4	0	N
153	4	8	Y
154	4	7	Y
155	3	0	N
156	4	0	N
157	3	0	N
158	2	0	N
159	2	0	N
160	2	0	N
161	4	0	N
162	4	8	Y
163	3	8	Y
164	3	0	N
165	4	8	Y
166	3	0	N
167	3	0	N
168	4	8	Y
169	3	0	N
170	3	0	N
171	4	0	N
172	4	0	N
173	4	0	N
174	3	0	N
175	4	0	N
176	4	0	N
177	4	7	Y
178	3	0	N
179	3	0	N
180	3	0	N

Table 49: Of 180 enacted House districts, 69 are rated as providing an effective opportunity to elect coalition candidates of choice.

	CD Alt			
CD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	30.3%	37.2%	3	0
2	47.7%	52.4%	4	8
3	51.2%	58.4%	4	8
4	50.6%	58.8%	3	8
5	50.1%	61.5%	3	8
6	13.7%	24.6%	0	3
7	34.3%	56.7%	3	8
8	27.3%	34.2%	4	0
9	4.6%	16.1%	0	0
10	17.6%	24.5%	3	0
11	17.6%	25.2%	2	0
12	39.2%	43.8%	3	0
13	52.0%	58.8%	4	8
14	7.6%	18.6%	1	0

Table 50: CD Alt effectiveness.

	SD Alt Eff 1			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	25.1%	32.6%	3	0
2	46.9%	54.4%	4	8
3	21.2%	27.4%	3	0
4	23.5%	29.0%	3	0
5	20.3%	54.9%	3	8
6	50.1%	56.2%	3	8
7	17.1%	31.4%	3	3
8	30.4%	36.6%	4	0
9	29.3%	56.3%	3	8
10	59.5%	70.5%	4	8
11	31.0%	38.6%	4	0
12	58.0%	61.5%	4	8
13	27.0%	33.0%	4	0
14	18.1%	29.5%	0	8
15	54.0%	60.6%	4	8
16	50.2%	56.4%	4	8
17	51.1%	57.7%	4	8
18	30.4%	34.9%	3	0
19	25.7%	34.1%	4	0
20	34.4%	39.5%	3	0
21	7.5%	16.3%	2	0
22	50.5%	54.3%	4	8
23	23.0%	28.6%	3	0
24	25.0%	28.5%	3	0
25	50.0%	54.0%	3	8
26	50.1%	53.8%	4	8
27	4.7%	14.9%	0	0
28	50.6%	57.4%	4	8
29	26.9%	31.4%	3	0
30	14.3%	19.4%	1	0
31	19.7%	26.9%	3	0
32	14.9%	25.4%	3	0
33	50.4%	68.5%	4	8
34	72.2%	83.8%	4	8
35	50.9%	58.9%	4	8
36	50.0%	55.7%	1	8
37	19.3%	28.0%	3	0
38	27.9%	43.3%	3	8
39	51.2%	56.6%	4	8
40	50.1%	67.8%	3	8
41	57.3%	67.3%	3	8
42	35.8%	45.4%	0	8
43	52.0%	59.0%	4	8
44	61.6%	65.2%	3	8
45	19.8%	31.9%	3	0
46	16.5%	21.5%	2	0
47	16.7%	25.4%	3	0
48	10.1%	16.5%	0	1
49	8.1%	32.7%	1	0
50	5.4%	11.5%	1	0
51	1.2%	5.5%	0	0
52	13.0%	21.2%	1	0
53	5.1%	8.3%	1	0
54	3.8%	26.4%	1	0
55	50.0%	63.9%	4	8
56	7.6%	15.3%	0	0

Table 51: Effectiveness in SD Alt Eff 1, which includes the Alt 1 Gingles maps.

	SD Alt Eff 2			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	25.1%	32.6%	3	0
2	46.9%	54.4%	4	8
3	21.2%	27.4%	3	0
4	23.4%	28.9%	3	0
5	29.9%	71.6%	3	8
6	23.9%	32.1%	0	8
7	21.4%	38.0%	3	8
8	30.4%	36.6%	4	0
9	29.5%	48.3%	3	8
10	71.5%	76.7%	4	8
11	31.0%	38.6%	4	0
12	58.0%	61.5%	4	8
13	27.0%	33.0%	4	0
14	19.0%	31.1%	0	8
15	54.0%	60.6%	4	8
16	22.7%	27.7%	3	0
17	32.0%	37.1%	3	0
18	30.4%	34.9%	3	0
19	25.7%	34.1%	4	0
20	31.3%	34.8%	3	0
21	7.5%	16.3%	2	0
22	56.5%	61.8%	4	8
23	35.5%	40.0%	3	0
24	19.9%	24.3%	3	0
25	33.5%	37.2%	3	0
26	57.0%	61.2%	3	8
27	5.0%	15.2%	0	0
28	19.5%	25.9%	2	0
29	26.9%	31.4%	3	0
30	20.9%	27.0%	2	0
31	20.7%	28.1%	3	0
32	14.9%	25.4%	3	0
33	43.0%	65.9%	4	8
34	69.5%	82.2%	4	8
35	71.9%	79.4%	4	8
36	51.3%	58.4%	3	8
37	19.3%	28.0%	3	0
38	65.3%	73.7%	4	8
39	60.7%	66.3%	3	8
40	19.2%	40.8%	0	8
41	62.6%	69.3%	3	8
42	30.8%	39.4%	0	8
43	64.3%	71.2%	4	8
44	71.3%	79.9%	4	8
45	18.6%	31.7%	3	0
46	16.9%	23.9%	1	0
47	17.4%	27.0%	3	0
48	9.5%	16.5%	1	0
49	8.0%	29.9%	1	0
50	5.6%	14.4%	1	0
51	1.2%	5.5%	0	0
52	13.0%	21.2%	1	0
53	5.1%	8.3%	1	0
54	3.8%	26.4%	1	0
55	66.0%	74.7%	4	8
56	7.6%	15.3%	0	0

Table 52: Effectiveness in SD Alt Eff 2, which includes the Alt 2 Gingles maps.

	HD Alt Eff 1 Part 1			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	4.2%	6.3%	1	0
2	3.2%	10.8%	1	0
3	3.4%	6.4%	1	0
4	5.4%	49.5%	2	0
5	4.6%	17.2%	1	0
6	1.5%	13.5%	1	0
7	0.6%	6.1%	0	0
8	1.4%	4.1%	0	0
9	1.6%	6.3%	0	0
10	3.7%	13.7%	1	0
11	1.8%	6.0%	0	0
12	9.7%	15.9%	1	0
13	19.2%	30.0%	1	0
14	6.8%	12.7%	2	0
15	14.2%	23.9%	2	0
16	11.7%	20.3%	3	0
17	23.0%	29.9%	2	0
18	8.0%	10.4%	2	0
19	24.1%	30.9%	3	0
20	9.3%	18.5%	1	0
21	5.1%	12.5%	1	0
22	15.1%	26.7%	3	0
23	6.5%	20.7%	1	0
24	7.0%	17.3%	1	0
25	5.9%	11.0%	0	0
26	4.0%	14.8%	0	0
27	3.7%	13.3%	1	0
28	3.9%	15.3%	0	0
29	13.6%	53.3%	2	0
30	8.1%	24.2%	0	0
31	7.6%	26.5%	1	0
32	8.0%	12.9%	2	0
33	11.2%	14.3%	3	0
34	15.7%	23.5%	3	0
35	28.4%	39.6%	3	8
36	17.0%	23.5%	3	0
37	28.2%	46.8%	3	8
38	54.2%	66.8%	4	8
39	55.3%	74.0%	4	8
40	33.0%	38.9%	3	8
41	39.4%	68.0%	4	8
42	33.7%	51.1%	3	8
43	26.5%	40.6%	3	8
44	12.0%	22.5%	2	0
45	5.3%	10.2%	0	0
46	8.1%	15.5%	0	0
47	10.7%	18.1%	2	0
48	11.8%	24.2%	0	1
49	8.4%	15.1%	0	0
50	12.4%	18.8%	2	8
51	23.7%	37.0%	0	8
52	16.0%	23.4%	0	8
53	14.5%	21.9%	0	1
54	15.5%	28.3%	0	7
55	55.4%	60.4%	3	8
56	45.5%	51.3%	3	8
57	18.1%	26.1%	0	8
58	63.0%	68.1%	3	8
59	70.1%	74.5%	3	8
60	63.9%	69.0%	3	8

	HD Alt Eff 1 Part 2			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	74.3%	81.9%	4	8
62	72.3%	79.1%	3	8
63	69.3%	78.6%	3	8
64	30.7%	38.1%	3	0
65	62.0%	66.5%	4	8
66	53.4%	62.9%	4	8
67	58.9%	66.7%	4	8
68	55.7%	62.0%	4	8
69	63.6%	69.0%	4	8
70	27.8%	35.8%	3	0
71	19.9%	26.1%	3	0
72	20.9%	27.8%	1	0
73	12.1%	19.1%	2	0
74	25.5%	31.1%	3	0
75	74.4%	85.7%	4	8
76	67.2%	80.4%	4	8
77	76.1%	88.3%	4	8
78	71.6%	80.5%	4	8
79	71.6%	87.6%	4	8
80	14.2%	37.3%	0	8
81	21.8%	42.7%	0	8
82	16.8%	23.6%	0	8
83	15.1%	43.6%	0	8
84	73.7%	76.7%	3	8
85	62.7%	68.6%	3	8
86	75.1%	79.4%	3	8
87	73.1%	79.8%	4	8
88	63.3%	73.3%	3	8
89	62.5%	65.9%	2	8
90	58.5%	62.8%	2	8
91	70.0%	75.9%	4	8
92	68.8%	73.5%	4	8
93	65.4%	75.0%	4	8
94	69.0%	76.3%	4	8
95	67.2%	75.1%	4	8
96	23.0%	59.0%	3	8
97	26.8%	46.0%	3	8
98	23.2%	76.0%	3	8
99	14.7%	23.4%	3	3
100	10.0%	20.0%	1	0
101	24.2%	42.4%	3	7
102	37.6%	58.9%	3	8
103	16.8%	33.7%	3	0
104	17.0%	28.1%	3	0
105	29.0%	45.8%	3	6
106	36.3%	47.4%	3	7
107	29.6%	60.7%	3	8
108	18.4%	36.6%	3	6
109	32.5%	68.6%	3	8
110	47.2%	57.7%	4	8
111	22.3%	31.1%	3	0
112	19.2%	22.5%	1	0
113	59.5%	66.2%	4	8
114	24.7%	28.4%	3	0
115	52.1%	59.1%	4	8
116	58.1%	65.4%	4	8
117	36.6%	42.0%	3	0
118	23.6%	27.3%	3	0
119	13.5%	23.9%	2	0
120	14.3%	21.4%	2	0

	HD Alt Eff 1 Part 3			
SD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
121	9.6%	15.2%	0	0
122	28.4%	40.1%	3	8
123	24.3%	28.6%	3	0
124	25.6%	31.8%	2	0
125	23.7%	31.4%	3	0
126	54.5%	57.7%	4	8
127	18.5%	23.3%	3	0
128	50.4%	52.1%	2	4
129	54.9%	59.2%	3	8
130	59.9%	63.8%	4	8
131	17.6%	23.5%	3	0
132	52.3%	60.1%	4	8
133	36.8%	38.9%	3	0
134	33.6%	37.3%	1	0
135	23.8%	25.6%	1	0
136	28.7%	32.3%	3	0
137	52.1%	56.6%	4	8
138	19.3%	22.6%	2	0
139	20.3%	26.7%	2	0
140	57.6%	65.6%	4	8
141	57.5%	64.1%	4	8
142	59.5%	63.2%	3	8
143	60.8%	65.5%	3	8
144	29.3%	31.9%	3	0
145	35.7%	41.6%	3	0
146	27.6%	32.3%	4	0
147	30.1%	37.3%	4	0
148	34.0%	37.1%	4	0
149	32.1%	37.8%	2	0
150	53.6%	59.7%	4	8
151	42.4%	49.7%	4	0
152	26.1%	28.4%	4	0
153	67.9%	70.4%	4	8
154	54.8%	56.5%	4	7
155	35.9%	38.1%	3	0
156	30.3%	37.2%	4	0
157	24.7%	33.7%	3	0
158	31.2%	35.7%	2	0
159	24.5%	27.4%	2	0
160	22.6%	27.6%	2	0
161	27.1%	33.9%	4	0
162	43.7%	53.3%	4	8
163	45.5%	52.9%	3	8
164	23.5%	32.0%	3	0
165	50.3%	55.6%	4	8
166	5.7%	9.8%	3	0
167	22.3%	29.7%	3	0
168	46.3%	56.6%	4	8
169	29.0%	36.7%	3	0
170	24.2%	32.9%	3	0
171	39.6%	44.2%	4	0
172	23.3%	36.7%	4	0
173	36.3%	41.7%	4	0
174	17.4%	25.4%	3	0
175	24.2%	29.2%	4	0
176	22.7%	30.9%	4	0
177	53.9%	60.0%	4	7
178	14.8%	19.9%	3	0
179	27.0%	33.4%	3	0
180	18.2%	23.8%	3	0

Table 53: Effectiveness in HD Alt Eff 1, which includes the Alt 1 Gingles maps.

	HD Alt Eff 2 Part 1			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
1	4.2%	6.3%	1	0
2	3.2%	10.8%	1	0
3	3.4%	6.4%	1	0
4	5.4%	49.5%	2	0
5	4.6%	17.2%	1	0
6	1.5%	13.5%	1	0
7	0.6%	6.1%	0	0
8	1.4%	4.1%	0	0
9	1.6%	6.3%	0	0
10	3.7%	13.7%	1	0
11	1.8%	6.0%	0	0
12	9.7%	15.9%	1	0
13	19.2%	30.0%	1	0
14	6.8%	12.7%	2	0
15	14.2%	23.9%	2	0
16	11.7%	20.3%	3	0
17	23.0%	29.9%	2	0
18	8.0%	10.4%	2	0
19	24.1%	30.9%	3	0
20	9.3%	18.5%	1	0
21	5.1%	12.5%	1	0
22	15.1%	26.7%	3	0
23	6.5%	20.7%	1	0
24	7.0%	17.3%	1	0
25	5.9%	11.0%	0	0
26	4.0%	14.8%	0	0
27	3.7%	13.3%	1	0
28	3.9%	15.3%	0	0
29	13.6%	53.3%	2	0
30	8.1%	24.2%	0	0
31	7.6%	26.5%	1	0
32	8.0%	12.9%	2	0
33	11.2%	14.3%	3	0
34	15.7%	23.5%	3	0
35	28.4%	39.6%	3	8
36	17.0%	23.5%	3	0
37	28.2%	46.8%	3	8
38	54.2%	66.8%	4	8
39	55.3%	74.0%	4	8
40	33.0%	38.9%	3	8
41	39.4%	68.0%	4	8
42	33.7%	51.1%	3	8
43	26.5%	40.6%	3	8
44	12.0%	22.5%	2	0
45	5.3%	10.2%	0	0
46	8.1%	15.5%	0	0
47	10.7%	18.1%	2	0
48	11.8%	24.2%	0	1
49	8.4%	15.1%	0	0
50	12.4%	18.8%	2	8
51	23.7%	37.0%	0	8
52	16.0%	23.4%	0	8
53	14.5%	21.9%	0	1
54	15.5%	28.3%	0	7
55	55.4%	60.4%	3	8
56	45.5%	51.3%	3	8
57	18.1%	26.1%	0	8
58	63.0%	68.1%	3	8
59	70.1%	74.5%	3	8
60	63.9%	69.0%	3	8

	HD Alt Eff 2 Part 2			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
61	74.3%	81.9%	4	8
62	72.3%	79.1%	3	8
63	69.3%	78.6%	3	8
64	30.7%	38.1%	3	0
65	62.0%	66.5%	4	8
66	53.4%	62.9%	4	8
67	58.9%	66.7%	4	8
68	55.7%	62.0%	4	8
69	63.6%	69.0%	4	8
70	27.8%	35.8%	3	0
71	19.9%	26.1%	3	0
72	20.9%	27.8%	1	0
73	12.1%	19.1%	2	0
74	25.5%	31.1%	3	0
75	74.4%	85.7%	4	8
76	67.2%	80.4%	4	8
77	76.1%	88.3%	4	8
78	71.6%	80.5%	4	8
79	71.6%	87.6%	4	8
80	14.2%	37.3%	0	8
81	21.8%	42.7%	0	8
82	16.8%	23.6%	0	8
83	15.1%	43.6%	0	8
84	73.7%	76.7%	3	8
85	62.7%	68.6%	3	8
86	75.1%	79.4%	3	8
87	73.1%	79.8%	4	8
88	63.3%	73.3%	3	8
89	62.5%	65.9%	2	8
90	58.5%	62.8%	2	8
91	70.0%	75.9%	4	8
92	68.8%	73.5%	4	8
93	65.4%	75.0%	4	8
94	69.0%	76.3%	4	8
95	67.2%	75.1%	4	8
96	23.0%	59.0%	3	8
97	26.8%	46.0%	3	8
98	23.2%	76.0%	3	8
99	14.7%	23.4%	3	3
100	10.0%	20.0%	1	0
101	24.2%	42.4%	3	7
102	37.6%	58.9%	3	8
103	16.8%	33.7%	3	0
104	17.0%	28.1%	3	0
105	29.0%	45.8%	3	6
106	36.3%	47.4%	3	7
107	29.6%	60.7%	3	8
108	18.4%	36.6%	3	6
109	32.5%	68.6%	3	8
110	47.2%	57.7%	4	8
111	22.3%	31.1%	3	0
112	19.2%	22.5%	1	0
113	59.5%	66.2%	4	8
114	24.7%	28.4%	3	0
115	52.1%	59.1%	4	8
116	58.1%	65.4%	4	8
117	36.6%	42.0%	3	0
118	23.6%	27.3%	3	0
119	13.5%	23.9%	2	0
120	14.3%	21.4%	2	0

	HD Alt Eff 2 Part 3			
HD	BVAP	BHVAP	Primaries out of 4	Generals out of 8
121	9.6%	15.2%	0	0
122	28.4%	40.1%	3	8
123	24.3%	28.6%	3	0
124	25.6%	31.8%	2	0
125	23.7%	31.4%	3	0
126	54.5%	57.7%	4	8
127	18.5%	23.3%	3	0
128	50.4%	52.1%	2	4
129	54.9%	59.2%	3	8
130	59.9%	63.8%	4	8
131	17.6%	23.5%	3	0
132	52.3%	60.1%	4	8
133	36.8%	38.9%	3	0
134	33.6%	37.3%	1	0
135	23.8%	25.6%	1	0
136	28.7%	32.3%	3	0
137	52.1%	56.6%	4	8
138	19.3%	22.6%	2	0
139	20.3%	26.7%	2	0
140	57.6%	65.6%	4	8
141	57.5%	64.1%	4	8
142	59.5%	63.2%	3	8
143	60.8%	65.5%	3	8
144	29.3%	31.9%	3	0
145	35.7%	41.6%	3	0
146	27.6%	32.3%	4	0
147	30.1%	37.3%	4	0
148	34.0%	37.1%	4	0
149	32.1%	37.8%	2	0
150	53.6%	59.7%	4	8
151	42.4%	49.7%	4	0
152	26.1%	28.4%	4	0
153	67.9%	70.4%	4	8
154	54.8%	56.5%	4	7
155	35.9%	38.1%	3	0
156	30.3%	37.2%	4	0
157	24.7%	33.7%	3	0
158	31.2%	35.7%	2	0
159	24.5%	27.4%	2	0
160	22.6%	27.6%	2	0
161	27.1%	33.9%	4	0
162	43.7%	53.3%	4	8
163	45.5%	52.9%	3	8
164	23.5%	32.0%	3	0
165	50.3%	55.6%	4	8
166	5.7%	9.8%	3	0
167	22.3%	29.7%	3	0
168	46.3%	56.6%	4	8
169	29.0%	36.7%	3	0
170	24.2%	32.9%	3	0
171	39.6%	44.2%	4	0
172	23.3%	36.7%	4	0
173	36.3%	41.7%	4	0
174	17.4%	25.4%	3	0
175	24.2%	29.2%	4	0
176	22.7%	30.9%	4	0
177	53.9%	60.0%	4	7
178	14.8%	19.9%	3	0
179	27.0%	33.4%	3	0
180	18.2%	23.8%	3	0

Table 54: Effectiveness in HD Alt Eff 2, which includes the Alt 2 Gingles maps.

C Splits of geographical units

County	CD	TOTPOP	VAP	BVAP	BHVAP	Biden20	Abrams18
Bibb	2	108371	82489	0.6349	0.6710	0.7139	0.7250
Bibb	8	48975	38413	0.3098	0.3394	0.4596	0.4202
Cherokee	6	40881	31202	0.0304	0.0814	0.2172	0.1862
Cherokee	11	225739	171726	0.0817	0.1902	0.3233	0.2905
Clayton	5	37919	27885	0.7280	0.8649	0.8849	0.9200
Clayton	13	259676	192693	0.7190	0.8266	0.8548	0.8773
Cobb	6	165925	125728	0.1092	0.1848	0.4913	0.4476
Cobb	11	397281	313106	0.2654	0.3850	0.5535	0.5309
Cobb	13	125029	94104	0.4458	0.6271	0.7316	0.7310
Cobb	14	77914	58910	0.4646	0.5644	0.6421	0.6263
DeKalb	4	601451	465661	0.5316	0.6302	0.8171	0.8166
DeKalb	5	162931	129615	0.5145	0.5480	0.9148	0.9203
Douglas	3	42970	32601	0.2970	0.3719	0.4220	0.3803
Douglas	13	101267	75827	0.5762	0.6647	0.7230	0.7055
Effingham	1	47208	34272	0.1276	0.1756	0.2462	0.2167
Effingham	12	17561	13023	0.1887	0.2129	0.2608	0.2521
Fayette	3	102685	78539	0.2094	0.2720	0.4272	0.3914
Fayette	13	16509	13259	0.5492	0.6082	0.6394	0.6271
Fulton	5	564287	464015	0.4769	0.5379	0.8077	0.8108
Fulton	6	245494	190172	0.1574	0.2568	0.5433	0.5069
Fulton	7	92558	69229	0.1175	0.1777	0.5527	0.5060
Fulton	13	164371	123766	0.8829	0.9171	0.9291	0.9474
Gwinnett	6	34755	25061	0.1336	0.2645	0.4320	0.3889
Gwinnett	7	672579	497705	0.3234	0.5450	0.6487	0.6332
Gwinnett	9	249728	186718	0.2061	0.3433	0.5045	0.4697
Henry	3	23975	17964	0.4678	0.5259	0.5731	0.5484
Henry	10	118452	86869	0.4414	0.4948	0.5093	0.4413
Henry	13	98285	75140	0.5710	0.6324	0.7013	0.6898
Houston	2	48521	36233	0.4321	0.5075	0.5511	0.5393
Houston	8	115112	85885	0.2788	0.3276	0.3996	0.3741
Muscogee	2	175155	132158	0.5262	0.5851	0.6625	0.6625
Muscogee	3	31767	24894	0.1909	0.2578	0.3973	0.3371
Newton	4	70114	52306	0.6098	0.6644	0.7470	0.7502
Newton	10	42369	32442	0.2631	0.2960	0.3764	0.3546
Wilkes	10	1802	1491	0.3273	0.3628	0.3556	0.3607
Wilkes	12	7763	6160	0.4193	0.4481	0.4191	0.3810

Table 55: All county splits in the enacted Congressional map.

County	SD	TOTPOP	VAP	BVAP	BHVAP	Biden20	Abrams18
Bibb	18	53182	42225	0.3079	0.3413	0.4239	0.3967
Bibb	25	15513	12080	0.4120	0.4384	0.5678	0.5256
Bibb	26	88651	66597	0.6951	0.7309	0.7939	0.8072
Chatham	1	81408	65586	0.1486	0.2032	0.3982	0.3743
Chatham	2	190408	150843	0.4686	0.5368	0.7304	0.7447
Chatham	4	23475	18286	0.2596	0.3331	0.4748	0.4463
Clarke	46	52016	45312	0.1485	0.2062	0.6611	0.6499
Clarke	47	76655	61518	0.2933	0.4111	0.7355	0.7329
Cobb	6	92249	75423	0.2527	0.3229	0.5988	0.5665
Cobb	32	101467	80689	0.1946	0.2934	0.5310	0.5013
Cobb	33	192694	146415	0.4296	0.6488	0.7124	0.7146
Cobb	37	181541	138961	0.2018	0.2812	0.4547	0.4203
Cobb	38	108305	83807	0.4264	0.5438	0.7289	0.7235
Cobb	56	89893	66553	0.0706	0.1257	0.4685	0.4177
DeKalb	10	75906	58884	0.9500	0.9605	0.9600	0.9783
DeKalb	40	164997	127423	0.1719	0.3807	0.6490	0.6138
DeKalb	41	183560	139591	0.6449	0.7009	0.8404	0.8492
DeKalb	42	190940	153952	0.3078	0.3875	0.8487	0.8451
DeKalb	43	32212	24150	0.9135	0.9384	0.9394	0.9582
DeKalb	44	51049	40820	0.7415	0.7714	0.9490	0.9654
DeKalb	55	65718	50456	0.9248	0.9473	0.9511	0.9698
Douglas	28	25889	19664	0.2400	0.3042	0.3485	0.3050
Douglas	30	23454	17242	0.5045	0.5920	0.6386	0.6270
Douglas	35	94894	71522	0.5587	0.6479	0.7084	0.6871
Fayette	16	87134	66132	0.1605	0.2249	0.4142	0.3812
Fayette	34	32060	25666	0.5111	0.5670	0.6424	0.6262
Fulton	6	99152	80358	0.2261	0.3060	0.6333	0.5887
Fulton	14	192533	155340	0.1897	0.3044	0.6012	0.5624
Fulton	21	83538	62497	0.1058	0.1749	0.4711	0.4310
Fulton	28	6963	5456	0.4646	0.5403	0.6541	0.6506
Fulton	35	97945	73153	0.8757	0.9161	0.9293	0.9449
Fulton	36	192282	161385	0.5134	0.5749	0.8962	0.9164
Fulton	38	84850	64560	0.9472	0.9672	0.9589	0.9831
Fulton	39	191500	156022	0.6070	0.6549	0.8816	0.8935
Fulton	48	83219	61631	0.1140	0.1697	0.5609	0.5128
Fulton	56	34728	26780	0.0764	0.1341	0.4753	0.4280
Gwinnett	5	191921	139394	0.2994	0.7018	0.7503	0.7914
Gwinnett	7	189709	147425	0.2144	0.3714	0.5941	0.5728
Gwinnett	9	192915	142054	0.2953	0.4730	0.6008	0.5667
Gwinnett	40	25547	19577	0.3258	0.5294	0.6840	0.6640
Gwinnett	41	7463	5687	0.1662	0.2427	0.5323	0.4821
Gwinnett	45	151475	110999	0.2039	0.3351	0.4571	0.4167
Gwinnett	46	27298	19469	0.3273	0.4631	0.4781	0.4201
Gwinnett	48	46297	33367	0.1244	0.2355	0.4312	0.3849
Gwinnett	55	124437	91512	0.5135	0.6159	0.7078	0.6833
Hall	49	189355	144123	0.0796	0.2954	0.2832	0.2646
Hall	50	13781	9721	0.0637	0.5322	0.4380	0.4661
Houston	18	42875	32630	0.2983	0.3609	0.4437	0.4176
Houston	20	74275	54626	0.2606	0.3022	0.3680	0.3405
Houston	26	46483	34862	0.4485	0.5232	0.5831	0.5711
Muscogee	15	142205	107284	0.5931	0.6521	0.7443	0.7508
Muscogee	29	64717	49768	0.2144	0.2771	0.4287	0.3868
Newton	17	45536	34660	0.3080	0.3453	0.3845	0.3582
Newton	43	66947	50088	0.5941	0.6466	0.7456	0.7531
Richmond	22	193163	150450	0.5650	0.6105	0.6912	0.6838
Richmond	23	13444	10449	0.2795	0.3129	0.3975	0.3659

Table 56: Counties with more than 15 points BHVAP differential across Senate districts.

County	HD	TOTPOP	VAP	BVAP	BHVAP share	Biden20	Abrams18
Bibb	142	59608	44584	0.5952	0.6249	0.6687	0.6705
Bibb	143	59469	46390	0.6079	0.6501	0.7099	0.7223
Bibb	144	33948	26547	0.3263	0.3545	0.4642	0.4220
Bibb	145	4321	3381	0.2576	0.2828	0.3445	0.3323
Carroll	18	18789	14467	0.1147	0.1479	0.1918	0.1808
Carroll	70	2854	2259	0.0469	0.0668	0.1414	0.1308
Carroll	71	59538	44582	0.1992	0.2572	0.3247	0.3170
Carroll	72	37967	29688	0.2419	0.3312	0.3361	0.3285
Chatham	161	28269	21359	0.3988	0.4739	0.6095	0.6037
Chatham	162	60308	46733	0.4373	0.5246	0.6721	0.6870
Chatham	163	60123	48461	0.4549	0.5242	0.7266	0.7313
Chatham	164	38681	30732	0.2607	0.3401	0.4644	0.4676
Chatham	165	59978	48247	0.5033	0.5506	0.7803	0.7899
Chatham	166	47932	39183	0.0481	0.0851	0.3527	0.3205
Clarke	120	30095	25090	0.1937	0.2693	0.6432	0.6235
Clarke	121	26478	22991	0.1359	0.1979	0.7010	0.6934
Clarke	122	59632	48840	0.2842	0.3977	0.7990	0.8078
Clarke	124	12466	9909	0.2940	0.3941	0.7018	0.6980
Cobb	22	28586	22350	0.2048	0.2980	0.5020	0.4894
Cobb	34	59875	45758	0.1567	0.2306	0.4198	0.3770
Cobb	35	59889	48312	0.2840	0.3856	0.5726	0.5603
Cobb	36	59994	44911	0.1698	0.2300	0.4022	0.3596
Cobb	37	59176	46223	0.2818	0.4599	0.6113	0.5933
Cobb	38	59317	44839	0.5423	0.6568	0.7243	0.7229
Cobb	39	59381	44436	0.5529	0.7293	0.7876	0.7930
Cobb	40	59044	47976	0.3298	0.3798	0.6673	0.6417
Cobb	41	60122	45271	0.3935	0.6699	0.7105	0.7199
Cobb	42	59620	48525	0.3370	0.5014	0.7158	0.7282
Cobb	43	59464	47033	0.2653	0.3973	0.6073	0.5885
Cobb	44	38013	29631	0.1281	0.2176	0.4855	0.4445
Cobb	45	59738	44023	0.0528	0.0988	0.4788	0.4200
Cobb	46	43930	32560	0.0782	0.1348	0.4656	0.4206
Coweta	65	13008	9714	0.1225	0.1650	0.3213	0.2874
Coweta	67	17272	13061	0.0763	0.1352	0.2416	0.2057
Coweta	70	56267	42990	0.2904	0.3678	0.4376	0.5036
Coweta	73	31608	24269	0.1336	0.2015	0.4070	0.3136
Coweta	136	28003	21121	0.1081	0.1469	0.2325	0.2141
DeKalb	52	28300	21991	0.1398	0.1987	0.6358	0.5815
DeKalb	80	59461	44784	0.1418	0.3654	0.6100	0.5681
DeKalb	81	59007	46259	0.2183	0.4191	0.7180	0.6918
DeKalb	82	59724	50238	0.1683	0.2309	0.8035	0.7923
DeKalb	83	59416	46581	0.1512	0.4284	0.6572	0.6316
DeKalb	84	59862	47350	0.7366	0.7561	0.9324	0.9440
DeKalb	85	59373	46308	0.6271	0.6765	0.8981	0.9246
DeKalb	86	59205	44614	0.7505	0.7832	0.8931	0.9160
DeKalb	87	59709	45615	0.7308	0.7866	0.8798	0.8936
DeKalb	88	47844	37310	0.7117	0.7652	0.8359	0.8377
DeKalb	89	59866	46198	0.6254	0.6519	0.9214	0.9284
DeKalb	90	59812	48015	0.5849	0.6205	0.9401	0.9508
DeKalb	91	19700	14941	0.9586	0.9683	0.9581	0.9793
DeKalb	92	15607	11794	0.9309	0.9453	0.9403	0.9581
DeKalb	93	11690	8476	0.9040	0.9412	0.9411	0.9598
DeKalb	94	31207	23817	0.9289	0.9513	0.9523	0.9703
DeKalb	95	14599	10985	0.8971	0.9250	0.9413	0.9607
Dougherty	151	6268	4791	0.5917	0.6022	0.6466	0.6213
Dougherty	152	6187	4906	0.4855	0.5298	0.5372	0.5517
Dougherty	153	59299	45692	0.6795	0.7010	0.7454	0.7566
Dougherty	154	14036	10877	0.8612	0.8694	0.8896	0.9081

County	HD	TOTPOP	VAP	BVAP	BHVAP share	Biden20	Abrams18
Douglas	61	30206	23160	0.5396	0.6574	0.6995	0.6949
Douglas	64	35576	26860	0.2958	0.3662	0.4137	0.3741
Douglas	65	19408	14130	0.6572	0.7146	0.7568	0.7413
Douglas	66	59047	44278	0.5341	0.6181	0.6899	0.6610
Fayette	68	29719	22798	0.2259	0.3098	0.4218	0.3753
Fayette	69	37303	29554	0.4700	0.5270	0.5903	0.5574
Fayette	73	28428	21467	0.1070	0.1718	0.3793	0.3349
Fayette	74	23744	17979	0.1329	0.1724	0.3872	0.3373
Floyd	5	5099	4048	0.0336	0.0684	0.1566	0.1349
Floyd	12	34335	27071	0.0836	0.1607	0.2351	0.2152
Floyd	13	59150	45176	0.1918	0.2979	0.3687	0.3564
Fulton	25	13280	9828	0.1043	0.1651	0.5348	0.4723
Fulton	47	55235	40829	0.1130	0.1834	0.4647	0.4241
Fulton	48	43976	33385	0.1231	0.2615	0.5322	0.4840
Fulton	49	59153	45263	0.0842	0.1480	0.4815	0.4342
Fulton	50	59523	43940	0.1240	0.1826	0.5939	0.5558
Fulton	51	58952	47262	0.2368	0.3623	0.6082	0.5728
Fulton	52	31511	26534	0.1765	0.2543	0.6372	0.6074
Fulton	53	59953	46944	0.1453	0.2143	0.5485	0.4998
Fulton	54	60083	50338	0.1547	0.2766	0.6104	0.5641
Fulton	55	59971	49255	0.5538	0.5960	0.8169	0.8121
Fulton	56	58929	52757	0.4548	0.5055	0.8971	0.9249
Fulton	57	59969	52097	0.1806	0.2543	0.8092	0.8025
Fulton	58	59057	50514	0.6304	0.6732	0.9213	0.9511
Fulton	59	59434	49179	0.7009	0.7332	0.9337	0.9603
Fulton	60	59709	45490	0.6388	0.6820	0.8065	0.8069
Fulton	61	29096	22287	0.9541	0.9658	0.9654	0.9789
Fulton	62	59450	46426	0.7226	0.7807	0.9254	0.9434
Fulton	63	59381	45043	0.6933	0.7761	0.9085	0.9279
Fulton	65	27048	20542	0.8293	0.8473	0.8952	0.9088
Fulton	67	41863	31238	0.8036	0.8785	0.8985	0.9164
Fulton	68	29758	22037	0.9004	0.9274	0.9278	0.9482
Fulton	69	21379	15994	0.9415	0.9655	0.9561	0.9811
Grady	171	8115	6461	0.1696	0.2131	0.2238	0.2074
Grady	173	18121	13501	0.3394	0.4507	0.4454	0.4338
Gwinnett	30	8620	6301	0.1584	0.2484	0.3775	0.3234
Gwinnett	48	15027	11394	0.1026	0.1660	0.4955	0.4395
Gwinnett	88	11845	8763	0.3005	0.5402	0.7198	0.7597
Gwinnett	94	28004	20992	0.4197	0.5235	0.6869	0.6571
Gwinnett	95	34221	25212	0.6639	0.7452	0.8115	0.8122
Gwinnett	96	59515	44671	0.2300	0.5797	0.6579	0.6661
Gwinnett	97	59072	46339	0.2677	0.4490	0.6617	0.6608
Gwinnett	98	59998	42734	0.2325	0.7459	0.7610	0.8075
Gwinnett	99	59850	45004	0.1471	0.2279	0.5261	0.4833
Gwinnett	100	35204	25378	0.1307	0.2425	0.4252	0.3789
Gwinnett	101	59938	46584	0.2419	0.4143	0.5632	0.5431
Gwinnett	102	58959	42968	0.3762	0.5767	0.6626	0.6503
Gwinnett	103	51691	38022	0.1879	0.3607	0.4796	0.4471
Gwinnett	104	35117	25457	0.2096	0.3042	0.3993	0.3442
Gwinnett	105	59344	43474	0.2905	0.4482	0.5553	0.5328
Gwinnett	106	59112	43890	0.3627	0.4648	0.5858	0.5390
Gwinnett	107	59702	44509	0.2963	0.5937	0.6884	0.6965
Gwinnett	108	59577	44308	0.1835	0.3578	0.5536	0.5107
Gwinnett	109	59630	44140	0.3251	0.6708	0.7711	0.8246
Gwinnett	110	59951	43226	0.4719	0.5645	0.6405	0.5965
Gwinnett	111	22685	16118	0.3307	0.4520	0.4726	0.4142
Hall	27	54508	42712	0.0386	0.1354	0.1804	0.1550
Hall	28	8108	6799	0.0284	0.1772	0.2527	0.2270
Hall	29	59200	43131	0.1359	0.5284	0.4485	0.4704
Hall	30	50646	39113	0.0685	0.2374	0.2707	0.2393
Hall	31	14349	9789	0.1036	0.6834	0.4858	0.5209
Hall	100	7819	5923	0.0653	0.1867	0.2453	0.2134
Hall	103	8506	6377	0.0486	0.1396	0.2653	0.2319

County	HD	TOTPOP	VAP	BVAP	BHVAP share	Biden20	Abrams18
Henry	74	18397	13441	0.4742	0.5356	0.5834	0.5642
Henry	78	3847	2965	0.6921	0.7292	0.8470	0.8768
Henry	91	35569	27415	0.5887	0.6628	0.7223	0.7183
Henry	115	60174	44807	0.5213	0.5797	0.6153	0.5443
Henry	116	55759	42471	0.5808	0.6380	0.6848	0.6669
Henry	117	54737	40246	0.3841	0.4324	0.4416	0.3759
Henry	118	12229	8628	0.1868	0.2258	0.2874	0.2449
Houston	145	28132	20686	0.5239	0.6021	0.6151	0.6114
Houston	146	60203	44589	0.2761	0.3192	0.3840	0.3558
Houston	147	59178	44902	0.3012	0.3678	0.4662	0.4414
Houston	148	16120	11941	0.2453	0.2778	0.3271	0.3070
Lamar	134	5026	3864	0.0970	0.1198	0.1786	0.1839
Lamar	135	13474	10677	0.3411	0.3603	0.3798	0.3906
Lowndes	174	9770	7472	0.1453	0.1935	0.2019	0.1828
Lowndes	175	43692	31957	0.2018	0.2494	0.3784	0.4034
Lowndes	176	4797	3588	0.2717	0.3743	0.4485	0.4632
Lowndes	177	59992	46014	0.5388	0.5936	0.5139	0.5285
McDuffie	125	4748	3805	0.1198	0.1532	0.2199	0.1901
McDuffie	128	16884	12810	0.4660	0.4938	0.4365	0.4312
Muscogee	137	30443	22797	0.6269	0.6746	0.6665	0.6618
Muscogee	138	12190	9628	0.1224	0.1692	0.3389	0.2796
Muscogee	139	45976	35539	0.2128	0.2770	0.4306	0.3842
Muscogee	140	59294	44411	0.5763	0.6468	0.7471	0.7692
Muscogee	141	59019	44677	0.5746	0.6305	0.7368	0.7428
Newton	93	15515	12080	0.5094	0.5404	0.5824	0.5743
Newton	113	60053	44538	0.5953	0.6533	0.7534	0.7636
Newton	114	36915	28130	0.2760	0.3104	0.3491	0.3299
Paulding	16	16549	11771	0.0981	0.1406	0.2447	0.2194
Paulding	17	59120	42761	0.2302	0.2934	0.3580	0.3264
Paulding	18	10627	7838	0.1069	0.1355	0.1902	0.1750
Paulding	19	58955	44299	0.2415	0.3025	0.3762	0.3525
Paulding	64	23410	17329	0.3249	0.3881	0.4450	0.4147
Peach	145	14093	11209	0.2211	0.2688	0.3275	0.3039
Peach	150	13888	10902	0.6643	0.7715	0.7004	0.7216
Richmond	126	25990	19714	0.6887	0.7181	0.7709	0.7804
Richmond	127	19152	15842	0.2599	0.2945	0.4192	0.3905
Richmond	129	58829	46873	0.5487	0.5835	0.6537	0.6344
Richmond	130	59203	44019	0.5991	0.6308	0.6388	0.6298
Richmond	132	43433	34451	0.5267	0.6146	0.7759	0.7966
Rockdale	91	4781	3817	0.4923	0.5179	0.5997	0.5626
Rockdale	92	44666	34757	0.6054	0.6511	0.7185	0.6871
Rockdale	93	32913	24178	0.6379	0.7670	0.8062	0.8013
Rockdale	95	11210	8751	0.4101	0.4845	0.5276	0.4859
Spalding	74	16815	13276	0.1990	0.2531	0.3220	0.3121
Spalding	117	5393	4727	0.2128	0.2520	0.4014	0.3618
Spalding	134	45098	34120	0.4063	0.4443	0.4206	0.4157
Telfair	149	9486	7884	0.3950	0.5747	0.3762	0.3533
Telfair	156	2991	2306	0.3001	0.3157	0.4131	0.4024
Thomas	172	4176	3246	0.1497	0.1753	0.2050	0.2061
Thomas	173	41622	31791	0.3726	0.3977	0.4351	0.4150
Tift	169	6730	5219	0.1129	0.1590	0.1807	0.1494
Tift	170	34614	26005	0.3220	0.4365	0.3806	0.3429
Troup	72	10281	7843	0.2076	0.2372	0.2844	0.3005
Troup	136	17913	13414	0.5139	0.5540	0.5738	0.6049
Troup	137	16144	12084	0.3974	0.4346	0.3855	0.3868
Troup	138	25088	19240	0.2535	0.2783	0.3040	0.2878
Whitfield	2	27861	21447	0.0331	0.1741	0.2209	0.1926
Whitfield	4	59070	42798	0.0538	0.4915	0.3551	0.3367
Whitfield	6	15933	12017	0.0280	0.1597	0.2017	0.1727

Table 57: Counties with more than 15 points BHVAP differential across House districts (table in three parts).

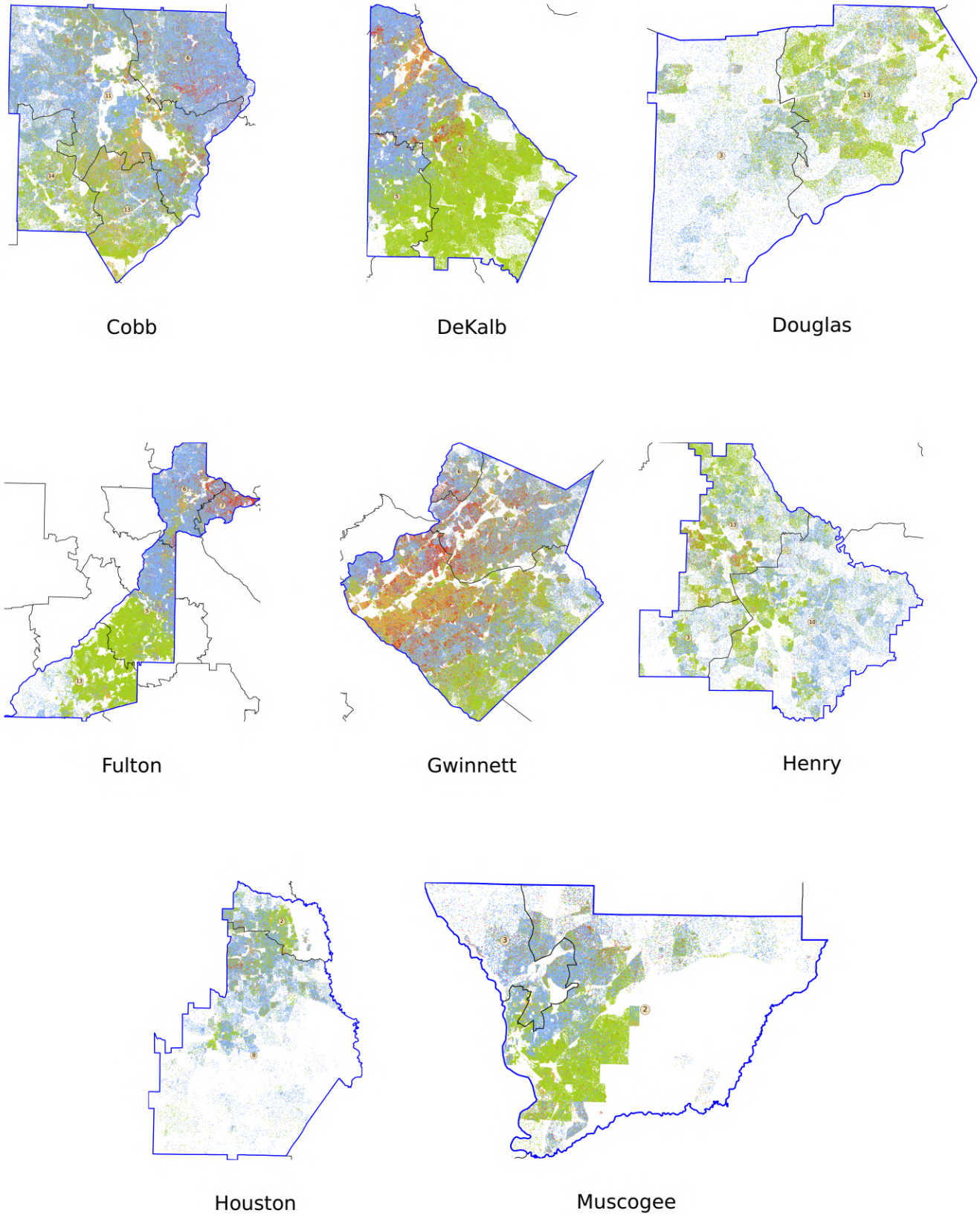


Figure 39: Additional county splits in the enacted Congressional plan with racially distinctive patterns at the boundary lines.

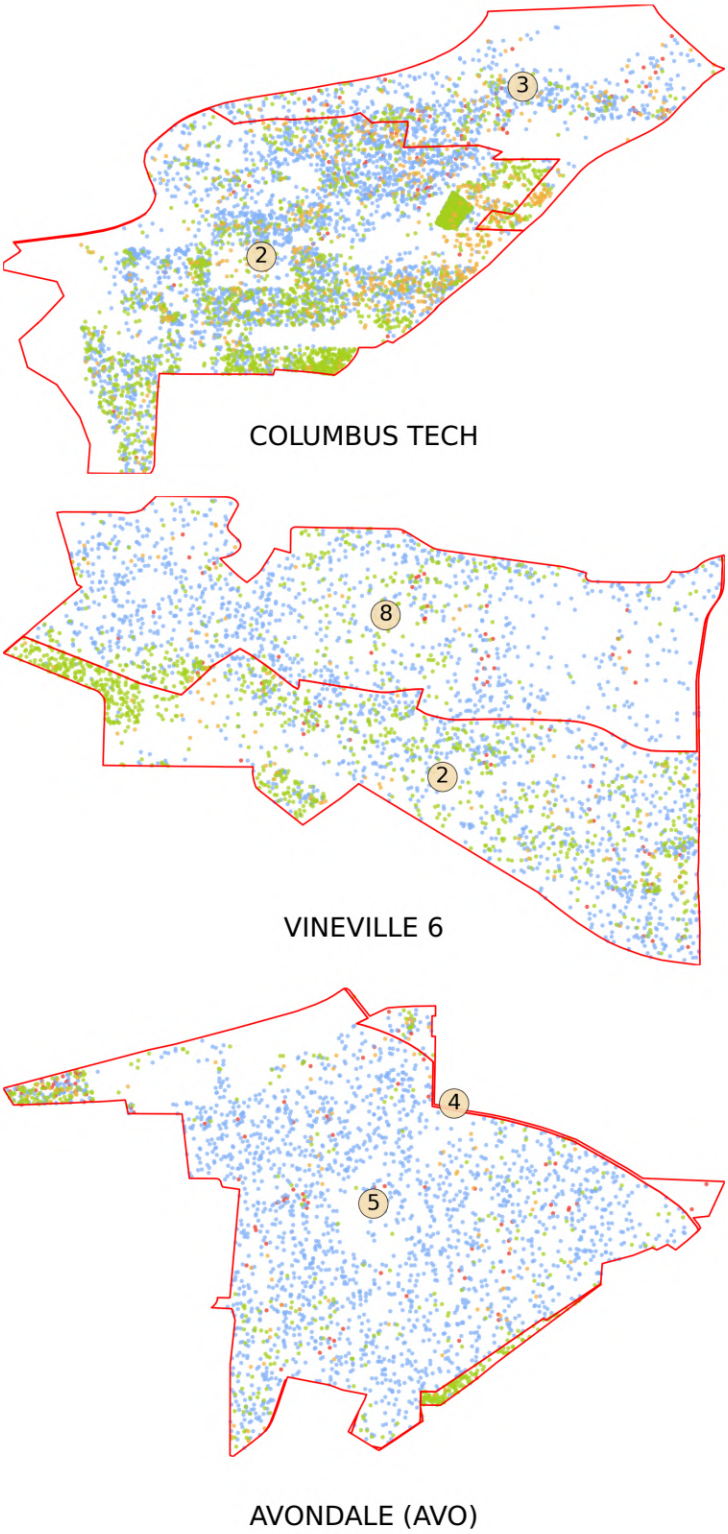
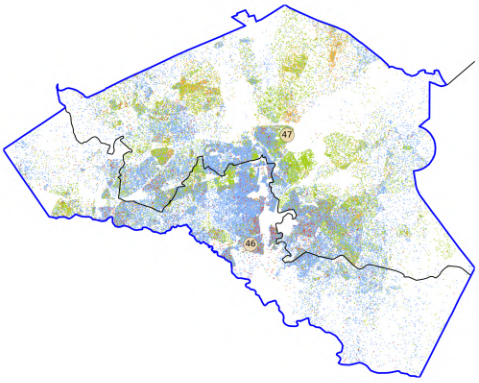
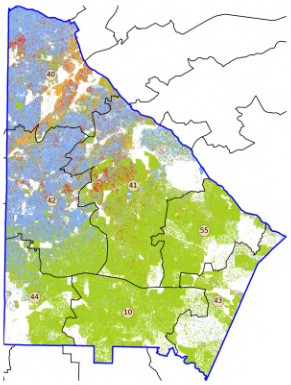


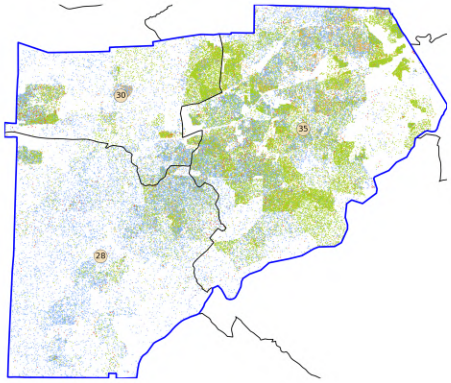
Figure 40: Illustrative precinct splits in the enacted Congressional plan showing racially distinctive patterns at the boundary lines.



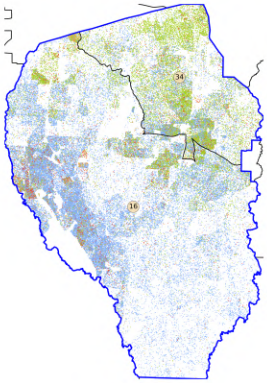
Clarke



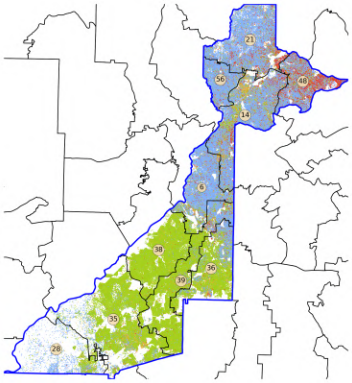
DeKalb



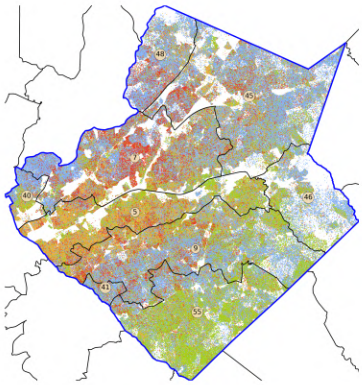
Douglas



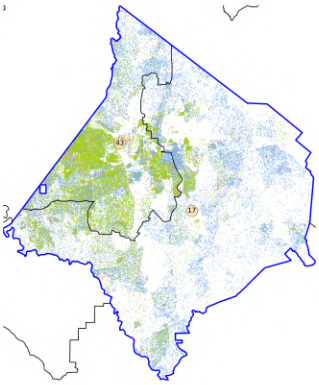
Fayette



Fulton

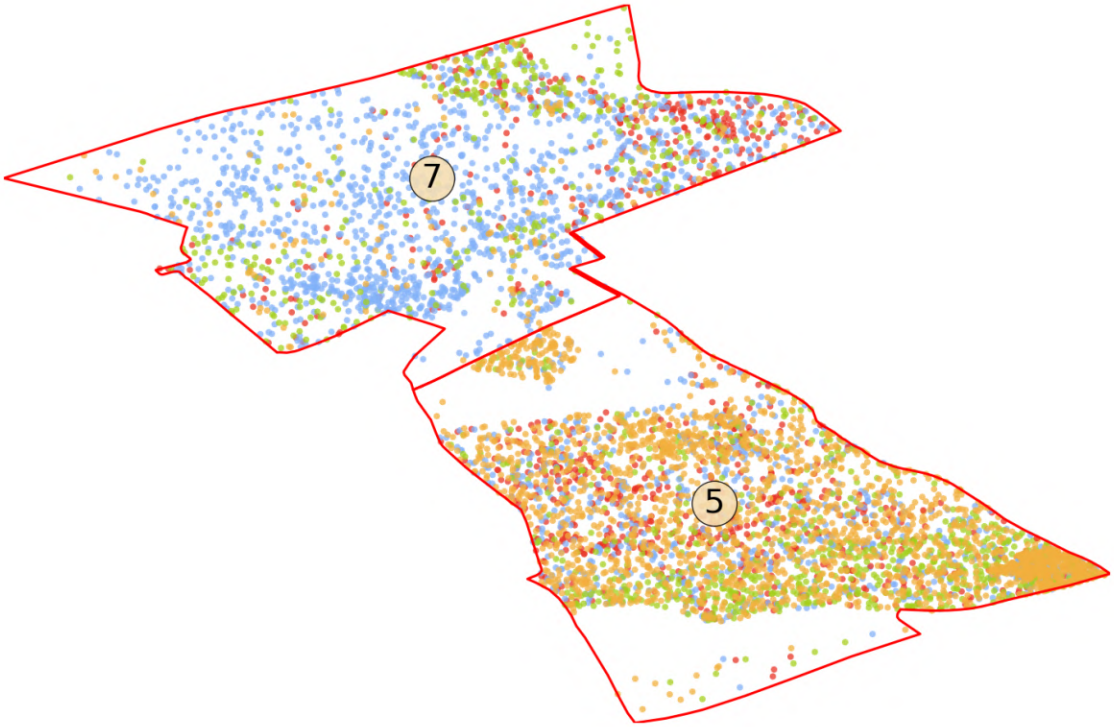


Gwinnett



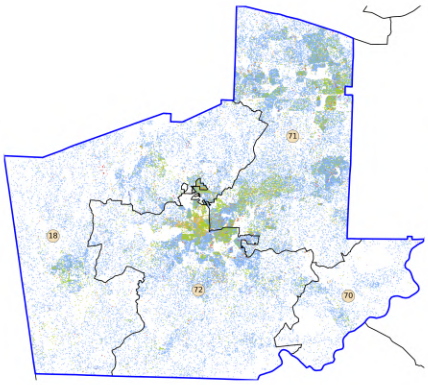
Newton

Figure 41: Additional county splits in the enacted Senate plan with racially distinctive patterns at the boundary lines.

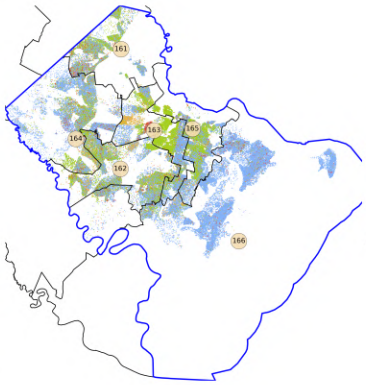


PINCKNEYVILLE W

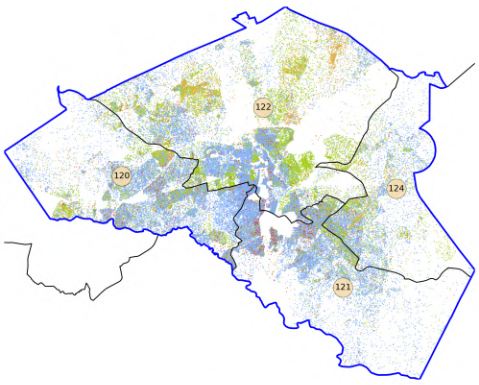
Figure 42: An illustrative precinct split in the enacted Senate plan showing a racially distinctive pattern at the boundary lines.



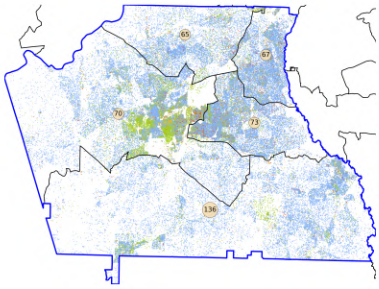
Carroll



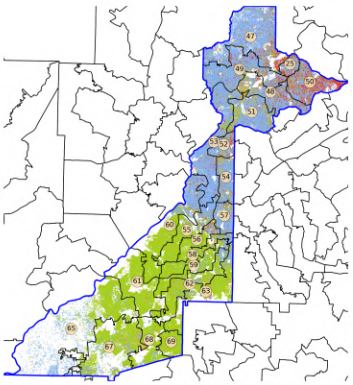
Chatham



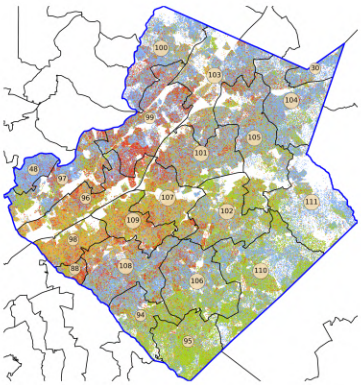
Clarke



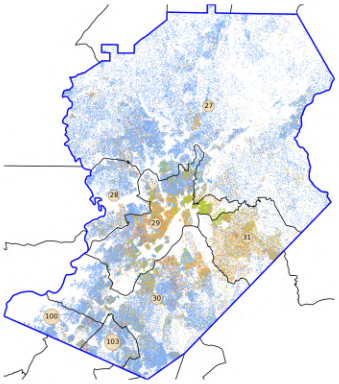
Coweta



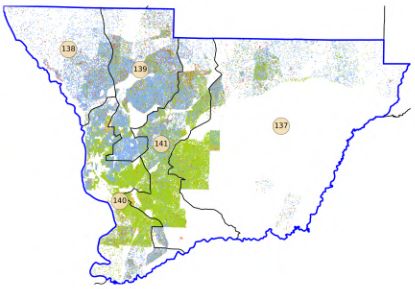
Fulton



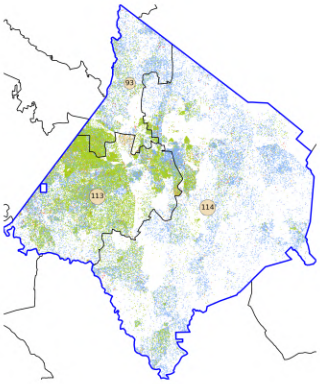
Gwinnett



Hall

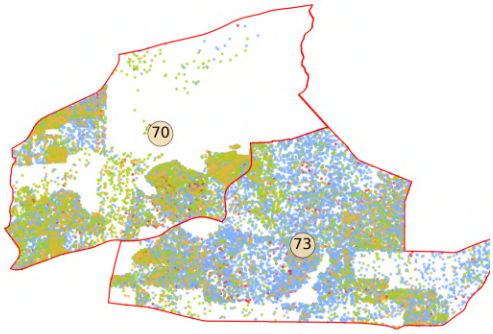


Muscogee

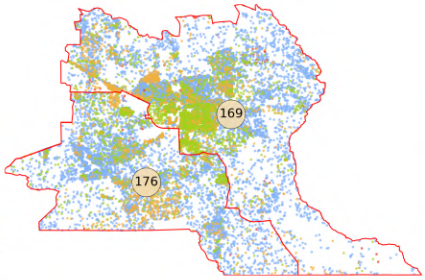


Newton

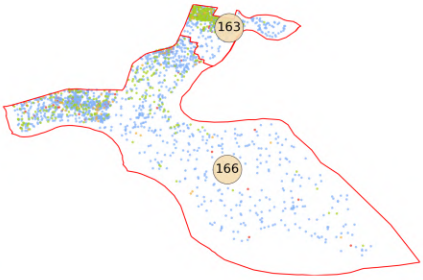
Figure 43: Illustrative county splits in the enacted House plan with racially distinctive patterns at the boundary lines.



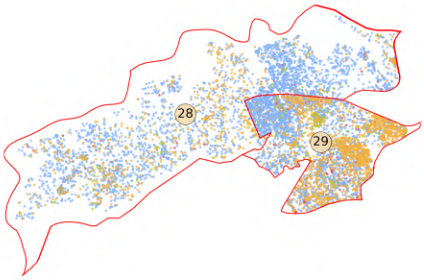
THE NEWNAN CENTRE



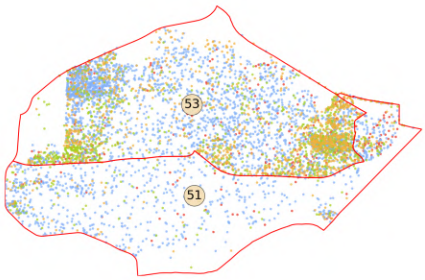
DOUGLAS



WINDSOR FOREST
BAPTIST CHURCH SCHOOL

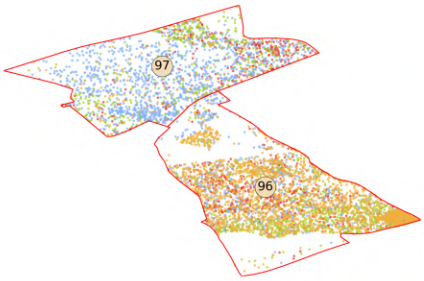


WILSON

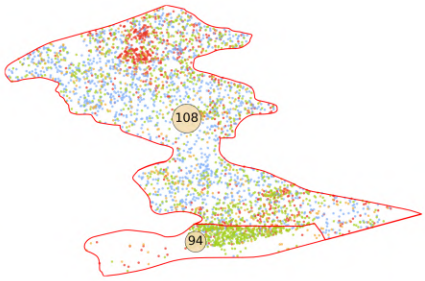


RW03

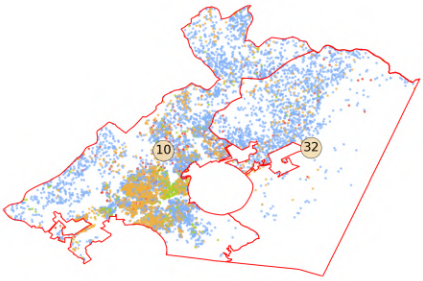
TUCKER



PINCKNEYVILLE W



CATES J



HABERSHAM SOUTH

Figure 44: Illustrative precinct splits in the enacted House plan with racially distinctive patterns at the boundary lines.

I reserve the right to continue to supplement my report in light of additional facts, testimony and/or materials that may come to light. Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct according to the best of my knowledge, information, and belief.

Executed this 13th day of January, 2023.

Moon Duchin

Rebuttal and Supplemental Report

Moon Duchin
Professor of Mathematics, Tufts University
Senior Fellow, Tisch College of Civic Life

February 15, 2023

In this report, I will rebut certain opinions contained in the Expert Report of John Morgan on behalf of defendants, dated December 5, 2022. I will also supplement my own expert report of January 13, 2023 (and further rebut the Morgan Report) in light of the deposition transcript of Gina Wright, Executive Director of the Legislative and Congressional Reapportionment Office of the Georgia General Assembly, dated January 26, 2023. Appendix C below also makes a minor correction to an Appendix from my January 13 report.

1 Response to Morgan Report

1.1 Intent can not be reliably inferred from a single alternative map

The report of John Morgan is based on the following premise: by drawing a single alternative plan for each chamber of the Georgia legislature, he can illuminate the intent behind the enacted plans and their balancing of numerous criteria in play for electoral maps.[1]

In Mr. Morgan's words,

> I was asked to draw a "blind" plan that did not consider race or incumbency or past redistricting plans for Georgia. This plan did consider other traditional redistricting principles. Using my expertise, I proceeded to draw a plan for the House and then a plan for the Senate. I then compared the illustrative plans to the enacted plans and drew conclusions about the impact of racial considerations on the enacted plans. (¶5, page 3)

Comparison techniques are well established in the scholarly literature to illuminate the intent and/or effects of a particular choice of district boundaries. In particular, there is a long tradition of using a collection of publicly available alternative maps as a comparator for a proposed plan; to give just one example from a published article, Altman–McDonald [2] use a batch of alternative plans to illustrate different tradeoffs facing line-drawers in Virginia in a law review article from 2013. Altman and McDonald present numerous plans for each map they consider, including enacted plans, draft plans by the legislature, draft plans by an advisory commission, and alternatives generated by students in the context of a competition. Citing that article, DeFord–Duchin [3] approach the same problem but leverage more recent algorithmic techniques, offering collections (called *ensembles*) containing tens of thousands of alternative plans made under explicit interpretations of the rules and priorities in the Virginia guidelines. Whether armed with dozens or thousands of alternatives, authors can then conclude with varying degrees of persuasive strength about the interaction of different principles: Does a priority on county preservation tend to have an impact on compactness scores? Did

[1] In Mr. Morgan's accounting, the principles he set aside are race, incumbency, and consideration of prior district boundaries. "Other" principles that he mentions—and presumably did consider in making his maps—include population balance, compactness by at least two measures, contiguity, "civic boundaries" (particularly those of counties, municipalities, and precincts), geographic features, and respect for communities of interest.

Exhibit
0002

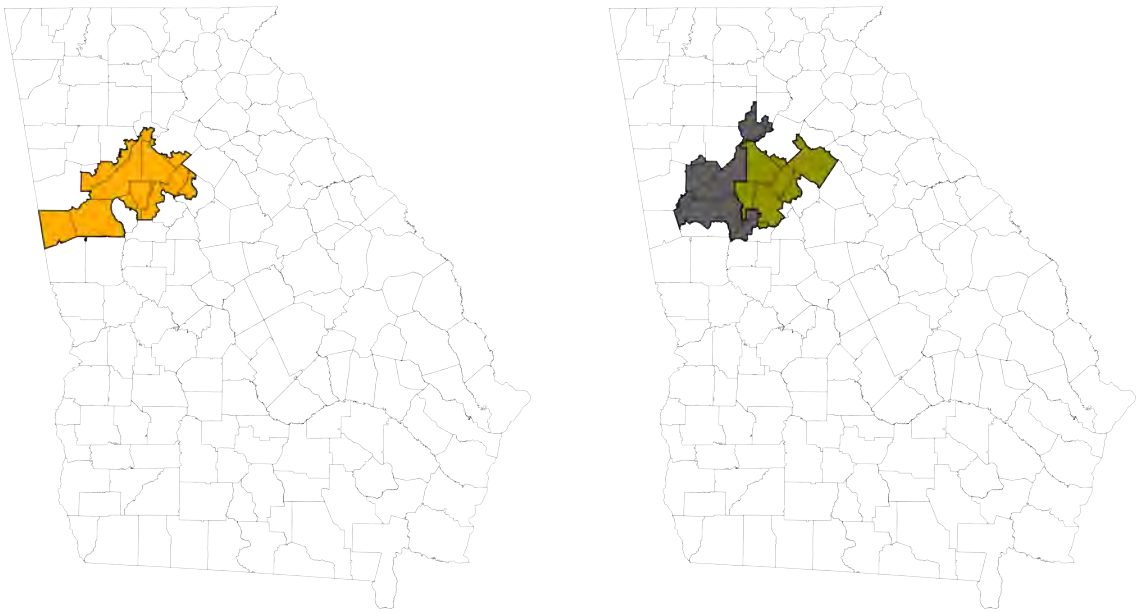
the special master's choice of how to break down the state into zones impose a partisan skew, relative to plans made without that zoning? And so on. Authors whose work uses comparisons with dozens, hundreds, or thousands of maps to make inferences of intent include, but are not limited to, Grofman, Mattingly, Imai, Chen, Clelland, Randall, as well as myself in collaboration with numerous co-authors.

In my opinion, based on my experience both with computational redistricting and through examining maps prepared by people with competing priorities in play, it would be impossible to draw any reliable conclusions as to lack of intent based on comparing a plan to a single alternative. This is especially true when the single comparator plan is drawn with a vague aim to pursue a long list of "other traditional redistricting principles" without differentiation or prioritization.

Below, I will take up Mr. Morgan's proposed method and execute it in a more scientific and systematic way, by using algorithmic generation of plans with varied priorities to better illuminate the choices and tradeoffs in the enacted plans.

The Morgan report identifies three regions of Georgia for analysis, each of which is replaced with an alternative map covering roughly (but not exactly) the same terrain. The regions are

- `Senate Metro Region`, made up of enacted districts 6, 10, 14, 28, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 55 (15 districts);
- `House Region 1`, made up of enacted districts 52, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 111, 112, 113, 115, 116, 117 (28 districts);
- `House Region 2`, made up of enacted districts 25, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 73, 74 (26 districts).

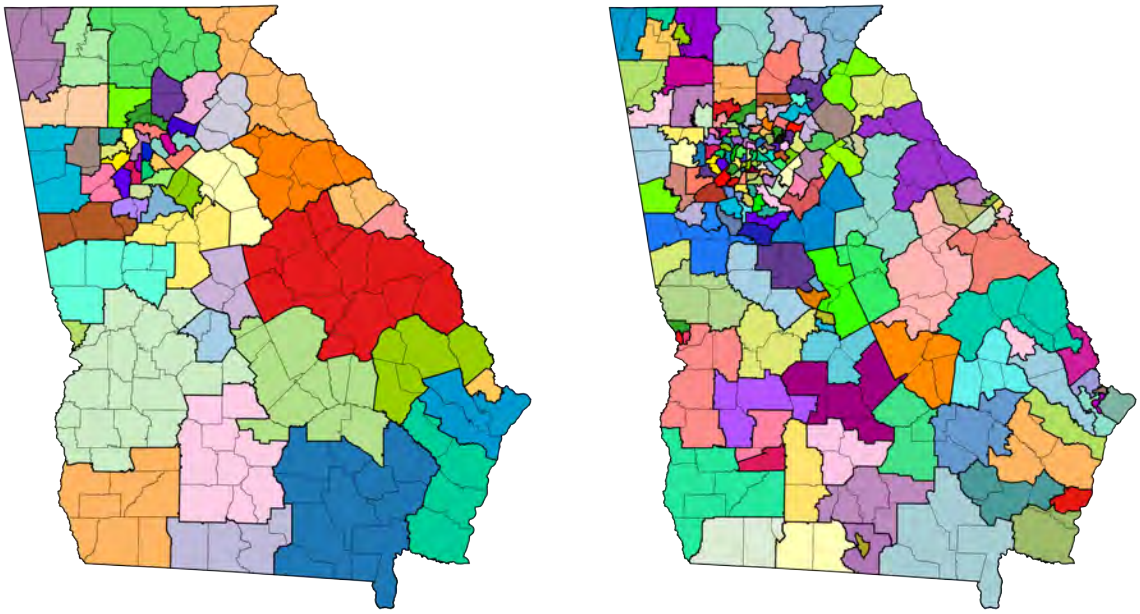


`Senate Metro Region`

`House Region 1` (olive green) and `House Region 2` (gray)

Figure 1: Regions from the enacted legislative plans, as designated in the Morgan Report.

The alternative plans presented in the Morgan report are not limited to these regions but are drawn statewide.



Morgan Senate Plan Morgan House Plan

Figure 2: Statewide alternative plans presented in the Morgan Report for the chambers of the state legislature.

1.2 Majority-minority districts and effective opportunity-to-elect

	majority BVAP	**majority BHVAP**	**majority BHCVAP**	**effective opportunity**
EnactedCD	2	5	4	5
CD Alt	4	6	6	6
EnactedSD	14	17	17	19
MorganSD	11	19	17	20
SD Alt Eff 1	17	23	22	23
EnactedHD	49	62	60	68
MorganHD	35	48	44	67
HD Alt Eff 1	50	77	74	77

Table 1: The first three columns report the number of majority-BVAP, majority-BHVAP, and majority-BHCVAP districts, in the plans under discussion in this report—this counts majority-minority districts by Black voting age population, Black and Hispanic voting age population, nad Black and Hispanic citizen voting age population, respectively. The final column reports the number of districts labeled as "effective" for Black and Latino opportunity to elect candidates of choice. CD Alt, SD Alt Eff 1, and HD Alt Eff 1 are my own alternative plans that were proposed in my January 13 report.

Table 1 shows a few remarkable facts about the Morgan plans. One is that Mr. Morgan's race-blind Senate plan actually has a *greater* number of districts with a majority of Black and Hispanic VAP (19 rather than 17), and an equal number by CVAP (17), relative to the enacted plan. Another striking contrast can be drawn from examining Mr. Morgan's plans in terms of *effectiveness* in providing electoral opportunity for Black and Latino voters to elect candidates of choice.[2] Here, the Morgan alternative plans are remarkably similar to the enacted plan. MorganHD has 67 effective districts to the enacted plan's 68, and MorganSD actually outperforms the state, with 20 effective districts to the enacted plan's 19.

In other words, the enacted legislative plans do indeed have more majority-Black districts than the Morgan plans, but this is achieved while slightly *diminishing* opportunity to elect in the Senate plan and offering the barest increase in the House plan relative to Mr. Morgan's "blind" plans.

In particular, the state's Senate plan, which is required to comply with the Voting Rights Act, offers Black and Latino voters less electoral opportunity than a plan drawn "blind" by the state's own expert with no regard to the VRA.

1.3 Experiment: Pursuing majority-Black districts

By comparing the enacted districts with his alternative districts, Mr. Morgan makes the following conclusions:

- "In my opinion, the creation of additional black majority districts in [House] region 1 [led] to lower compactness scores in this region." (¶30, p23)
- "In my opinion, the creation of additional black majority districts in [House] region 2 [led] to lower compactness scores in this region." (¶34, p29)
- "In my opinion, the creation of an additional black majority district in the [Senate Metro] region [led] to lower compactness scores in this region." (¶46, p42)

I have conducted a simple experiment to examine whether there is evidence of the causality that is ascribed by Mr. Morgan. To do so, I have run an algorithmic procedure that randomly alters districting plans, with a specification favoring plans with more majority-Black districts. I ran this chain of districting plans for 100,000 steps on the regions `House Region 1`, `House Region 2`, and `Senate Metro Region` from the Morgan report. With these outputs, I can ask whether plans with more majority-Black districts are necessarily less compact.

I do not find that this is the case; on the contrary, an exploratory search turns up tens of thousands of examples that are at least as compact as the enacted plan with at least as many majority-BVAP districts.[3] Notably, the alternatives I am considering are an exact match for the region covered by the enacted districts Mr. Morgan has selected, whereas his own alternatives are only approximate, and do not cover the same terrain.

[2] As detailed in §5 of my January 13 report (p15-19), an "effective" district is one in which the coalition candidate of choice would have won at least three out of four primary contests and five out of eight general contests from a dataset of probative elections.

[3] It is important to emphasize that this experiment was conducted to test a hypothesis about the relationship between majority-Black districts and compactness in the state's plan, not to maximize the number of majority-Black districts. Use of algorithmic techniques known as *heuristic optimization* or *local search* can find many examples with 4 majority-BVAP Congressional districts, 21 majority-BVAP Senate districts, and 66 majority-BVAP House districts. In Figure 3, I use block cut edges as a compactness score. Since the transcript of Director Wright's deposition indicated that the state did not use any particular compactness score, but favored the "eyeball test," I have also provided a visual comparison in Appendix B to demonstrate that these techniques also produce districts that are compact by informal, visual standards.

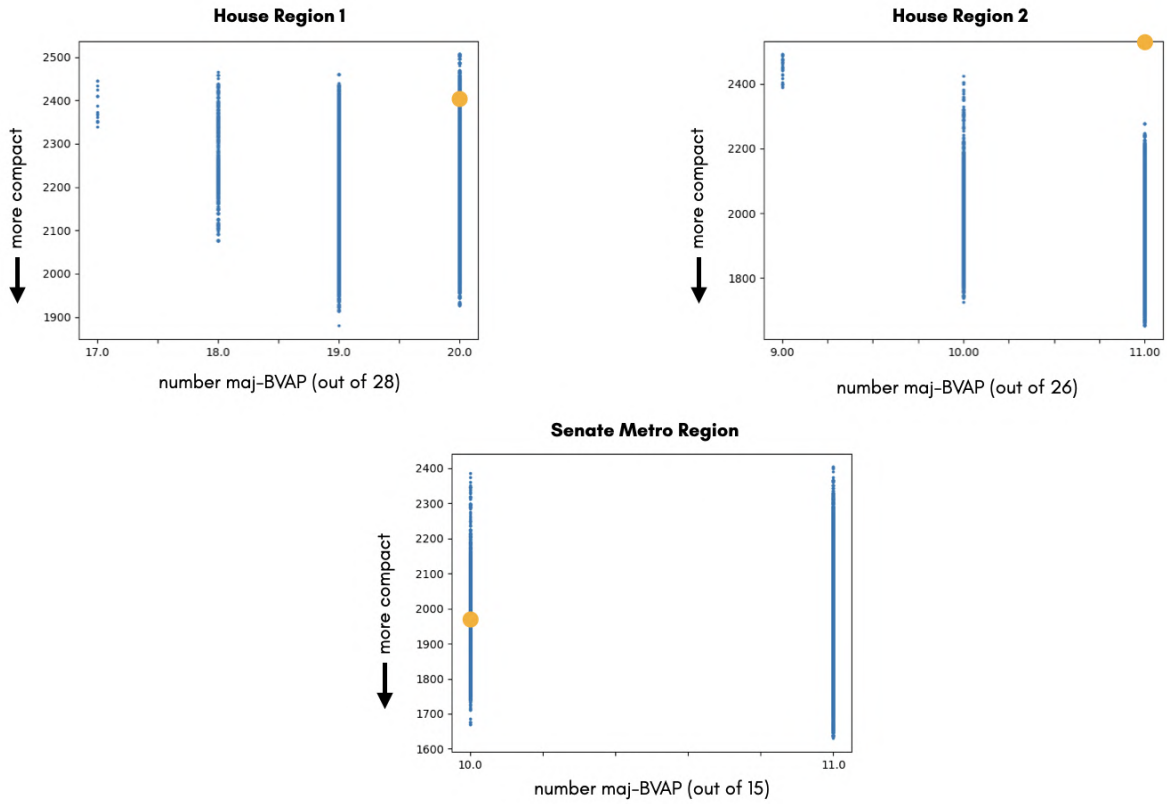


Figure 3: To test the hypothesis in the Morgan report, I generated 100,000 plans in each region with an exploratory algorithm. These runs show no evidence that there is a cost to compactness in matching the number of majority-BVAP districts in the state's enacted plan; if anything, the correlation goes the other way. Large dots mark the position of the enacted plan on the plot (though in House Region 2, the enacted plan is so much less compact than these alternatives that it is out of range). I am unable to locate the Morgan alternative plan on these plots because it does not cover the same terrain.

1.4 Summary discussion of Morgan report

- Comparison to a single alternative plan is plainly inadequate to probe the tradeoffs and incentives in the enacted plan.
- Even though the regions under consideration are composed of whole districts from the enacted plan—28 districts in `House Region 1`, 26 districts in `House Region 2`, and 15 districts in `Senate Metro Region`—Mr. Morgan's replacement districts do not cover the same terrain. This means that the alternative districts do not have the same collective contour and do not have the same demographics as the districts they replace, so it is not an apples-to-apples comparison.

- Mr. Morgan erroneously concludes from a consideration of his own maps that lower compactness scores are *required* to create additional majority-BVAP districts.[4]
- The Morgan plan for Senate (MorganSD), which is described as being created "blind" to race and ethnicity, has more districts with a majority of voting age population that is Black and Latino (19) than the state's enacted plan (17). The Morgan "blind" Senate plan also has more districts that provide an effective opportunity for Black and Latino voters to elect their candidates of choice (20) than are present in the state's enacted plan (19).

2 Discussion of Wright Deposition

In her deposition of January 26, Gina Wright described her work as a mapper drawing the enacted plans for Congress, Senate, and House. She broadly acknowledged that multiple motives were in play, which notably included the pursuit of partisan advantage for the Republican party

Regarding Congressional District 6:

> Q: Do you know why Senator Kennedy's staff wanted to try adding Forsyth into CD 6?
>
> A: The desire for [CD 6] was to make it a more politically electable district.
>
> Q: Politically electable for whom?
>
> A: For the party of the people who were drawing the map. (p111, lines 16-23)

And again later:

> To my recollection, adding Dawson to CD 6 had to do with the political numbers of the district. That was the only thing. (p120, lines 1-3)

Regarding SD 17:

> I think the idea was to draw a district that would be a Republican district. (p178, lines 10-11)

Appeals to partisan advantage are found throughout the transcript, in reference to CD 14, SD 48, HD 104, and in numerous other instances, sometimes justifying the downgrading of other traditional districting principles.

Their statements are consistent with a stance that party, not race, is explanatory of the features found in the enacted plans. In other words, any structural disadvantage to voters of color might be argued to be a mere consequence of the pursuit of partisan advantage for Republicans. To illuminate this possible argument, I will use the same method referenced above in connection with the Morgan Report. I have run an algorithmic procedure that randomly alters districting plans, with a specification favoring plans with more Trump-favoring districts from his Presidential run in 2020.

[4] For instance, he writes of several districts that "The black percentage is lowered *only* by elongating the district to include lower concentrations of black population. This allows the black population to be redistributed and to create other majority black districts." (repeated verbatim four times ¶30, p23; ¶33, p29; ¶44, p41; and ¶45, p42; emphasis added).

2.1 Experiment: Pursuing partisan advantage

I ran a chain of districting plans for 100,000 steps statewide for Congress, Senate, and House using a specification that up-weights plans with more Trump districts according to 2020 voting patterns. From these outputs, I can ask whether plans selected for partisanship—but with no race data—tend to have the same hallmarks of racial sorting that I find in the enacted plans.

Figure 4 sets the table by illustrating that the algorithmic procedure succeeds in securing as much or more partisan advantage (measured by counting districts in which Trump received more votes than Biden in 2020) as the enacted plan, while remaining respectful of traditional districting principles. Compactness is illustrated here, but considerations for population balance and county preservation were also implemented in the runs, as described in Appendix A.

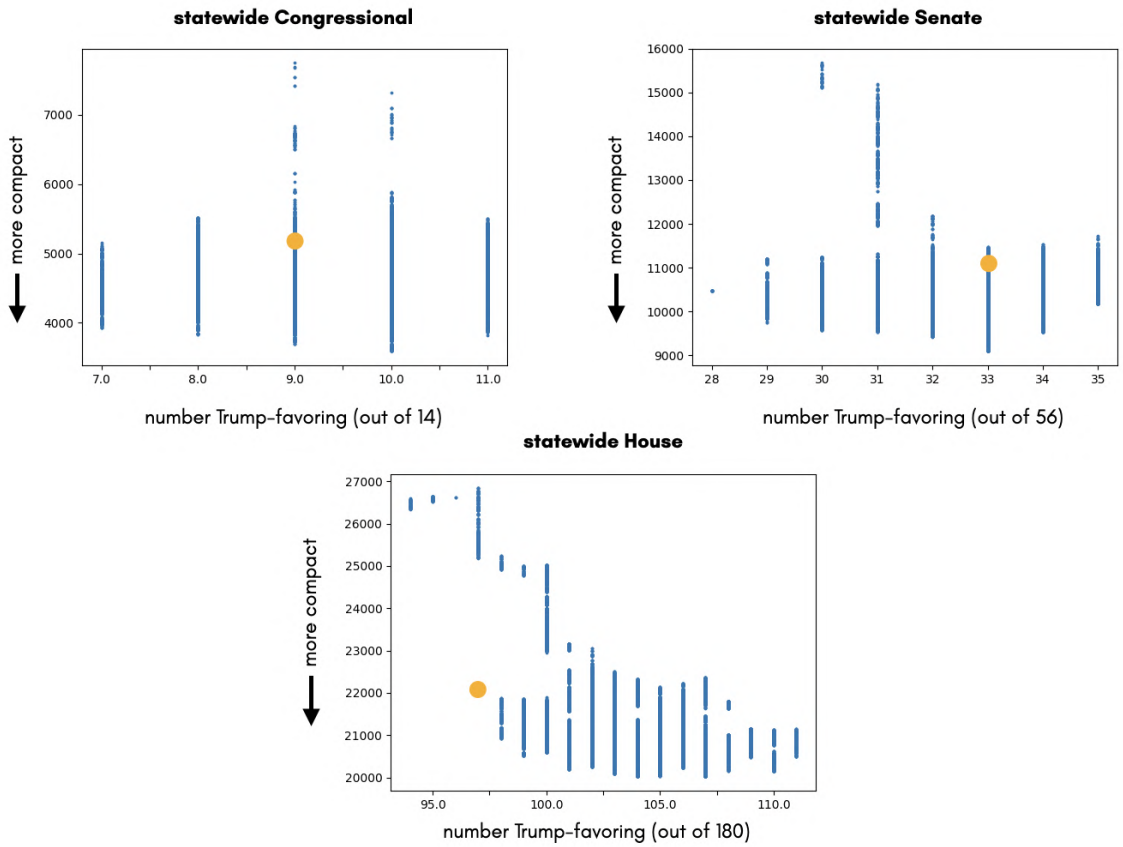


Figure 4: To examine the effects of partisanship, I generated 100,000 statewide plans at each level of redistricting with an exploratory algorithm seeking larger numbers of Trump-favoring districts from the 2020 Presidential election. The enacted plans, marked with large dots in the plots, have 9 Trump-favoring districts in Congress, 33 in the Senate, and 97 in the House. This figure is included to show that the algorithms meet and exceed the partisan performance of the enacted plan while respecting traditional districting principles. The following figures will illustrate the racial features that were used to achieve this on the part of the state.

Next, we examine whether the enacted plan is unusual in its racial balance *among highly partisan alternatives*. To do this, I will focus on the Black voting age population, since this was the principal racial category described by Director Wright as being considered in the mapping process.[5] If a plan were drawn by using minority racial population to secure partisan advantage in a state with roughly 50-50 partisan support, we would expect to see that the districts near the middle range would be "cracked"—the middle range because, all things being equal, these would be the most likely to be contested for political party control in an evenly split state. This would show up on a boxplot with dots below the boxes, perhaps even at or below the whiskers, in the middle columns. That is exactly what we see in Figure 5.

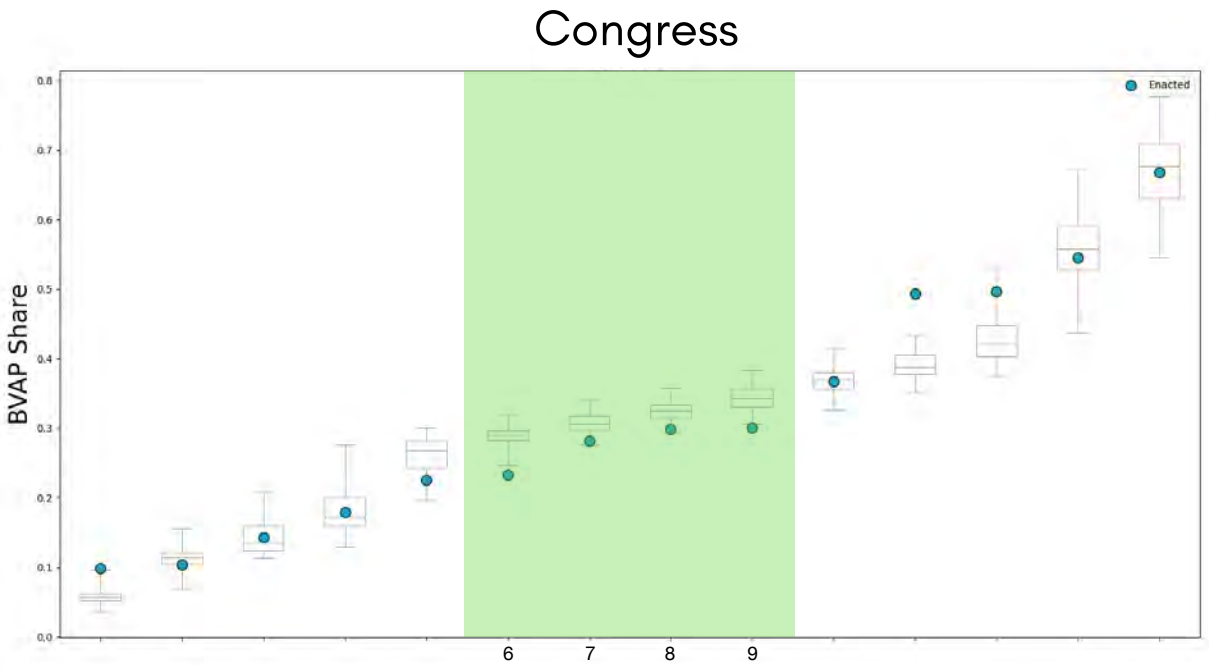


Figure 5: This box-and-whiskers plot organizes the districts of Congressional plans from the one with the lowest BVAP share to the one with the highest, regardless of geography. From 100,000 plans drawn with an emphasis on Republican partisan advantage, the box shows the 25th to 75th percentile, and the whiskers show the 1st to 99th percentile, of the Black voting age population share. The BVAP of districts in the enacted plan is shown with blue dots. Even compared to this collection of partisan plans, we can see that the middle range of districts show clear signs of "cracking," or reduced Black population relative to the comparison plans. This does not suggest a race-neutral pursuit of partisan advantage, but rather a highly race-conscious pursuit of partisan advantage.

[5] "I have not usually combined race categories together to consider it a packing or not packing. From my experience, it has typically been one single race category." (Wright transcript p171, lines 11-14)

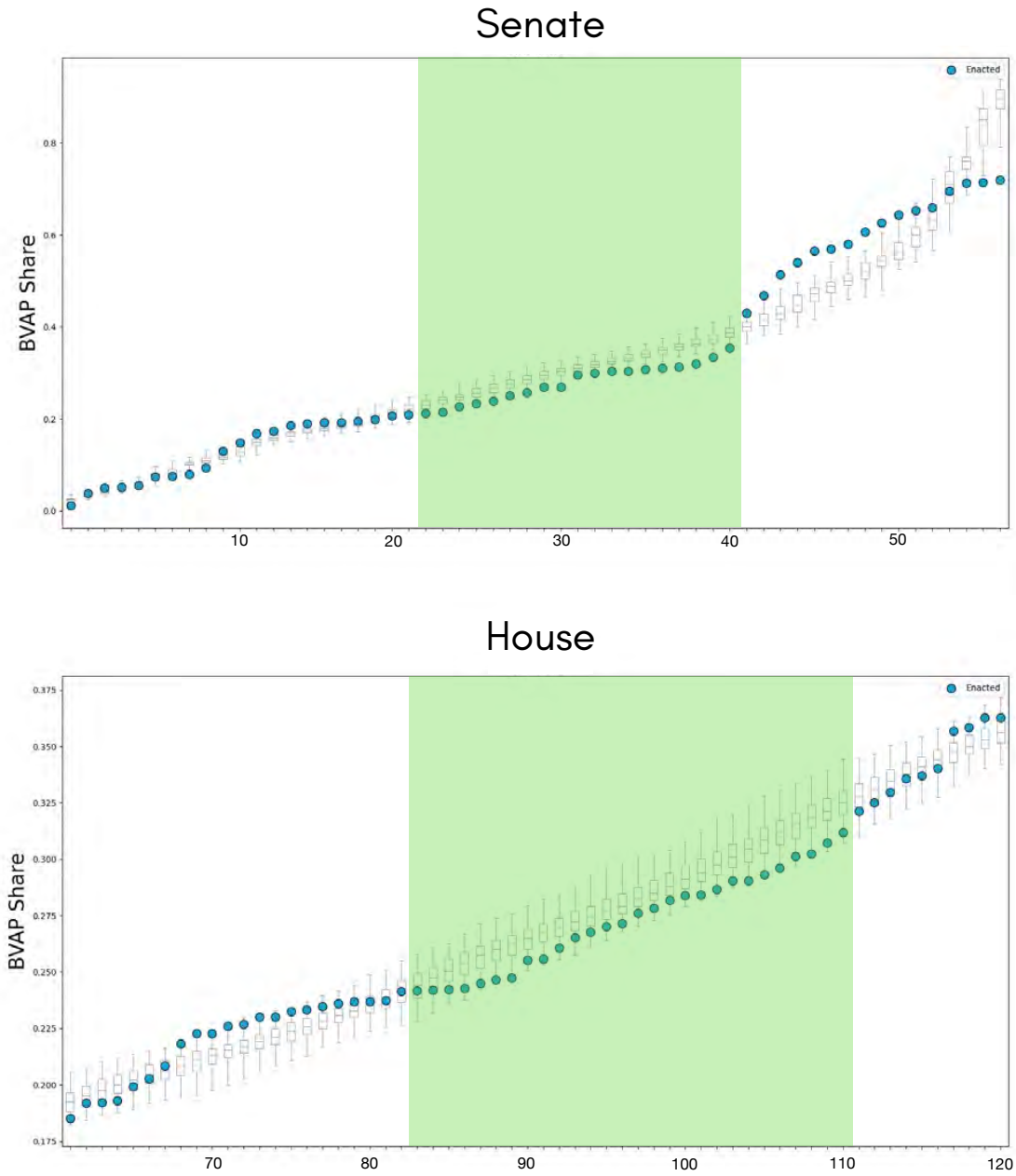


Figure 6: This figure shows boxplots for Senate (top) and state House (bottom; in each, the districts of the plan are arranged from the one with the lowest BVAP share to the one with the highest, regardless of geography. For state House, the middle range of districts is shown. The same signature of cracking is visible here as in the Congressional boxplot.

2.2 Summary discussion of race-versus-party experiments

Simple experiments show that the pursuit of partisan advantage may have been a motivation for map-drawers, but many thousands of examples with even more partisan tilt were found. These alternative examples do not show the marked signs of racial sorting that are found in the enacted plan. In a partisan-motivated plan for a 50-50 state, we would expect cracking in the middle range of districts, as discussed above; if that partisanship is pursued aggressively, we would expect it to extend somewhat above the middle range as the controlling party tries for more districts. This is what we see here.

In order to add a quantitative element to the illustrations provided in the figures above, I selected ten random plans from each Trump-favoring collection shown in the boxplots. For Congress, this makes eleven plans—ten randomized alternatives and the enacted plan. In districts indexed 6-9 (highlighted in Figure 5), the relative position of the enacted plan is 1-1-1-1. This means that in all four districts, all ten random plans had a higher BVAP. These order statistics are not probabilistically independent, because they display correlations that are hard to model precisely. However, if variables were drawn in an independently and identically distributed (i.i.d.) fashion, then the probability of being last of eleven values four times in a row would be less than .00007.

I repeated this demonstration in Senate and House, with ten random plans from the Trump-favoring collection, plus the Morgan alternative plan. With the enacted plan, that makes twelve. In the districts indexed 22-40, the relative position of the enacted plan is 1-1-1-1-1-1-1-1-1-1-3-2-2-1-1-1-1-1-1-1. The probability of being last of twelve options this often, if i.i.d., would be less than 0.0000000000000004. Similarly, in the House districts indexed 83-110, the relative position of the enacted plan is 3-1-1-1-1-1-3-2-3-3-4-4-3-3-3-6-2-1-1-1-1-1-1-1-1-1-1. The probability of being last of twelve options this often, if i.i.d., would be less than 0.00000000006.

In addition to these ensemble comparisons, we can find corroborating indications that race was operationalized by the mapmakers by considering other elements of the plan, such as the high numbers of split precincts. The enacted House plan splits 352 state precincts, while the random selection of alternatives split no more than 231. The enacted Senate plan splits 144 state precincts, while the alternatives split no more than 74.[6] High levels of precinct splitting is of particular note in a race-versus-party analysis, because vote history is not available at a sub-precinct level.

In summary, I find the enacted plan to have properties associated with the cracking of minority voters, suppressing their numbers in a range of districts in a manner that reduces or eliminates their opportunity to elect candidates of choice. This is consistent with a hypothesis that race was used to achieve partisan outcomes in the state's enacted plans.

[6] I am omitting the Congressional comparison, since I did not tune the alternative plans to two-person balance.

References

[1] MGGG Redistricting Lab, *GerryChain Python Library*. GitHub Repository. github.com/mggg/gerrychain

[2] Micah Altman and Michael McDonald, *A Half-Century of Virginia Redistricting Battles: Shifting from Rural Malapportionment to Voting Rights to Public Participation.* University of Richmond Law Review **47** (2013), 771–831.

[3] Daryl DeFord and Moon Duchin, *Redistricting Reform in Virginia: Districting Criteria in Context.* Virginia Policy Review, Vol. 12 No. 2 (2019), 120–146.

[4] Daryl DeFord, Moon Duchin, and Justin Solomon, *Recombination: A family of Markov chains for redistricting.* **Harvard Data Science Review**, Issue 3.1, Winter 2021.

A Description of methods

Randomized alternative districting plans were made with a Markov chain method called *recombination* has been implemented in a publicly available, open-source Python package called GerryChain since 2018 [1] and whose mathematical properties are surveyed in a peer-reviewed article that appeared in 2021 [4].

The basic step begins with a graph representing the geographical units of Georgia, then fuses two districts chosen at random. We draw a random tree (graph with no cycles) that spans the double-district; next, the tree is cut at an edge that creates two complementary balanced pieces, which become the new districts replacing the ones that were fused. The district generation process enforces that every district has population within a thresholded difference to ideal district size; if the tree has no cut edge leaving sufficiently balanced pieces, then a new tree is drawn. (Districts can have up to 1% deviation in Congressional runs and I studied variants with up to 2% deviation and up to 1.5% deviation in Senate and House runs.) Contiguity is also enforced throughout, as a consequence of the fact that deleting an edge from a tree always leaves two connected components, which ensures that new districts formed in the process are connected. Compactness is highly favored throughout this process, because compact districts have far more spanning trees [4]. All of these steps are performed with no attention to race or partisanship—these are only taken into account later in the procedure.

To choose the random tree, a method called *minimum spanning trees* is employed, using weights that encourage county integrity. Within-county edges are given a random weight in $[0, 1]$ while those between counties receive a weight with a +1 "surcharge." The random tree is chosen by drawing weights from these intervals and then finding the (generically unique) spanning tree of minimum weight. In addition, when that tree is cut to separate new districts, the algorithm first seeks for a between-county edge as the cut, if it is possible within balance constraints. This promotes the selection of spanning trees that restrict to counties in a single connected piece, which will tend to keep counties un-split in the districts. Census blocks were employed as the base unit, and a surcharge exactly like the one described above was used to promote the inclusion of whole precincts.

The method for favoring plans with higher numbers of majority-Black districts (or Trump-favoring districts, respectively) works without any change to the proposal of incremental changes. The only variation is that a weighted coin is then flipped to decide whether to accept a change. If the number of majority-Black or Trump-favoring districts is higher, the change is made with higher probability; if the number decreases, the change may still be accepted, but with lower probability. The parameter controlling this probability is called the *temperature*, and we experiment to find temperature settings that allow for reasonably low rates of rejected proposals. This kind of protocol is standard in MCMC, a leading method in applied statistics, and fits under the umbrella of what are called *heuristic optimization* or *local search* methods.

B Visual comparison

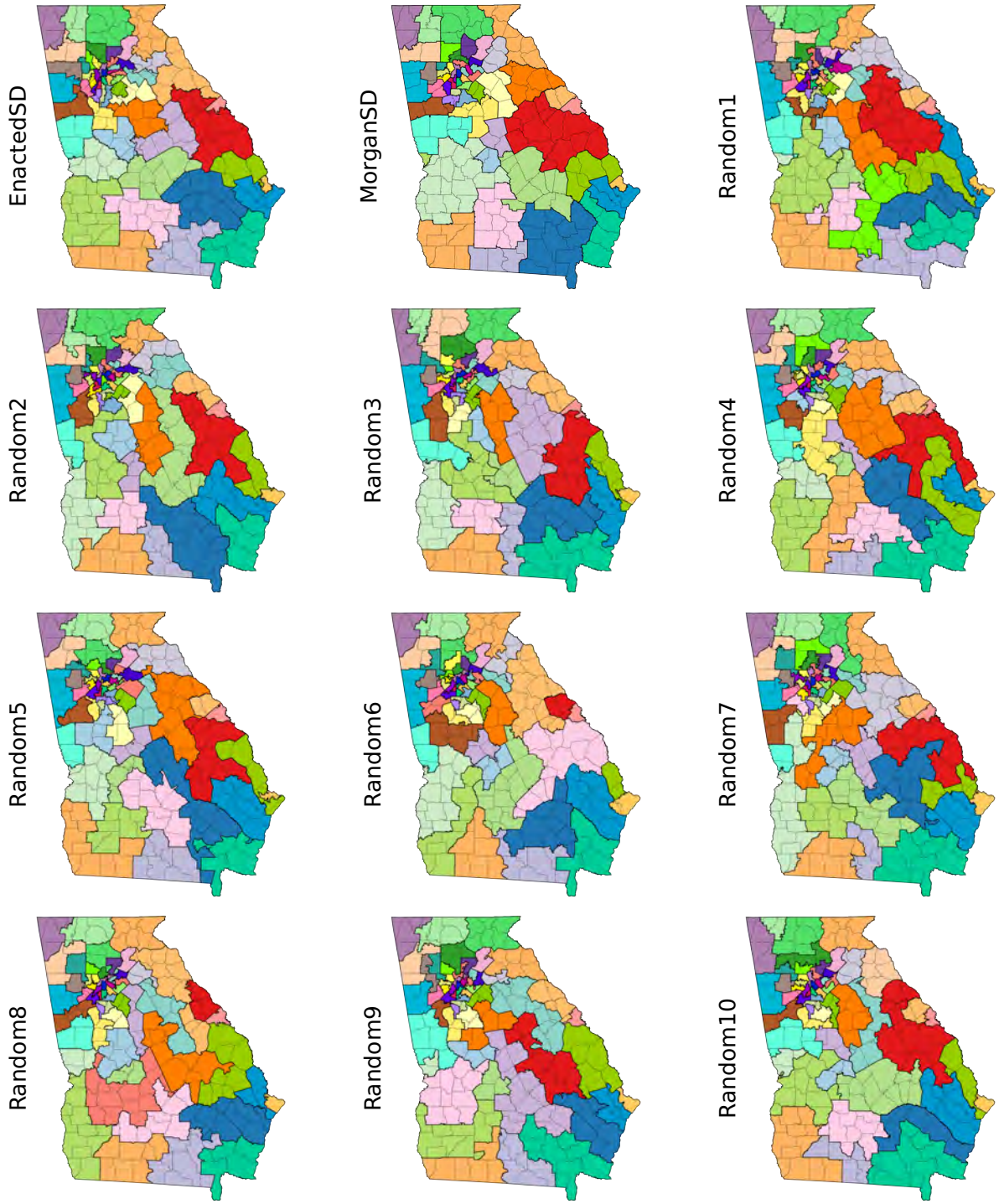


Figure 7: Subsampled Senate plans discussed in §2.2.

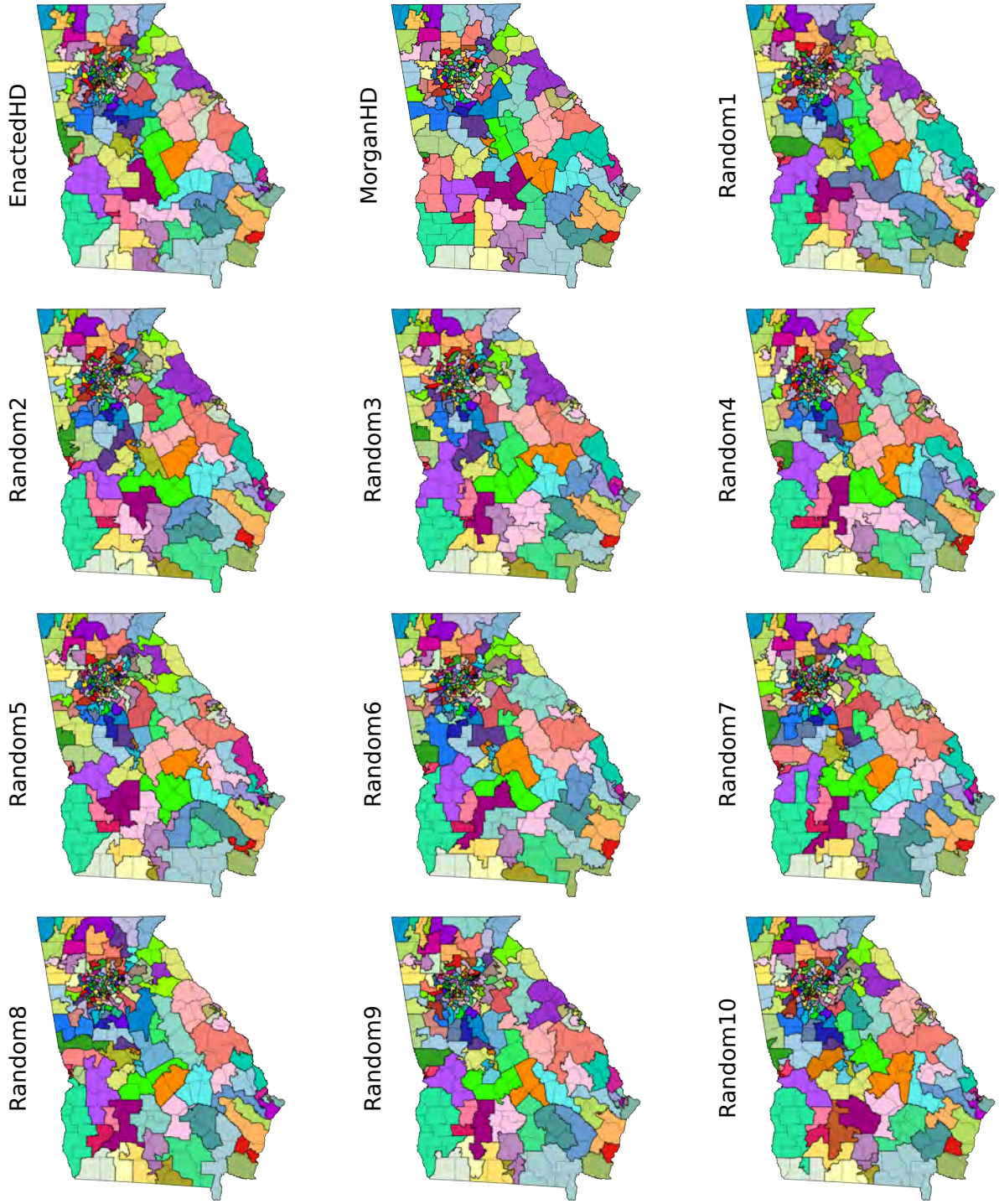


Figure 8: Subsampled House plans discussed in §2.2.

C Minor correction to January 13 Report

In my report filed January 13, 2023, Appendix A on page 81 gives a precise accounting of the construction of racial and ethnic categories throughout the report.

The bullets at the bottom of that page contain minor typographic errors, which are corrected here for clarity and completeness. The corrected version reads as follows:

- Black citizenship ratios are computed by dividing Black-alone CVAP from Table B05003B by Black-alone VAP from Table B01001B.
- Hispanic citizenship ratios are computed by dividing Hispanic CVAP from Table B05003I by Hispanic VAP from Table B03002.
- White citizenship ratios are computed by dividing non-Hispanic White-alone CVAP from Table B05003H by non-Hispanic White-alone VAP from Table B01001H.
- Citizenship ratios for the remaining ("Other") population are computed by dividing CVAP from Tables B05003C (American Indian and Alaska Native alone), B05003D (Asian alone), B05003E (Native Hawaiian and Other Pacific Islander alone), B05003F (some other race alone), and B05003G (two or more races) by VAP from Tables B01001C (American Indian and Alaska Native alone), B01001D (Asian alone), B01001E (Native Hawaiian and Other Pacific Islander alone), B01001F (some other race alone), and B01001G (two or more races).

I reserve the right to continue to supplement my report in light of additional facts, testimony and/or materials that may come to light. Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct according to the best of my knowledge, information, and belief.

Executed this 15th day of February, 2023.

Moon Duchin

2020 Census Populations Georgia Congressional Districts

Based on Ideal Value of 765,136

Congressional District	2020 Total Population	Deviation from Ideal Value	Deviation from Ideal Value (%)
Congressional District 1	755781	-9355	-1.22%
Congressional District 2	673028	-92108	-12.04%
Congressional District 3	763075	-2061	-0.27%
Congressional District 4	773761	8625	1.13%
Congressional District 5	788126	22990	3.00%
Congressional District 6	765793	657	0.09%
Congressional District 7	859440	94304	12.33%
Congressional District 8	719919	-45217	-5.91%
Congressional District 9	775367	10231	1.34%
Congressional District 10	775012	9876	1.29%
Congressional District 11	802515	37379	4.89%
Congressional District 12	738624	-26512	-3.47%
Congressional District 13	792916	27780	3.63%
Congressional District 14	728551	-36585	-4.78%

Exhibit
0003

Data Release August 12, 2021

Moon Duchin

moon.duchin@tufts.edu · mduchin.math.tufts.edu
Mathematics · STS · Tisch College of Civic Life | Tufts University

Education

University of Chicago MS 1999, PhD 2005
Mathematics
Advisor: Alex Eskin Dissertation: *Geodesics track random walks in Teichmüller space*

Harvard University BA 1998
Mathematics and Women's Studies

Appointments

Tufts University
Professor of Mathematics 2021—
Assistant Professor, Associate Professor 2011–2021

Principal Investigator | MGGG Redistricting Lab 2017—

Senior Fellow | Jonathan M. Tisch College of Civic Life 2017—

Director | Program in Science, Technology, & Society 2015–2021

University of Michigan
Assistant Professor (postdoctoral) 2008–2011

University of California, Davis
NSF VIGRE Postdoctoral Fellow 2005–2008

Research Interests

Data science for civil rights, elections, computing and law, geometry and redistricting.
Science, technology, and society, science policy, census data, privacy, computational social choice.
Random walks and Markov chains, partition problems, networks, algorithmic fairness.
Geometric group theory, counting and growth, nilpotent groups, dynamics of group actions.
Geometric topology, hyperbolicity, metric geometry, Teichmüller theory.

Selected Awards & Distinctions

Seelye Fellow, University of Auckland Department of Mathematics 2023
Research Professor - MSRI Program in Analysis and Geometry of Random Spaces Spring 2022
Guggenheim Fellow 2018
Radcliffe Fellow - Evelyn Green Davis Fellowship 2018–2019
Fellow of the American Mathematical Society elected 2017
NSF C-ACCEL (PI) - Harnessing the Data Revolution: Network science of Census data 2019–2020
NSF grants (PI) - CAREER grant and continuous grants from Topology/Geometric Analysis 2009–2022
Professor of the Year, Tufts Math Society 2012–2013
AAUW Dissertation Fellowship 2004–2005
NSF Graduate Fellowship 1998–2002
Lawrence and Josephine Graves Prize for Excellence in Teaching (U Chicago) 2002
Robert Fletcher Rogers Prize (Harvard Mathematics) 1995–1996

Exhibit
0004

Applied and Interdisciplinary Publications & Preprints

Political Geometry: Rethinking Redistricting in the U.S. with Math, Law, and Everything In Between
25 chapters, 475 pages. Birkhäuser Books 2022. Preprint online. (eds. Moon Duchin, Olivia Walch)
see: Introduction, Compactness, Communities of Interest, Clustering, Random Walks, Ranked Choice Voting.

Blind justice: Algorithms and neutrality in the case of redistricting
Proceedings of 2nd ACM Symposium on Computer Science and Law (CS&Law), to appear 2022. (with Doug Spencer)

Aggregating community maps
ACM Conference on Advances in Geographic Information Systems (SIGSPATIAL), to appear 2022. (with Erin Chambers, Ranthony Edmonds, Parker Edwards, JN Matthews, Anthony Pizzimenti, Chanel Richardson, Parker Rule, and Ari Stern)

Private numbers in public policy: Census, differential privacy, and redistricting
Harvard Data Science Review, Special Issue 2, June 2022. Online. (with Aloni Cohen, JN Matthews, and Bhushan Suwal)

The (homological) persistence of gerrymandering
Foundations of Data Science, to appear 2022. Online first. (with Thomas Needham and Thomas Weighill)

Implementing partisan symmetry: Problems and paradoxes
Political Analysis, to appear 2022. arXiv:2008:06930
(with Daryl DeFord, Natasha Dhamankar, Mackenzie McPike, Gabe Schoenbach, and Ki-Wan Sim)

Measuring segregation via analysis on graphs
SIAM Journal on Matrix Analysis and Apps., to appear 2022. arXiv:2212.10708 (with James Murphy and Thomas Weighill)

Ranked choice voting and proportional representation
Submitted. Online. (with Gerdus Benade, Ruth Buck, Dara Gold, and Thomas Weighill)

A reversible recombination chain for graph partitions
Preprint. (with Sarah Cannon, Dana Randall, and Parker Rule)

Clustering propensity: Segregation in networks
Preprint. (with Emilia Alvarez, Everett Meike, and Marshall Mueller; appendix by Tyler Piazza)

Discrete geometry for electoral geography
Preprint. (with Bridget Eileen Tenner) arXiv:1808.05860

Recombination: A family of Markov chains for redistricting
Harvard Data Science Review. Issue 3.1, Winter 2021. Online. (with Daryl DeFord and Justin Solomon)

Census TopDown: The impact of differential privacy on redistricting
2nd Symposium on Foundations of Responsible Computing (FORC 2021), 5:1–5:22. Available online.
(with Aloni Cohen, JN Matthews, and Bhushan Suwal)

Models, Race, and the Law
Yale Law Journal Forum, Vol. 130 (March 2021). Available online. (with Doug Spencer)

Computational Redistricting and the Voting Rights Act
Election Law Journal, Volume 20, Number 4 (2021), 407–441. Available online.
(with Amariah Becker, Dara Gold, and Sam Hirsch)

Mathematics of nested districts: The case of Alaska
Statistics and Public Policy. Vol 7, No 1 (2020), 39–51. (w/ Sophia Caldera, Daryl DeFord, Sam Gutekunst, & Cara Nix)

A computational approach to measuring vote elasticity and competitiveness
Statistics and Public Policy. Vol 7, No 1 (2020), 69–86. (with Daryl DeFord and Justin Solomon)

Locating the representational baseline: Republicans in Massachusetts
Election Law Journal, Volume 18, Number 4, 2019, 388–401.
(with Taissa Gladkova, Eugene Henninger-Voss, Ben Klingensmith, Heather Newman, and Hannah Wheelen)

Redistricting reform in Virginia: Districting criteria in context
Virginia Policy Review, Volume XII, Issue II, Spring 2019, 120–146. (with Daryl DeFord)

Geometry v. Gerrymandering
The Best Writing on Mathematics 2019, ed. Mircea Pitici. Princeton University Press.
reprinted from Scientific American, November 2018, 48–53.

Gerrymandering metrics: How to measure? What's the baseline?
Bulletin of the American Academy for Arts and Sciences, Vol. LXII, No. 2 (Winter 2018), 54–58.

Rebooting the mathematics of gerrymandering: How can geometry track with our political values?
The Conversation (online magazine), October 2017. (with Peter Levine)

A formula goes to court: Partisan gerrymandering and the efficiency gap
Notices of the American Mathematical Society **64** No. 9 (2017), 1020–1024. (with Mira Bernstein)

International mobility and U.S. mathematics
Notices of the American Mathematical Society **64**, No. 7 (2017), 682–683.

Pure Mathematics Publications & Preprints

Conjugation curvature for Cayley graphs
Journal of Topology and Analysis, Vol 14, Number 02 (2022), 439–459. (with Assaf Bar-Natan and Robert Kropholler)

You can hear the shape of a billiard table: Symbolic dynamics and rigidity for flat surfaces
Commentarii Mathematici Helvetici, Vol 96, Issue 3 (2021), 421–463. Available online.
(with Viveka Erlandsson, Christopher Leininger, and Chandrika Sadanand)

Stars at infinity in Teichmüller space
Geometriae Dedicata, Volume 213, 531–545 (2021). (with Nate Fisher) arXiv:2004.04321

The Heisenberg group is pan-rational
Advances in Mathematics **346** (2019), 219–263. (with Michael Shapiro)

Random nilpotent groups I
International Mathematics Research Notices, Vol. 2018, Issue 7 (2018), 1921–1953.
(with Matthew Cordes, Yen Duong, Meng-Che Ho, and Ayla Sánchez)

Hyperbolic groups
chapter in *Office Hours with a Geometric Group Theorist*, eds. M.Clay,D.Margalit, Princeton U Press (2017), 177–203.

Counting in groups: Fine asymptotic geometry
Notices of the American Mathematical Society **63**, No. 8 (2016), 871–874.

A sharper threshold for random groups at density one-half
Groups, Geometry, and Dynamics **10**, No. 3 (2016), 985–1005.
(with Katarzyna Jankiewicz, Shelby Kilmer, Samuel Lelièvre, John M. Mackay, and Ayla Sánchez)

Equations in nilpotent groups
Proceedings of the American Mathematical Society **143** (2015), 4723–4731. (with Hao Liang and Michael Shapiro)

Statistical hyperbolicity in Teichmüller space
Geometric and Functional Analysis, Volume 24, Issue 3 (2014), 748–795. (with Howard Masur and Spencer Dowdall)

Fine asymptotic geometry of the Heisenberg group
Indiana University Mathematics Journal 63 No. 3 (2014), 885–916. (with Christopher Mooney)

Pushing fillings in right-angled Artin groups
Journal of the LMS, Vol 87, Issue 3 (2013), 663–688. (with Aaron Abrams, Noel Brady, Pallavi Dani, and Robert Young)

Spheres in the curve complex
In the Tradition of Ahlfors and Bers VI, Contemp. Math. **590** (2013), 1–8. (with Howard Masur and Spencer Dowdall)

The sprawl conjecture for convex bodies
Experimental Mathematics, Volume 22, Issue 2 (2013), 113–122. (with Samuel Lelièvre and Christopher Mooney)

Filling loops at infinity in the mapping class group
Michigan Math. J., Vol 61, Issue 4 (2012), 867–874. (with Aaron Abrams, Noel Brady, Pallavi Dani, and Robert Young)

The geometry of spheres in free abelian groups
Geometriae Dedicata, Volume 161, Issue 1 (2012), 169–187. (with Samuel Lelièvre and Christopher Mooney)

Statistical hyperbolicity in groups
Algebraic and Geometric Topology **12** (2012) 1–18. (with Samuel Lelièvre and Christopher Mooney)

Length spectra and degeneration of flat metrics
Inventiones Mathematicae, Volume 182, Issue 2 (2010), 231–277. (with Christopher Leininger and Kasra Rafi)

Divergence of geodesics in Teichmüller space and the mapping class group
Geometric and Functional Analysis, Volume 19, Issue 3 (2009), 722–742. (with Kasra Rafi)

Curvature, stretchiness, and dynamics
In the Tradition of Ahlfors and Bers IV, Contemp. Math. **432** (2007), 19–30.

Geodesics track random walks in Teichmüller space
PhD Dissertation, University of Chicago 2005.

Teaching

Courses Developed or Customized

Mathematics of Social Choice | sites.tufts.edu/socialchoice
Voting theory, impossibility theorems, redistricting, theory of representative democracy, metrics of fairness.
Have designed and taught variants at entry level and at math-major level.

History of Mathematics | sites.tufts.edu/histmath
Social history of mathematics, organized around episodes from antiquity to present. Themes include materials and technologies of creation and dissemination, axioms, authority, credibility, and professionalization. In-depth treatment of mathematical content from numeration to cardinal arithmetic to Galois theory.

Reading Lab: Mathematical Models in Social Context | sites.tufts.edu/models
One hr/wk discussion seminar of short but close reading on topics in mathematical modeling, including history of psychometrics; algorithmic bias; philosophy of statistics; problems of model explanation and interpretation.

Reading Lab: Classification | sites.tufts.edu/classification
One hr/wk discussion seminar of short but close reading on topics in classifications and taxonomies, including censuses; race and ethnicity; academic disciplines, mathematical and legal definition; chemical elements; species and model organisms; sex and gender.

Geometric Literacy
Module-based graduate topics course. Modules have included: p-adic numbers, hyperbolic geometry, nilpotent geometry, Lie groups, convex geometry and analysis, the complex of curves, ergodic theory, the Gauss circle problem.

Markov Chains (graduate topics course)
Teichmüller Theory (graduate topics course)
Fuchsian Groups (graduate topics course)
Continued Fractions and Geometric Coding (undergraduate topics course)
Mathematics for Elementary School Teachers (inquiry-based course for pre-service teachers)

Standard Courses

Mathematical Modeling and Computation (with Python), Discrete Mathematics, Calculus I-II-III, Intro to Proofs, Linear Algebra, Complex Analysis, Differential Geometry, Abstract Algebra, Graduate Real Analysis

Selected Talks and Lectures

AMS Einstein Public Lecture in Mathematics — October 2023
Central Sectional Meeting of the AMS, Omaha, NE

Distinguished Plenary Lecture — June 2021
75th Anniversary Meeting of Canadian Mathematical Society, Ottawa, Ontario — *online (COVID)*

BMC/BAMC Public Lecture — April 2021
Joint British Mathematics/Applied Mathematics Colloquium, Glasgow, Scotland — *online (COVID)*

Radcliffe Fellow Lecture
Radcliffe Institute for Advanced Study, Cambridge, MA — November 2018

Gerald and Judith Porter Public Lecture
AMS-MAA-SIAM, Joint Mathematics Meetings, San Diego, CA — January 2018

Mathematical Association of America Distinguished Lecture
MAA Carriage House, Washington, DC — October 2016

American Mathematical Society Invited Address
AMS Eastern Sectional Meeting, Brunswick, ME — September 2016

Named University Lectures

- Lorne Campbell Lecture | Queen's University, Ontario — December 2022
- Plancherel Lecture | Université de Fribourg, Switzerland — October 2022
- Loeb Lectures in Mathematics | Washington University in St. Louis — April 2022
- Mathematics and Natural Sciences Divisional Lecture | Reed College — March 2022
- Parsons Lecture | UNC Asheville — October 2020
- Math, Stats, CS, and Society | Macalester College — October 2019
- MRC Public Lecture | Stanford University — May 2019
- Freedman Memorial Colloquium | Boston University — March 2019
- Julian Clancy Frazier Colloquium Lecture | U.S. Naval Academy — January 2019
- Barnett Lecture | University of Cincinnati — October 2018
- School of Science Colloquium Series | The College of New Jersey — March 2018
- Kieval Lecture | Cornell University — February 2018
- G. Milton Wing Lectures | University of Rochester — October 2017
- Norman Johnson Lecture | Wheaton College — September 2017
- Dan E. Christie Lecture | Bowdoin College — September 2017

Math/Computer Science Department Colloquia

- University of Michigan — Sept 2022
- UC Berkeley — Apr 2022
- Reed College — Dec 2020
- Georgetown (CS) — Sept 2020
- Santa Fe Institute — July 2020
- Univ of Illinois - Chicago — Oct 2019
- UC Berkeley — Sept 2018
- Brandeis-Harvard-MIT-NEU — Mar 2018
- Northwestern University — Oct 2017
- University of Illinois — Sept 2017
- University of Utah — Aug 2017
- Wesleyan — Dec 2016
- Worcester Polytechnic Inst. — Dec 2016
- Université de Neuchâtel — Jun 2016
- Brandeis University — Mar 2016
- Swarthmore College — Oct 2015
- Bowling Green — May 2015
- City College of New York — Feb 2015
- Indiana University — Nov 2014
- the Technion — Oct 2014
- Wisconsin–Madison — Sept 2014
- Stony Brook — March 2013

Minicourses

- Modeling democracy (three hours) | Modern Math Workshop, Puerto Rico — October 2022
- Integer programming and combinatorial optimization (two talks) | Georgia Tech — May 2021

Visiting Lectures

- A Democracy Initiative | Harvard Law School — Fall 2022
- Election Law | Yale Law School — Spring 2022
- Election Law | Harvard Law School — Spring 2022
- Privacy, Policy, and the U.S. Census | University of Chicago (CS) — Spring 2022
- Optimized Democracy | Harvard (CS) — Spring 2021, 2022

Science, Technology, and Society

- The Mathematics of Accountability | Sawyer Seminar, Anthropology, Johns Hopkins — February 2020
- STS Circle | Harvard Kennedy School of Government — September 2019
- Data, Classification, and Everyday Life Symposium | Rutgers Center for Cultural Analysis — January 2019
- Science Studies Colloquium | UC San Diego — January 2019
- Arthur Miller Lecture on Science and Ethics | MIT Program in Science, Tech, and Society — November 2018

Data Science, Computer Science, Quantitative Social Science

- Societal Considerations and Applications | Simons Institute for the Theory of Computing — November 2022
- ACM Symposium on Computer Science and Law | Washington, DC — November 2022
- Econ/CS Seminar | Harvard — October 2022
- Can Algorithms Bend the Arc Towards Fairness? | Algorithmic Justice Project, UNM/SFI — March 2022
- Data Linkage Seminar | Massive Data Institute, McCourt School of Public Policy — August 2021
- Mechanism Design for Social Good (MD4SG) Colloquium | MD4SG Initiative — November 2020
- Data Science for Social Good (DS4SG) Workshop | Georgia Tech — November 2020
- Privacy Tools Project Retreat | Harvard — May 2020
- Women in Data Science Conference | Microsoft Research New England — March 2020
- Quantitative Research Methods Workshop | Yale Center for the Study of American Politics — February 2020
- Societal Concerns in Algorithms and Data Analysis | Weizmann Institute — December 2018
- Quantitative Collaborative | University of Virginia — March 2018
- Quantitative Social Science | Dartmouth College — September 2017
- Data for Black Lives Conference | MIT — November 2017

Law, Democracy, Political Science, Geography

- The Long 19th Amendment: Women, Voting, and American Democracy | Radcliffe Institute — Nov–Dec 2020
- "The New Math" for Civil Rights | Social Justice Speaker Series, Davidson College — November 2020
- Math, Law, and Racial Fairness | Justice Speaker Series, University of South Carolina — November 2020
- Voting Rights Conference | Northeastern Public Interest Law Program — September 2020
- Political Analysis Workshop | Indiana University — November 2019
- Program in Public Law Panel | Duke Law School — October 2019
- Redistricting 2021 Seminar | University of Chicago Institute of Politics — May 2019
- Geography of Redistricting Conference Keynote | Harvard Center for Geographic Analysis — May 2019
- Political Analytics Conference | Harvard University — November 2018
- Cyber Security, Law, and Society Alliance | Boston University — September 2018
- Clough Center for the Study of Constitutional Democracy | Boston College — November 2017
- Tech/Law Colloquium Series | Cornell Tech — November 2017
- Constitution Day Lecture | Rockefeller Center for Public Policy, Dartmouth College — September 2017

Program Development

Principal Investigator MGGG Redistricting Lab mggg.org

Multidisciplinary research lab with postdocs, research staff, and undergraduate researchers drawn from mathematics, computer science, software development, geography, policy. Hosts law student externs. Provided public mapping support for roughly 140 localities after 2020 Census data released.

Support includes NSF Convergence Accelerator, Sloan Foundation, Thornburg Foundation, Arnold Foundation.

Co-Founder, Program Director Science, Technology, and Society Program sts.tufts.edu

Interdisciplinary program offering a major and minor, with ∼40 affiliated faculty. Runs popular weekly lunch seminar, Reading Labs on topics from Automation to Classification to Life to Energy.

Organizer

Semester Program in *Algorithms, Fairness, and Equity*, Fall 2023
Mathematical Sciences Research Institute, Berkeley CA

Program will host ∼50 research members on topics connected to mechanism design, fair partitioning, and fair ML.

Short workshops and training programs

- GeoData Bootcamp 2020 (2 weeks, 20 students from around the country)
- Mapping Training 2020 (1 week, 30 students from around the country)
- Graphs and Networks Workshop 2020 (1 day, 500 live participants)
- Data for Election Administration 2019, 2021 (multi-day, dozens of administrators and scholars)

Program Building Research and mentorship programs

- Voting Rights Data Institute 2018, 2019
  Six-week summer research programs hosting 52 and 33 undergraduate and graduate students, respectively, with dozens of visitors from math, CS, law, political science, geography, urban planning, and more.
- Polygonal Billiards Research Cluster 2017, Random Groups Research Cluster 2014
  Five-week intensive summer research programs for vertically integrated groups of 12-14 undergraduate, graduate, postdoctoral, and junior faculty researchers, combining experimental and theoretical work.
- Directed Reading Program and DRP Network sites.google.com/view/drp-network/
  Co-founded highly successful near-peer mentoring program in 2003 at UChicago. Now exists at >40 math departments as grad-student-run reading program with excellent outcomes for broadening participation in mathematics. Secured NSF grant to expand the program to more campuses and to fund social science research on outcomes.

Graduate Advising in Mathematics

Nate Fisher (PhD 2021), Sunrose Shrestha (PhD 2020), Ayla Sánchez (PhD 2017),
Kevin Buckles (PhD 2015), Mai Mansouri (MS 2014)

Outside committee member for Chris Coscia (PhD 2020), Dartmouth College

Postdoctoral Advising in Mathematics

Principal supervisor Thomas Weighill (2019–2020)

Co-supervisor Daryl DeFord (MIT 2018–2020), Rob Kropholler (2017–2020), Hao Liang (2013–2016)

Selected Professional Service and Public-Facing Work

Program committees and editorial boards

ACM Conference on Fairness, Accountability, and Computing (FAccT)	2022
Symposium on Foundations of Responsible Computing (FORC)	2021
Harvard Data Science Review	since 2019
Advances in Mathematics	since 2018

Committee on Science Policy 2020–2022
American Mathematical Society

Amicus Brief of Mathematicians, Law Professors, and Students 2019
principal co-authors: Guy-Uriel Charles and Moon Duchin

Supreme Court of the United States, in Rucho v. Common Cause - cited in dissent

Expert work for redistricting litigation 2018—
reports, deposition, and/or trial testimony

Wisconsin, North Carolina, Alabama, Pennsylvania, South Carolina, Texas, Georgia

Johnson v. Wis. Elections Comm'n, No. 2021AP1450-OA, 2022 WL 621082 (Wis. Mar. 3, 2022); *NC League of Conservation Voters, et al. v. Hall, et al.* No. 21-cvs-500085 (Wake Cnty. Sup. Ct. 2021); *Milligan, et al. v. Merrill, et al.*, Case No. 2:21-cv-01530-AMM and *Thomas, et al. v. Merrill, et al.*, Case No. 2:21-cv-01531-AMM (N.D. Ala. 2021); *Carter v. Chapman*, No. 7 MM 2022, 2022 WL 702894 (Pa. Mar. 9, 2022); *SC NAACP et al. v. Alexander, et al.*, Case No. 3-21-cv-03302-MBS-TJH-RMG (D.S.C.) (three-judge ct.); *TX NAACP et al. v. Abbott*, Case No. 1:21-CV-00943-RP-JES-JVB.

Presenter on Public Mapping, Statistical Modeling 2019, 2020
National Conference of State Legislatures

Committee on The Future of Voting: Accessible, Reliable, Verifiable Technology 2017–2018
National Academies of Science, Engineering, and Medicine

Committee on the Human Rights of Mathematicians 2016–2019
American Mathematical Society

Selected Visiting Positions and Residential Fellowships

Research Professor Analysis and Geometry of Random Spaces program — Spring 2022
Mathematical Sciences Research Institute | Berkeley, CA

Visiting Professor Department of Mathematics — Fall 2021
Boston College | Chestnut Hill, MA

Fellow Radcliffe Institute for Advanced Study — 2018–19
Harvard University | Cambridge, MA

Member Center of Mathematical Sciences and Applications — 2018–19
Harvard University | Cambridge, MA

Visitor Microsoft Research — 2018–19
MSR New England | Cambridge, MA

Research Member Geometric Group Theory program — Fall 2016
Mathematical Sciences Research Institute | Berkeley, CA

Research Member Random Walks and Asymptotic Geometry of Groups program — Spring 2014
Institut Henri Poincaré | Paris, France

Math of Social Choice

math 19 / sts 50

Website. sites.tufts.edu/socialchoice

Lectures. Asynchronous

Sections. Tuesdays 9:30–10:30am or 12:30–1:30pm

What's the class about? *Democracy!* A great idea, but how is it supposed to work? That is, how can we take the complicated preferences of a diverse society and fuse them into (a) representation, and (b) decisions? We'll develop some mathematics to help us understand what's hard — and sometimes impossible — about our goals for systems of social choice. But then we'll do something even more productive and use math to build a toolkit for finding our way to a more just democracy.

Assessment. Each week in section you'll start work on a worksheet. These won't be graded, but solutions will be provided. The following Tuesday at 9:30 sharp you need to sign on to take a quiz on the same material. There will be one midterm and one final exam, both synchronous. And your section will be responsible for a one-hour video as a final project.

quizzes 25% *final exam 15%*
midterm 25% *final project 25%*
engagement 10%

Tufts University
Spring 2021
Zoom Semester Redux

Exhibit
0005

course staff

Moon Duchin is a math professor whose training is in 18-dimensional geometry but whose obsession is "data for civil rights." She loves to think and write about history, philosophy, law, and feminist science studies. She runs the MGGG Redistricting Lab.

Tasia Gladkova is a masters student at Tufts studying Human Factors Engineering who trained with MGGG in Summer 2018. Recently she has tried (and failed) to take up running. She thinks a lot about the usability of data visualization and how we interpret information in the physical space.

Robert Hoover is a Tufts senior who loves volleyball and STS, but can be frequently spotted in the physics department. He enjoys leading hands-on STEM education classes and thinking about how people get numbers out of real things.

Bhushan Suwal is a Tufts alum who works on computational projects at the Redistricting Lab, where he thinks about districting plans on a daily basis. He enjoys biking, reading history of science, and thinking about algorithmic fairness. He is originally from Nepal and his interest in technological equity has an international lens.

Heather Newman is a PhD student studying a mash-up of math and computer science at Carnegie Mellon. She found her interests in math and politics/law working with MGGG in Summer 2018. Outside of math, she is a passionate word-lover who likes to read all things linguistics and an advocate for women in STEM and educational equity.

Talia Blum literally just graduated from MIT yesterday, where she studied math and did her best to trick the engineers into thinking she was one of them. She has done organizing work around diversity and inclusion in STEM. Her visual art projects have played with color through egg murals, sodium light, and teabag dresses.

Book. For the first part of the course, we will follow Christoph Börgers's book *Mathematics of Social Choice*, which was written for this class! The book is available free through **tischlibrary.tufts.edu**. For the second half of the semester, we'll rely on worksheets and other materials but no textbook.

Sections. The synchronous component of this course happens in four groups of 20 students each. We have amazing section leaders! Attendance is required and the expectation is that you get to know your section well. Your final project is done as a group.

Each section will have a loose theme. Themes include computation, STS, international, and civil rights/law.

Midterm, final exam, final project. There's a midterm (more of an extended quiz) in our class slot on March 23. There's a short synchronous final exam in our exam block (Wed May 12 at noon Eastern). Finally, each section is responsible for producing a 60-minute final video project developing ideas from your section theme. It's due at the final exam.

Teaching philosophy. Zoom learning is hard! So this course is optimized to help you get the most out of the class. We'll have tons of different ways to interact:

- Slack
- watch parties
- guest speakers
- office hours

The goal is to build an effective learning community. But also your participation in these will figure into your "engagement" grade for the course.

Flexibility. In a course of this size, there's absolutely no way to do make-up quizzes or exams. Having said that, we absolutely know what a crazy and challenging time this is on many levels and we're doing to do our best to make this class as meaningful and flexible as we can. This may involve oral exams or make-up work of other kinds.

Learning objectives. From math: basic understanding of higher math; written communication; research skills; problem solving skills. From other disciplines: the ability to examine social structures analytically and critically; how political, economic and social systems shape crucial public domains; the skills to analyze systematic biases in neutral-seeming algorithms and political processes.

Community norms. You'll be held to high standards of repsectful communication—please be thoughtful, generous, and open-minded!

You will also be held to high standards of academic and personal integrity. There are many, many ways to get support and collaboration, but your work must be your own.

Use your zoom name to show us how you'd like to be named (and tell us your pronouns if you wanna). Please don't hesitate to let us know whether we're living up to our goals of an inclusive and welcoming virtual classroom.

Outside resources. There are lots of resources around the university, especially for **counseling and mental health** and **tutoring or learning accommodations**.

and don't forget...

Elections matter!

2019 Papers and Links

Censuses, enumeration, classification

Nancy Krieger, Politics, Public Health, and the Census

Bowker and Star, from *Sorting Things Out*

- To Classify is Human
- The Case of Race Classification and Reclassification under Apartheid

B.R. Ambedkar, From Millions to Fractions (on counting Untouchables)

Legal overview of actual redistricting practices

Realist's Guide to Redistricting

Exhibit
0006

Partisan metrics

Bernstein and Duchin, A Formula Goes to Court: Partisan Gerrymandering and the Efficiency Gap

Katz, King, and Rosenblatt, (the case for partisan symmetry)

Political philosophy

Dahl, On Democracy, Ch 8, What Political Institutions Does Large-Scale Democracy Require?

Political science methods

Nancy Hite-Rubin, How financial modernization disrupts patronage

and NHR, Field Experiments to Identify "Invisible People"

Ecological inference

King, Rosen, Tanner, (Adding MCMC to King's EI)

Communities of Interest

Mac Donald and Cain, Community of Interest Methodology and Public Testimony

Fishkin, "Deliberative Polling and Public Opinion"

Gardner, "Representation without Party" (see esp. footnotes on p58 of PDF for case law) and Political Community

several by Stephanopoulos: California, Spatial Territory, Community

Antioch, CA's "What is a COI?" info page (plus see sidebar for their collection link) and another sample draft COI collection form

Levine, "The Paradox of Community Power"

Rodríguez-Muñiz, "Cultivating Consent"

Young, "Social Groups and Judgments of Injustice"

Massey, "Questions of Locality"

Harris & Weiner, "Empowerment, Marginalization, and 'Community-integrated' GIS"

Examples of community structure of districts being described after the fact:

- California (see district descriptions starting on p28)
- Pennsylvania governor's map (courtesy of wayback machine)

Districting Criteria

Cain and Mac Donald, The Implications of Nesting in CA Redistricting

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The Realist's Guide to Redistricting

Avoiding the Legal Pitfalls

SECOND EDITION

J. Gerald Hebert, Paul M. Smith,
Martina E. Vandenberg and Michael B. DeSanctis

Defending Liberty
Pursuing Justice

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0007

Defending Liberty
Pursuing Justice

Section of Administrative Law and Regulatory Practice

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ABA Defending Liberty Pursuing Justice
Section of Administrative Law and Regulatory Practice

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Contents

Foreword ..... **vii**

Preface ..... **ix**

Acknowledgments ..... **xiii**

About the Authors ..... **xv**

Chapter 1
Population Equality **1**
A. Measures of Population (In)Equality 1
B. Congressional Districts 4
1. The *Karcher v. Daggett* "Two Step" 4
2. Justifying Deviations in a Congressional Plan 5
3. How Large a Deviation Will a Court Actually Approve? 6
4. Even the Smallest Deviations Must Be Justified 8
C. State and Local Districts 9
1. The "Ten-Percent Rule" 10
2. Justifying Deviations Above Ten Percent 10
3. Justifying Deviations Below Ten Percent 13
D. Who Is Counted 14

Chapter 2
The Constitutional Limits on Political (or Partisan) Gerrymandering **17**

Chapter 3
Section 5 of the Voting Rights Act **21**
A. The Enactment of Section 5 22
B. Preclearance Procedures 25
C. The "Effects Prong" 25
D. The "Purpose Prong" 28

E. The Continuing Constitutionality of Section 5 29
F. Bailout 30
G . The Relationship Between Section 5 and Section 2 ...31

Chapter 4
Section 2 of the Voting Rights Act 33
A. Establishing a Section 2 Claim: The Four Prongs of *Gingles* and *De Grandy* 34
B. The First Prong of the *Gingles* Test 38
1. Numerosity 38
a. The Denominator: What Is the Proper Population Base? 38
b. The Numerator: When Is the Minority Group "Sufficiently Large"? 41
2. Compactness 43
C. The Second and Third Prongs: Racially Polarized Voting 45
1. Statistical Methods for Identifying Racially Polarized Voting 45
2. What Is "Minority Political Cohesiveness"? 48
3. What Evidence Does a Court Use to Determine Racial Polarization? 50
a. How Does One Determine the Minority-Preferred Candidate? 50
b. Should One Look at Results from "Exogenous" Elections? 54
c. How Many Elections Should Be Analyzed? ..55
4. What Constitutes "Legally Significant" Racially Polarized Voting? 56
a. Are the Reasons for Racial Polarization Relevant? 57
b. What Degree of Racial Bloc Voting Is Legally Significant? 58
D. The "Fourth Prong": Proportionality 59

Chapter 5
The Constitutional Limits on Racial Gerrymandering 63
A . How A Court Determines That Race Was a Factor in Districting 64

1. District Shape and Demographics 65
2. Statements by Legislators and Their Staff 68
3. The Nature of Reapportionment Data 70
B. Traditional Districting Principles and Political Considerations 72
1. Compactness 73
2. Contiguity 74
3. Respect for Political Subdivisions 75
4. Respect for Communities of Interest 76
5. Protection of Incumbents 77
6. Pursuit of Partisan Advantage 78
7. State-Specific Principles and Other Race-Neutral Redistricting Principles 78
C. Other Ways to Justify the Use of Race in Districting ...79

Index 83

Foreword

In *Reynolds v. Sims, 377* U.S. 533 (1964), the Supreme Court declared that one person, one vote was the requisite basis for equality in the voting process. In the long electoral history of the United States, severe population disparities in the electoral districts appear to be the norm, not the exception. The decision in *Reynolds* intended to ensure that majoritarian principles would be the primary factor in a state's process of drawing electoral district lines. The decision in *Reynolds,* and in a series of cases exploring issues of voter representation (*see, e.g., Westbury v. Sanders,* 376 U.S. 1 (1964), and *Baker v. Carr,* 369 U.S. 186 (1962)), sought to determine what constituted "fair and effective representation." Though in principle redistricting is intended to protect every citizen's fundamental right to participate in democracy, it is procedurally subject to one of the most political and unpredictable components of our democracy—buffeted by prevailing partisan winds, caprices of state legislators, and a host of complex and evolving issues. This intersection of a fundamental right and political district drawing determines where political party candidates run, who gets to elect them, and thus, who controls state legislative and even congressional seats. Among one of the most controversial issues is to guarantee that historically disenfranchised groups have the right to an effective vote under the Voting Rights Act, 42 U.S.C. § 1971 (2009).

The redistricting process has been the grist of numerous Supreme Court cases addressing questions of population equality, constitutional limits to political gerrymandering, enforcement of Sections 2 and 5 of the Voting Rights Act, and the constitutional parameters to the creation of minority–majority districts. To say the least, the law of redistricting is complex, inconsistent and fact-intensive.

The *Realist's Guide to Redistricting* is a practical handbook about the recondite world of redistricting written by seasoned experts in the field. It is a manual invaluable for practitioners, legislators and citizens who seek to understand the seemingly inscrutable mechanisms that de-

termine the composition of the districts that elect our representatives. The *Realist's Guide* provides the fundamentals of redistricting law and identifies the internal conflicts which make the process so challenging.

The *Realist's Guide* also shows the breadth of administrative law for which the American Bar Association's Section of Administrative Law and Regulatory Practice plays a major role. Administrative law touches all parts of modern life. As Professor Duffy declared, it is about "power, politics, personalities and revolutions in legal thought." (John F. Duffy, "Administrative Common Law in Judicial Review," 77 Texas. L. Rev. 113, 213 (1998).) Redistricting involves everything Professor Duffy describes as administrative law. The Section is proud to be able to publish this second edition of the *Realist's Guide* in time for the 2010 Census and associated redistricting cycle.

John Hardin (Jack) Young
Adjunct Professor, Comparative Election Law
College of William & Mary School of Law
American Bar Association, Board of Governors

Preface

This is *not* the definitive legal guide to redistricting after the 2010 census. That guide cannot yet be written—at least not without a crystal ball. Some of the most important legal issues that will affect the redistricting process have not been decided by the Supreme Court. In the meantime, the lower courts are "all over the map." Moreover, even those questions that have been decided by the Supreme Court hinge on the vote of a single justice. Today's majority opinion could easily become tomorrow's dissent.

Rather than trying to pretend to be definitive, we offer the *realist's* guide to redistricting.

The realist understands that the very foundations of redistricting law have been shaken to their core in the last couple of decades—both because of deep divisions in the U.S. Supreme Court and because of a lack of consensus among the lower courts about how to balance the delicate issues of race, party, and politics.

The realist understands that arguments that prevail in court, or in one state, or under one set of circumstances, may fall flat when mechanically replicated elsewhere.

The realist understands that a state that zealously seeks to comply with any one of the laws that constrain redistricting—whether it be "one-person, one-vote," the Voting Rights Act, or the "*Shaw* doctrine"—may inadvertently subject itself to liability under another of those laws.

And perhaps, above all, the realist understands that states simply cannot draw districting plans that will go unchallenged in the courts. The best that realistically can be hoped for is to draw plans that will not be *successfully* challenged. At a time when Democrats and Republicans are polarized and—despite the election of the first African-American president in U.S. history—the politics of race and ethnicity remain contentious, the stakes in redistricting are simply too high to avoid litigation altogether. The only realistic goal for a state is to win. And

the only alternative to winning is to replace the traditional, once-a-decade redistricting process with a ten-year-long series of skirmishes, each resulting in yet another set of newly reconfigured districts. No one profits from such instability, least of all the voters who will be thrown into a new district before they even get to know the representative of their former district.

This realist's guide, then, is designed to warn the reader of the legal pitfalls that surely lie ahead. States must understand and fully respect each of the legal constraints described in this guide—the "one-person, one-vote" standard, Sections 2 and 5 of the Voting Rights Act, and the constitutional limits on racial and partisan gerrymandering that flow from the Equal Protection Clause of the Fourteenth Amendment. These constraints are invariably in tension with each other—and often with the redistricters' political and partisan goals. A district drawn to satisfy one requirement may violate another. The challenge lies in finding a way to satisfy all these requirements simultaneously. This guide, we hope, will serve as a useful first step.

As should be obvious from the relative brevity of this guide, it is not intended to be a comprehensive treatise on the law of redistricting. We have written this guide to acquaint our readers with the fundamentals of redistricting law—and to identify some of the internal conflicts that make redistricting such a difficult enterprise.

The legal guidelines for proper redistricting have long varied from state to state and from federal court to federal court and, nowadays, they seem to vary from month to month. Only the timely advice of experienced counsel can be relied upon to navigate these ever-changing waters.

Every statewide redistricting plan—whether for Congress or for either house of the state legislature—may be challenged in a three-judge federal district court, with a right to appeal directly to the United States Supreme Court. By statute, the Supreme Court is required to decide these cases, but often it rules on them "summarily," that is, without full briefing or oral argument and often without issuing any written opinion explaining its ruling. Because these summary decisions have limited precedential value, and because the Supreme Court plays such a pivotal role in so many redistricting cases, this field of law is unique. Thus, redistricting counsel must possess not only a realistic understanding of *current* law, but also a nuanced feel for the coming *trends* in the Supreme Court, where shifting majorities and fragile alliances are the norm.

This guide, of course, is by no means intended to present fully such a nuanced, specialized view. It simply is designed to highlight a few of the problems and questions that will face states as they prepare for the post-2010 round of redistricting. We hope you find it helpful.

J. Gerald Hebert
Law Offices of J. Gerald Hebert
Alexandria, Virginia

Paul M. Smith
Michael B. DeSanctis
Martina E. Vandenberg
Jenner & Block LLP
Washington, D.C.

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About the Authors

J. Gerald Hebert, a sole practitioner in Alexandria, Virginia, specializes in election law and the Voting Rights Act. Gerry spent more than 20 years in the U.S. Department of Justice, where he served in many supervisory capacities, including Acting chief, deputy chief, and special litigation counsel in the Voting Section of the Civil Rights Division. He has taught courses on election law at Georgetown University Law Center, the University of Virginia Law School, and the Washington College of Law at American University. Gerry has authored a number of articles on voting rights and redistricting. From 1999 through 2002, Gerry served as general counsel to IMPAC 2000, the national Democratic Party's congressional redistricting project.

Paul M. Smith, a partner in Jenner & Block LLP's Washington, D.C., office, chairs the firm's Appellate and Supreme Court Practice and co-chairs the Election Law and Redistricting Practice. Paul has argued 13 cases before the Supreme Court, including *Crawford v. Marion County Election Board* (2008), the Indiana voter ID case, and two Congressional redistricting cases, *LULAC v. Perry* (2006) and *Vieth v. Jubelirer* (2003). For nearly two decades, Paul has represented clients in trial and appellate cases involving congressional redistricting and voting rights. Paul graduated from Yale Law School, where he served as editor-in-chief of the *Yale Law Journal*. He clerked for Judge James L. Oakes of the U.S. Court of Appeals for the Second Circuit and for Justice Lewis F. Powell, Jr. of the Supreme Court. He served as a member of the Board of Governors of the District of Columbia Bar and was recognized in the 2007, 2008, and 2009 editions of Washington D.C. *Super Lawyers for Appellate Law* and as one of the Top 100 Lawyers in D.C.

Michael B. DeSanctis is managing partner of Jenner & Block LLP's Washington, D.C., office. He is co-chair of the firm's Election Law and Redistricting Practice, and is a member of the firm's Litigation Department and Creative Content Practice Group. Michael litigated numerous redistricting cases in the 2000 cycle, and has been centrally involved in election law and voting rights cases in the 2004 and 2008 congressional and presidential election cycles. He also maintains an active commercial litigation and copyright practice. His work has extended to the U.S. Su-

preme Court, the U.S. Courts of Appeals for the District of Columbia, Third, Fourth, Sixth, Eighth, Ninth, and Eleventh Circuits, as well as federal district courts and state courts across the country. In July 2009, Michael was recognized by *The National Law Journal* in its "40 Under 40: Washington's Rising Stars," feature on Washington D.C.'s top lawyers under 40. Michael received his J.D. cum laude from New York University School of Law and his B.A. summa cum laude from Boston College.

Martina E. Vandenberg, a partner in Jenner & Block LLP's Washington, D.C., office, is a member of the Complex Commercial Litigation Practice Group, the Media and First Amendment Practice Group, and the Election Law and Redistricting Practice Group. Martina has represented clients in litigation challenging federal statutes and regulations on First Amendment grounds. She maintains an active commercial litigation practice. Prior to joining the firm, Martina worked at Human Rights Watch, where she conducted policy advocacy and research on war crimes in the Balkans. Martina, a Truman and Rhodes Scholar, was honored with the Albert E. Jenner, Jr. Pro Bono Award for her work representing human trafficking victims and for her legislative advocacy efforts to combat human trafficking. Martina graduated from Columbia Law School, where she was a Harlan Fiske Stone Scholar, and has served as an adjunct faculty member at American University.

CHAPTER 1

Population Equality

Perhaps the most fundamental requirement the law imposes on redistricters is "population equality," also known as the "one-person, one-vote" standard. This principle is captured by the saying "equal representation for equal numbers of people."[1] In practical terms, population equality means that each district in an apportionment plan should have roughly, if not precisely, the same number of people as every other district. There are two different legal standards for determining whether this principle has been satisfied. A rather strict standard, allowing for only the smallest variance among districts, governs congressional redistricting. A considerably looser standard governs all other state and local election districts.

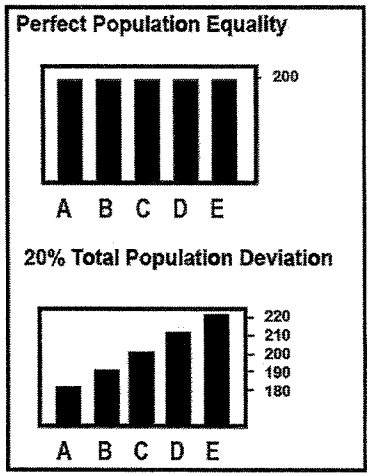
A. MEASURES OF POPULATION (IN)EQUALITY

Before delving into the legal questions, it is important to define two standard measures of population equality. The most widely used measure—the difference between the populations of the most heavily, and the least heavily, populated districts—is called the "overall population deviation" or "total population deviation." Often, this measure is expressed as a percentage of the ideal (or average) population of a district. For example, assume there is a state with 1,000 people and five districts (A, B, C, D, and E). Perfect population equality would result if each of the five districts contained exactly 200 people. The overall or total population deviation would then be zero. But if the redistricting

1. Karcher v. Daggett, 462 U.S. 725, 730 (1983) (quoting Wesberry v. Sanders, 376 U.S. 1, 18 (1964)).

plan were altered so that the five districts contained 180, 190, 200, 210, and 220 people, respectively, the deviation would then become quite substantial. The most heavily populated district (District E) would have 220 people, and the least heavily populated (District A) would have 180 people, so the overall population deviation would be 40 people (220 minus 180). Or, expressed as a percentage of the ideal population of a district, the overall or total population deviation would be 20 percent (40 divided by 200).

A second measure of population inequality is "average population deviation," the average of each district's deviation from the ideal. In the above example, District C contained the ideal population (200 people), Districts B and D each differed from the ideal population by 10 persons (190 people or 210 people, respectively), and Districts A and E each differed from the ideal by 20 persons (180 people or 220 people, respectively). Thus, the average deviation would be 12 (the average of 0, 10, 10, 20, and 20), which also can be expressed as 6 percent of the ideal population (12 divided by 200). Courts most often use total population deviation as the yardstick for determining when a deviation is too high to be constitutionally acceptable, but average deviation is sometimes considered as well.



The most common measure of population equality is called "total population deviation" or "overall population deviation."

States engaged in congressional or state-legislative redistricting have ordinarily used the population figures generated by the federal decennial census. In anticipation of the 2000 census, the Census Bureau planned to use forms of the statistical method known as "sampling" to adjust for the chronic problem of differentially "undercounting" certain identifiable groups of individuals, including certain racial and language minority groups, children, and renters.[2] In 1999, the Supreme Court held that the

2. *See* Dep't. of Commerce v. U.S. House of Representatives, 525 U.S. 316, 320, 322 (1999).

Census Act prohibited the Bureau's proposed uses of sampling in calculating the "'population for purposes of apportionment of Representatives in Congress among the several States.'"[3] Thus, sampling could not be used in 2000 to determine the size of each state's congressional delegation.[4] But the Court left open the possibility of the use of sampling "for purposes other than apportionment [of congressional seats among the 50 States,] . . . if 'feasible.'"[5]

When the apportionment counts from the 2000 census were delivered to the states, however, the Census Bureau recommended against the use of adjusted data (data drawn from sampling) for redistricting, citing concerns regarding their accuracy.[6] The Secretary of Commerce adopted the recommendation and determined that unadjusted data would be released as the official redistricting data. In October 2001, the Census Bureau director rejected the use of adjusted data even for non-redistricting purposes.[7] Sampling also is not expected to be used in the 2010 census.

The Census Bureau has now separated the tasks of counting residents for apportionment and redistricting purposes from that of collecting detailed socioeconomic information for resource allocation purposes.[8] In 2010, the decennial census will count residents, as well as ask for name, sex, age, date of birth, race, ethnicity, relationship, and housing tenure,[9] while the more detailed information will be collected through a yearly rotation of sampling conducted by the American Community Survey.[10]

3. *Id.* at 334, 339–40, 342–43 (quoting 13 U.S.C. § 195).

4. The Census Bureau did use a technique referred to as "hot-deck imputation" to fill in gaps in its information and resolve conflicts in its data. The Supreme Court held in *Utah v. Evans* that this method of supplementing census data did not constitute "sampling" and did not violate the Census Clause. 536 U.S. 452 (2002).

5. Dep't of Commerce, 525 U.S. 316, 339, 341 (quoting 13 U.S.C. § 195).

6. U.S. Census Bureau, History, http://www.census.gov/history/www/through_the_decades/overview/2000.html (last visited Oct. 5, 2009).

7. *Id.*

8. U.S. Census Bureau, Census 2010, http://www.census.gov/acs/www/Special/Alerts/Latest.htm (last visited Oct. 6, 2009).

9. *Id.*

10. *Id.*; U.S. Census Bureau, American Community Survey, http://www.census.gov/acs/www/SBasics/ (last visited Oct. 5, 2009).

B. CONGRESSIONAL DISTRICTS

Section 2 of Article I of the U.S. Constitution, which governs population equality for congressional districts, provides: "The House of Representatives shall be composed of Members chosen every second Year by the People of the several States. . . . Representatives . . . shall be apportioned among the several States . . . according to their respective numbers."[11] The Supreme Court has interpreted this clause to mean that only a very small amount of deviation is acceptable within a state's congressional districting plan.

1. The *Karcher v. Daggett* "Two Step"

The leading case on population equality of congressional districts is *Karcher v. Daggett*.[12] Under *Karcher*, two basic questions must be answered to determine whether a congressional districting plan complies with Article I, Section 2 of the Constitution:

- *First*: Could the population differences among the districts have been reduced or eliminated altogether by a good-faith effort to draw districts of equal population?
- *Second*: If the state did *not* make a good-faith effort to achieve equality, can the state prove that each significant variance among the districts was necessary to achieve some legitimate goal?[13]

As to the first question, a state making a good-faith effort can usually draw congressional districts with virtually no deviations at all. For example, in the 2000s, most states drew plans in which the total deviation was less than 100 people—less than one-fiftieth of 1 percent of the population of an average, or ideal, district.[14] Thirteen states drew plans in which the population of the largest district exceeded that of the smallest district by just *one person*.[15] For example, in North Carolina, 12 districts each had a population of 619,178, and one district had a population of 619,177.[16]

11. U.S. Const. art. I, § 2.
12. 462 U.S. 725 (1983).
13. *Id.* at 730–31.
14. National Conference of State Legislatures, Redistricting 2000 Population Deviation Table, http://www.ncsl.org/LegislaturesElections/Redistricting/RedistrictingPopulationDeviation2000/tabid/16636/Default (last visited Sept. 17, 2009).
15. *Id.*

Thus, one way to avoid any possible constitutional question on the "one-person, one-vote" front is to draw districts with the minimum possible deviation.[17] However, it is not absolutely necessary to do so.

2. Justifying Deviations in a Congressional Plan

Under the second of *Karcher*'s two steps, a state also has the option of enacting a congressional plan with a larger total population deviation, but it must be prepared to prove that *each* significant variance between districts was necessary to achieve some legitimate goal. For example, a state with seven districts could draw five districts containing precisely the ideal number of residents, one district with a significantly higher population, and another district with a significantly lower population—*if* it could prove that the deviations in the latter two districts were directly caused by an effort to achieve some legitimate goal.

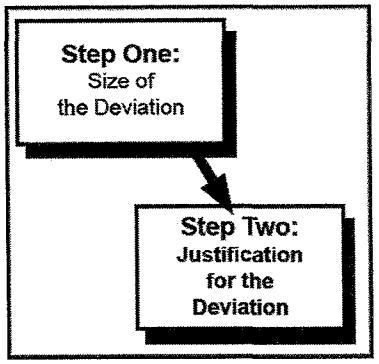
That raises the question, Which redistricting goals are considered "legitimate" and therefore capable of justifying a deviation? As long as a state *consistently applies* a legislative policy without discrimination, the following policies *may* justify some variance:

- making districts compact;
- respecting municipal boundaries;
- respecting county boundaries *if* the counties are small enough to represent communities of interest;
- respecting precinct boundaries;
- preserving the cores of prior districts; and
- avoiding contests between incumbents.[18]

16. General Assembly of North Carolina, Congress Zero Deviation, http://www.nega.state.nc.us/GIS/RandR07/Home.html (follow "Congressional" hyperlink; then follow PDF hyperlink for "Ideal versus Actual Populations") (last visited on Oct. 5, 2009).
17. *See, e.g.*, Vieth v. Pennsylvania, 195 F. Supp. 2d 672 (M.D. Pa. 2002) (*Vieth II*), discussed *infra*; *but cf.* Duckworth v. State Bd. of Elections, 213 F. Supp. 2d 543, 551 (D. Md. 2002) (finding a population variance of two persons to be the smallest possible given "the dictates of arithmetic," the limitations of available Census data, and the requirements of the redistricting process), *aff'd*, 332 F.3d 769 (4th Cir. 2003).
18. Karcher, 462 U.S. 725, 740; Abrams v. Johnson, 521 U.S. 74, 98–100 (1997). In *League of United Latin American Citizens v. Perry*, the Supreme Court called into question the legitimacy of incumbency protection as a justification for redistricting decisions in the context of section 2 of the Voting Rights Act. The Court found that a policy of incumbency protection for the

To defend successfully against a population inequality charge, the state must justify its plan by specifically relating *each* overpopulated or underpopulated district to one of those legitimate state policies. In deciding whether a state has succeeded in justifying the deviation, courts weigh several different factors:

- the size of the deviation;
- the importance of the state's interests;
- the consistency with which the plan reflects those interests overall; and
- the possibility that alternative plans can protect those interests while still maintaining population equality.[19]



The Karcher *"two step" requires states to justify any deviation from perfect population equality in congressional redistricting.*

If the state cannot provide a legitimate justification and specifically relate that justification to *each* overpopulated or underpopulated district, then the apportionment plan probably will be found unconstitutional. That was the case in *Karcher*, where a congressional plan with a total deviation of less than 1 percent (0.6984 percent, to be exact) was not justified by a consistently applied legislative policy.[20]

3. How Large a Deviation Will a Court Actually Approve?

As with so many redistricting issues, it is hazardous to speculate precisely which deviations will be acceptable to the courts and which will be struck down. Significantly, none of the 50 states currently has a congressional districting plan with a total population deviation above 1 percent.[21] But courts have upheld population deviations reaching toward 1 percent in the past, provided the state policies underlying each individual deviation are both legitimate and sufficiently related to the deviation.[22] Nonetheless, only one state currently has a total population deviation above 0.5 percent.[23]

While a state must consistently apply a legislative policy without discrimination, these policies may not be consistently applied or accepted by district courts in different states. The constitutionality of each population deviation must be decided on a case-by-case basis. In its 1997 decision in *Abrams v. Johnson*, the Supreme Court upheld Georgia's congressional districting plan, which had a total deviation of 0.35 percent,[24] in part because the challenged plan's deviations were justified by three legitimate state policies: avoiding split precincts; maintaining communities of interest by not splitting certain counties; and maintaining the cores of prior districts.[25]

The *Abrams* Court expressly reaffirmed, however, that some population variances may be unconstitutional even if they "'necessarily result[ed] from a State's attempt to avoid fragmenting political subdivisions by drawing congressional district lines along existing county, municipal, or other political subdivision boundaries.'"[26] Thus, building congressional districts with whole, undivided counties may justify an otherwise unconstitutional deviation in one plan, or in one state, but not in another. It would be a mistake simply to assume that respect for county lines would *always* prevent a court from invalidating a congressional plan with a high population deviation.[27]

benefit of officeholders could not justify line-drawing that diminished the voting power of Texas's Latino population. 548 U.S. 399, 441–42 (2006).

19. *See* Karcher, 462 U.S. 725, 741.

20. *Id.* at 728, 742.

21. National Conference of State Legislatures, *supra* note 14.

22. *See, e.g.*, Vera v. Bush, 933 F. Supp. 1341, 1348 & n.9 (S.D. Tex. 1996) (three-judge court); Vera v. Bush, 980 F. Supp. 251, 253 (S.D. Tex. 1997) (three-judge court).

23. Idaho has a total population deviation of 0.60%, with the next-largest deviation reaching only 0.39% in Massachusetts. National Conference of State Legislatures, *supra* note 14.

24. 521 U.S. 74, 99 (1997).

25. *Id.* at 99–100.

26. *Id.* at 99 (quoting Kirkpatrick v. Preisler, 394 U.S. 526, 533–34 (1969)).

27. For example, in 1992 a federal court in Kansas rejected a plan with a total deviation of 0.94% that had been justified only by the goal of retaining the integrity of county lines. State *ex rel.* Stephan v. Graves, 796 F. Supp. 468, 471–73 (D. Kan. 1992) (three-judge court).

4. Even the Smallest Deviations Must Be Justified

The state's burden in justifying a population deviation is proportional to the magnitude of the deviation; the greater a state's total deviation, the more compelling the justification must be.[28] States with extremely small deviations still may be required to provide legitimate state policies as justification for any deviation. In 2002, for example, a Kansas congressional districting plan with a total population deviation of 33 persons—equaling 0.0049 percent—survived scrutiny under the "as nearly as practicable" standard by showing the plan's effectiveness in serving the state legislature's legitimate interests: avoiding split counties or voting districts; not diluting minority voting strength; maintaining communities of interest; and prioritizing contiguity and compactness.[29] The court also found it significant that the challenging parties had failed to present a substantially superior plan, though it noted that its province was not "to judge whether the legislature's redistricting choices achieve[d] the *best* possible solution," but rather to determine whether they were "*sufficient* to justify [the] deviation."[30]

In a more straightforward case, a district court in Mississippi found an apportionment plan with a total population deviation of 10 persons (a 0.0014 percent deviation) to "comply fully with the Supreme Court's requirements" as a good-faith effort to achieve perfect population distribution.[31] The court pointed out that in order to achieve absolute perfection, the plan would have had to split precincts, which "would cause administrative problems for election officials and confusion and frustration for voters."[32]

But plans with such small population deviations do not always survive court review. In 2002, a three-judge federal district court in Pennsylvania rejected a congressional districting plan that had a total population deviation of just 19 persons, or 0.0029 percent.[33] The court reasoned that because the Supreme Court "squarely rejected" any *de minimis* exception to the absolute population equality requirement under *Karcher*, and because plaintiffs proved a lack of good faith by defendants to avoid the deviation, the variation evidenced a *prima facie* violation of the one person-one vote command.[34] As such, the burden shifted to the state to provide justification for the deviation.

28. Vieth II, 195 F. Supp. 2d 672, 677 (three-judge court).
29. Graham v. Thornburgh, 207 F. Supp. 2d 1280, 1295 (D. Kan. 2002) (three-judge court).
30. *Id.* at 1295–97 (emphasis added).
31. Smith v. Clark, 189 F. Supp. 2d 529, 539 (S.D. Miss. 2002) (three-judge court).
32. *Id.* at 539 n.5.
33. Vieth II, 195 F. Supp. 2d 672 (three-judge court).

The panel held that the defendants failed to provide any legitimate justification for the population deviations.[35] Even with such a minor deviation, the court found that the justification provided by the defendants—a desire to avoid splitting voting precincts—was a legitimate state interest, but in this case was "a mere pretext."[36] The court further found that the challenged plan failed under *Karcher*'s neutral criteria. Compared with the other maps presented during trial, the challenged plan had the least compact districts, split the most counties, and pitted more incumbents than necessary against one another.[37]

State	Deviation	Decision
Kansas	33 persons	Plan Justified - OK
Pennsylvania	19 persons	Lack of Good Faith; Plan Not Justified - Not OK
Mississippi	10 persons	Good Faith Effort - OK
Maryland	2 persons	Smallest Possible - OK

C. STATE AND LOCAL DISTRICTS

Because Article I, Section 2 of the U.S. Constitution concerns Congress, it is relevant only to congressional redistricting plans. But state legislative districts (and other electoral districts, as well) are also subject to "one-person, one-vote" requirements flowing from the Equal Protection Clause of the Fourteenth Amendment to the Constitution. That clause provides that "[n]o State shall . . . deny to any person within its jurisdiction the equal protection of the laws." In the legislative redistricting context, the Supreme Court has interpreted the clause as requiring states to

34. Vieth v. Pennsylvania, 188 F. Supp. 2d 532, 542 (M.D. Pa. 2002) (three-judge court) (Vieth I).
35. Vieth II, 195 F. Supp. 2d 672, 677–78.
36. *Id.* at 677.
37. *Id.* at 678.

make "an honest and good faith effort" to create population equality among districts.[38]

1. The "Ten-Percent Rule"

Even though the words used are similar to *Karcher*'s strict congressional standard, the standard for state legislative districts is far more flexible. A total population deviation of 10 percent or less entitles the state to a rebuttable presumption that the plan was the result of an "honest and good faith effort" to reach population equality among districts.[39] In contrast, a state apportionment plan with a total population deviation above 10 percent creates a *prima facie* case of discrimination, shifting the burden to the state to justify the deviation.[40] Thus, for a hypothetical state with 1,000 residents and five districts, any plan with a total population deviation of 20 persons or less (10 percent of 200) would be presumptively constitutional. But if the total population deviation exceeded 20 persons, the state would be required to justify the variance.

2. Justifying Deviations Above Ten Percent

Apportionment plans for state and local districts are thus given much more leeway than plans for congressional districts. In addition, it may be easier to justify state and local districts with deviations above 10 percent than it is to justify even the most minimal deviation in a congressional districting plan. For example, there is no doubt that preserving political subdivisions is a sufficient justification for deviations in a state or legislative districting plan. On the same day the Supreme Court decided *Karcher*, it also decided *Brown v. Thompson*, upholding a state legislative plan with an average deviation of 16 percent and a total deviation of 89 percent. *Brown* unquestionably marked the outer limits of what might be acceptable in state redistricting plans, and is probably unique because Wyoming's constitution mandates that every county be separately represented in the legislature.[41] The Court upheld the plan because it resulted from a longstanding and consistent application of that legitimate state

38. Brown v. Thomson, 462 U.S. 835, 842 (1983) (quotation marks omitted).
39. Daly v. Hunt, 93 F.3d 1212, 1220 (4th Cir. 1996) (quotation marks omitted).
40. Larios v. Cox, 300 F. Supp. 2d 1320, 1339–40 (N.D. Ga. 2004) (three-judge court), *summarily aff'd*, 542 U.S. 947 (2004).
41. Wyo. Const. art. 3, § 49.

policy. However, the Court also noted that providing every political subdivision with a representative would not *always* save an otherwise unacceptable deviation from being struck down.[42] Wyoming's long-standing constitutional policy and its unique geography and demography persuaded the *Brown* Court to uphold the plan, notwithstanding its 89 percent total deviation.[43]

The same rationale, however, was unsuccessful in the litigation over the redistricting plan that followed the 1990 census. Reappraising Wyoming's redistricting plan, which used the same justification the Supreme Court had upheld in *Brown*, the district court found that total deviations of 83 percent in the House plan and 58 percent in the Senate plan were unconstitutionally large.[44] The court stated that Wyoming's state constitutional requirement of county preservation could not be elevated to such an extreme extent over the "one-person, one-vote" requirement of the U.S. Constitution. Instead, the court accepted a revised plan with less than 10 percent deviation for each house.[45] Wyoming again managed to keep the total population deviations of both its House and Senate plans below 10 percent following the 2000 census.

Total Deviation < 10%
Generally, no justification required

Total Deviation > 10%
Justification always required

Apportionment plans for state and local districts also require an "honest and good faith effort" to create population equality across districts. But the standard is far less strict.

As the Wyoming cases suggest, it is crucial to keep in mind not only the federal constitutional requirement of population equality but also state constitutional and statutory districting guidelines. A federal district court in Wisconsin, for example, noted that although it would not always be possible to avoid the division of counties, the prerogatives of the Wisconsin constitution to keep wards and municipalities

42. Brown, 462 U.S. 835, 845–46 & n.7.
43. *Id.* at 844–45.
44. Gorin v. Karpan, 775 F. Supp. 1430 (D. Wyo. 1991) (three-judge court).
45. Gorin v. Karpan, 788 F. Supp. 1199 (D. Wyo. 1992) (three-judge court).

whole should be respected when possible.[46] Likewise, the Idaho Supreme Court scrutinized the 2002 state apportionment plan for compliance with the Idaho Constitution, Article III, Section 5, which prohibits the division of counties unless necessary to meet the constitutional standards of equal protection.[47]

In addition to state constitutional requirements, the same justifications used in the congressional context can be used in the state legislative one as well. In 2002, a federal district court in West Virginia upheld a 10.92 percent deviation justified by five state policy interests: recognizing established political subdivisions; compactness; contiguity; maintaining communities of interest; and avoiding crossing county lines unless necessary to preserve the other stated goals.[48] The Supreme Court affirmed.

One potentially important issue that remains unresolved by the Supreme Court is whether there is an absolute limit on population deviation even if the state can demonstrate a legitimate legislative policy. In *Mahan v. Howell*,[49] the Supreme Court upheld a Virginia legislative plan with a total deviation of 16.4 percent, but commented, "While this percentage may well approach tolerable limits, we do not believe it exceeds them."[50] Some lower courts have consequently viewed 16.4 percent as the outer bounds of "tolerable limits" even where a valid justification for the higher deviation exists,[51] though some have allowed greater deviations.[52]

In creating state and local reapportionment plans that satisfy the "one-person, one-vote" standard, then, the key is to keep the total population deviation below 10 percent, if possible, and if the deviation exceeds 10 percent, to justify the excess with consistently applied, nondiscriminatory redistricting policies.

46. Baumgart v. Wendelberger, No. 01-C-0121, 2002 WL 34127471, at *3 (E.D. Wis. May 30, 2002) (three-judge court).

47. Bonneville County v. Ysursa, 129 P.3d 1213 (Idaho 2005).

48. Deem v. Manchin, 188 F. Supp. 2d 651, 656 (N.D.W. Va.), *aff'd sub nom.* Unger v. Manchin, 536 U.S. 935 (2002).

49. 410 U.S. 315 (1973).

50. *Id.* at 329.

51. Boddie v. City of Cleveland, 297 F. Supp. 2d 901 (N.D. Miss. 2004) (noting the undisputed presumption that deviations of at least 23.36% and at most 48.7% were in violation of the one-person/one-vote principle); *In re* Apportionment of the State Legislature v. Sec'y of State, 486 N.W.2d 639, 646–47 & nn.36–37 (Mich. 1992).

52. Blackmoon v. Charles Mix County, 386 F. Supp. 2d 1108 (D.S.D. 2005) (upholding a total population deviation of 19.02%).

3. Justifying Deviations Below Ten Percent

The 10 percent rule is not, however, a safe harbor. Rather, it is a threshold that allocates the burden of proof for one-person, one-vote claims.[53] State legislative plans with total population deviations below 10 percent still may be struck down if the population deviation resulted from some unconstitutional, irrational, or arbitrary state policy, such as intentionally discriminating against certain groups of voters, certain cities, or certain regions of the state.[54]

In *Hulme v. Madison County*, for example, a district court in Illinois found that the apportionment process for a local county board, which had a total population deviation of 9.3 percent, was "unquestionably tainted with arbitrariness and discrimination."[55] The court rejected the county board's contention that a plan with a population of less than 10 percent was presumptively valid, and therefore required no justification.[56] Noting that the county board had not offered *any* state policy to justify the population disparity, and, in addition, that the plan was specifically designed to satisfy the political agenda of the chairman of the legislative committee, the court found the apportionment plan unconstitutional.[57]

Similarly, in *Larios v. Cox*, a three-judge panel in Georgia found that the state's legislative apportionment plan, with a total population deviation of 9.98 percent, violated the one-person, one-vote principle.[58] The court acknowledged that while minor deviations may be allowed, these deviations cannot withstand constitutional scrutiny when they are "tainted by arbitrariness or discrimination."[59] Finding that the deviations were not supported by "*any* legitimate, consistently-applied state interests," but were the result of regionalism and partisan gerrymandering, the court struck down the state legislative plan as violative of the one-person, one-vote principle.[60] On appeal, the Supreme Court summarily affirmed.

53. Moore v. Itawamba County, 431 F.3d 257, 259 (5th Cir. 2005); Daly v. Hunt, 93 F.3d 1212, 1217–18, 1220–21 (4th Cir. 1996).

54. Moore, 431 F.3d 257, 260; Larios v. Cox, 300 F. Supp. 2d 1320 (N.D. Ga. 2004) (three-judge court), *summarily aff'd*, 542 U.S. 947 (2004).

55. 188 F. Supp. 2d 1041, 1051 (S.D. Ill. 2001).

56. *Id.* at 1052.

57. *Id.* at 1051–52.

58. Larios, 300 F. Supp. 2d 1320, 1352–53.

59. *Id.* at 1338.

60. *Id.* at 1352–53, 1356 (emphasis in original); *cf.* Rodriguez v. Pataki, 308 F. Supp. 2d 346, 370 n.27 (S.D.N.Y. 2004) (distinguishing *Larios* and finding that plaintiffs failed to show that a deviation of 9.78% was not caused by the promotion of court-approved state policies).

D. WHO IS COUNTED

One outstanding issue that remains unresolved by the Supreme Court is what measure of population may be used by states to equalize the population in districts across the state.[61] In *Burns v. Richardson*, the Court said that the Equal Protection Clause does not require the states to use total population figures as the standard by which population equivalency is to be measured.[62] But circuit courts have subsequently interpreted *Burns* in different ways.

In *Garza v. County of Los Angeles*, the Ninth Circuit held that districting based on citizen voting-age population instead of total population would have been unconstitutional.[63] The panel judges disagreed as to which principle lies at the core of one-person, one-vote—the principle of electoral equality, or that of equality of representation. Judges Schroeder and Nelson favored equality of representation, finding for the court that a plan based on citizen voting-age population would impermissibly "dilute the access of voting age citizens in that district to th[eir] representative, and . . . abridge the right of aliens and minors to petition their representative."[64] Judge Kozinski, in dissent, argued that *Burns* "can only be explained as an application of the principle of electoral equality."[65] Viewing the representational equality principle as subservient to the principle of electoral equality, Judge Kozinski argued that individual votes must carry equal weight across districts.[66]

Other circuits have dealt with the question differently. In *Daly v. Hunt* and *Chen v. City of Houston*, the Fourth and Fifth Circuits, respectively, held that the decision as to which population figures to use is a part of the political process, and as such states and localities should be

61. Chen v. City of Houston, 532 U.S. 1046 (2001) (Thomas, J., dissenting).

62. 384 U.S. 73, 91–92 (1966). Another controversial issue relating to the proper headcount calculation for purposes of "one-person, one-vote" is where incarcerated individuals are to be counted. The U.S. Census Bureau counts inmates in penal institutions as residents of the institution. *Hayden v. Pataki*, 449 F.3d 305, 329 n.25 (2d Cir. 2006). Since felons and incarcerated persons in many states are barred from voting under state law, this has the effect of increasing the weight of other votes cast in the district.

63. 918 F.2d 763 (9th Cir. 1990).

64. *Id.* at 775.

65. *Id.* at 784 (Kozinski, J., dissenting).

66. *Id.* at 782 (Kozinski, J., dissenting).

given deference.[67] In 2001, the Supreme Court denied a petition for writ of certiorari to hear an appeal of *Chen*. In dissent, Justice Thomas protested that this "critical variable" in the one-person, one-vote requirement has been left undefined.[68] "[A]s long as we sustain the one-person, one-vote principle," he concluded, "we have an obligation to explain to states and localities what it actually means."[69]

67. Daly v. Hunt, 93 F.3d 1212, 1227–28 (4th Cir. 1996); Chen v. City of Houston, 206 F.3d 502, 523 (5th Cir. 2000).

68. Chen v. City of Houston, 532 U.S. 1046, 1046 (2001) (Thomas, J., dissenting).

69. *Id.*

CHAPTER 2

The Constitutional Limits on Political (or Partisan) Gerrymandering

Political or partisan gerrymandering refers to the practice of drawing electoral district lines in such a way that one political party benefits and another is disadvantaged. For example, a party's supporters may be "packed" into a few districts where they constitute the overwhelming majority, with the result that the party's share of legislative seats statewide is substantially smaller than its share of the vote. Similarly, a party's supporters may be "cracked" among several districts so that they do not constitute a majority in any of these districts, with the same consequences for the party's statewide influence. At present, there are no constitutional limits on political gerrymandering, though this may change if the Supreme Court's composition alters or if Justice Kennedy is persuaded that a justiciable standard for measuring partisan gerrymandering can be found.

In the 1986 case of *Davis v. Bandemer*,[1] the Supreme Court held for the first time that political gerrymandering claims *could* be adjudicated by the courts. To prevail on such a claim, a plaintiff had to establish both discriminatory intent, in the sense that districts were deliberately drawn to disadvantage a party, and discriminatory effect, meaning that "the electoral system is arranged in a manner that will consistently degrade a

1. 478 U.S. 109 (1986). *Bandemer* focused on Indiana's 1981 Republican-drawn redistricting plan. In the 1982 elections for the Indiana House of Representatives, Democrats received 51.9 percent of the vote but only 43 out of 100 House seats. *Id.* at 115 (plurality opinion).

voter's or a group of voters' influence on the political process as a whole."[2] While *Bandemer*'s intent prong was not particularly difficult to satisfy, its effect prong proved effectively insurmountable over the next 18 years. Not a single plaintiff was ever able to meet both prongs and hence succeed on a political gerrymandering claim.[3]

In 2004, the Court revisited the justiciability of political gerrymandering in *Vieth v. Jubelirer*.[4] Four justices would have overruled *Bandemer* and declared all political gerrymandering claims to be nonjusticiable. In an opinion written by Justice Scalia, they said that *Bandemer*'s approach was "misguided when proposed" and "has not been improved in subsequent application."[5] More fundamentally, in their view, all potential standards for detecting unconstitutional gerrymandering are flawed because they seek to draw an untenable "line between good politics and bad politics."[6] If district-drawers may contemplate political consequences *to some degree*, the plurality observed, nothing in the Constitution can "provide[] a judicially enforceable *limit* on the political considerations that the states and Congress may take into account when districting."[7]

Justice Kennedy, however, concurred only in *Vieth*'s outcome. Like Justice Scalia, he did not consider *Bandemer*'s approach or any of the standards proposed by the *Vieth* litigants or dissenters to be judicially manageable. But unlike Justice Scalia, he was unwilling to shut the door on the possibility that a justiciable standard might subsequently be discovered. "That no such standard has emerged in this case should not be taken to prove that none will emerge in the future."[8] Justice Kennedy suggested that a workable test might be formulated on the basis of First Amendment principles rather than the Equal Protection Clause.[9]

2. *Id.* at 132 (plurality opinion).

3. *See* Vieth v. Jubelirer, 541 U.S. 267, 279–80 (2004) (plurality opinion) ("[I]n *all* of the cases we are aware of involving that most common form of political gerrymandering, relief was denied."). In one prominent case, California Republicans lost their *Bandemer* claim despite receiving 50.1% of the 1984 statewide vote but only 40% of the congressional seats (18 of 45). *See* Badham v. Eu, 694 F. Supp. 664, 670 (N.D. Cal. 1988), *aff'd*, 488 U.S. 1024 (1989). The court observed that California had a Republican governor and one Republican senator, and remarked that "[i]t simply would be ludicrous for plaintiffs to allege that their interests are being 'entirely ignore[d]' in Congress when they have such a large contingent of representatives who share those interests." *Id.* at 672.

4. 541 U.S. 267 (2004). *Vieth* involved Pennsylvania's 2002 Republican redistricting plan. Republicans won 12 of Pennsylvania's 19 seats in the U.S. House of Representatives in 2002 even though Democrats outnumbered Republicans in the state.

5. *Id.* at 283.

6. *Id.* at 299.

7. *Id.* at 305 (emphasis added).

The Supreme Court again evaluated a political gerrymandering claim in a 2006 case involving Texas's unusual mid-decade redistricting.[10] In a 5-4 decision, the Court declined to adopt a rule that such mid-decade line-drawing is unconstitutional when motivated solely by partisan objectives. In the majority's view, it is very difficult to determine a legislature's motive for any particular action, and it is not sensible to subject mid-decade redistricting to higher scrutiny than conventional start-of-decade redistricting.[11]

The Court's recent decisions appear to give legislators leeway to pursue partisan advantage as zealously as they like when drawing district lines. Legislators may "pack" or "crack" a party's supporters, ignore traditional districting criteria, create exceedingly safe districts for incumbents, and even redraw lines in the middle of a decade, with some confidence that their decisions will not be second-guessed by courts. Similarly, there is no constitutional requirement of proportional representation of each political party.

As discussed elsewhere in this guide, however, complex constitutional and statutory requirements do apply to redistricting decisions when they involve issues of race and ethnicity. In addition, *state* statutes and constitutions frequently impose limits on political gerrymandering.[12] Furthermore, it is important to note that the Court's two recent political gerrymandering decisions were decided by a plurality and by a slim 5-4 majority, respectively. If a new standard for adjudicating claims of partisan gerrymandering were to emerge that appealed to Justice Kennedy, or if Justice Kennedy were replaced by a justice inclined to agree with the four *Vieth* dissenters, this doctrine could change rapidly and dramatically.

8. *Id.* at 311 (Kennedy, J., concurring in the judgment).

9. *See id.* at 314–17 (Kennedy, J., concurring in the judgment).

10. League of United Latin Am. Citizens v. Perry, 548 U.S. 399 (2006).

11. *See id.* at 416–20.

12. *See* Vieth, 541 U.S. 267, 277 n.4 (citing state laws aimed at "prevent[ing] abusive districting practices" and "insulat[ing] the process from politics").

CHAPTER 3

Section 5 of the Voting Rights Act

Section 5 of the Voting Rights Act, unlike Section 2, applies only to certain parts of the country—specifically, to nine entire states (Alabama, Alaska, Arizona, Georgia, Louisiana, Mississippi, South Carolina, Texas, and Virginia) and to parts of seven others (California, Florida, Michigan, New Hampshire, New York, North Carolina, and South Dakota).[1] Therefore, legislators from the other 34 states need not consider the limits that Section 5 places on the redistricting process. However, for legislators from the "covered jurisdictions," Section 5 remains one of the most significant legal constraints on the redistricting process.

Section 5 requires covered jurisdictions to obtain either administrative preclearance from the Attorney General of the United States or judicial preclearance from the U.S. District Court for the District of Columbia for any change in a "standard, practice, or procedure with respect to voting."[2] A new congressional or legislative redistricting plan—and even a city councilman seat reapportionment plan—qualifies as such a change.[3]

1. For a map of all the covered jurisdictions, *see* http://www.usdoj.gov/crt/voting/sec_5/covered.php (last visited Oct. 5, 2009). *See also Procedures for the Administration of Section 5 of the Voting Rights Act of 1965,* 28 C.F.R. § 51.1. Covered jurisdictions are those that "had used a forbidden test or device in November 1964, and had less than 50% voter registration or turnout in the 1964 Presidential election." Northwest Austin Mun. Util. Dist. No. One v. Holder, 129 S. Ct. 2504, 2509 (2009).

2. 42 U.S.C. § 1973c.

3. Beer v. United States, 425 U.S. 130, 133 (1976).

To obtain preclearance, the state must prove that the new redistricting plan does not have the purpose and will not have "the effect of denying or abridging the right to vote on account of race or color, or membership in a language minority group."[4] Thus, Section 5 provides two procedural paths (administrative preclearance by the attorney general and judicial preclearance by the D.C. court) and two substantive standards (commonly referred to as the "purpose prong" and the "effects prong"). States may take either procedural path, but they must satisfy *both* substantive standards. Significantly, a third substantive standard, previously used by the attorney general to deny preclearance to plans that violated Section 2 of the Voting Rights Act, was struck down by the Supreme Court in 1997. Before explaining these points in more detail, it is helpful to understand why Congress enacted Section 5 of the Voting Rights Act.

A. THE ENACTMENT OF SECTION 5

The Fifteenth Amendment of the U.S. Constitution, ratified after the Civil War, provides that the "right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude." The amendment's history suggests it was designed to counter southern states' efforts to prevent newly freed slaves from voting by giving Congress the power to enforce the amendment by appropriate legislation. Pervasive and often violent racial discrimination in voting continued unabated for more than a century.

Congress enacted Section 5 of the Voting Rights Act in 1965. Since then, the Supreme Court has stated that the purpose of Section 5 was to prevent voting-related changes "that would lead to a *retrogression* in the position of racial minorities."[5] Section 5 "was enacted as 'a response to a common practice in some jurisdictions of staying one step ahead of the federal courts by passing new discriminatory voting laws as soon as the old ones had been struck down.'"[6] Effectively, Section 5 "freezes" proposed changes in election procedures in place until the state can prove that the proposed changes are nondiscriminatory in both purpose and effect. If a plan has not been precleared, it is legally unenforceable and

4. 28 C.F.R. § 51.52(a); *see also* 42 U.S.C. § 1973c.

5. Beer, 425 U.S. 130, 141 (emphasis added).

6. Reno v. Bossier Parish Sch. Bd., 520 U.S. 471, 477 (1997) (Bossier Parish I) (quoting Beer, 425 U.S. at 140); *see* Miller v. Johnson, 515 U.S. 900, 926 (1995).

may not be implemented. Furthermore, Section 5 places the burden of persuasion squarely on the states: If the evidence is conflicting and the attorney general or the D.C. court is unable to determine whether a new redistricting plan is free of discriminatory purpose and effect, preclearance will be denied.[7]

Rather than designating the jurisdictions to be covered, Congress enacted a formula to determine which states (and political subdivisions) would be "covered jurisdictions." The initial formula, outlined in Section 4 of the Act, provided that a state or political subdivision would be covered by Section 5 if: (1) the state or political subdivision maintained, on November 1, 1964, a "test or device" restricting the right to register or vote;[8] and (2) the Director of the Census determined either that less than 50 percent of the voting age population had registered to vote, or that less than 50 percent of the voting age population had voted in the November 1964 elections.

Congress amended the act in 1970 and 1975, expanding the coverage formula in two key ways. First, Congress covered new jurisdictions based on voting data from the 1968 and 1972 elections, adding those new jurisdictions to those covered by the original formula. And second, Congress significantly expanded the definition of "test or device" to include election-related materials printed only in the English language in states or political subdivisions in which the Director of the Census determined that more than five percent of voting-age citizens are members of a "single language minority."[9] These rules still govern today.

Congress originally intended Section 5 to remain in effect for only five years. However, Congress has reauthorized the statute four times, most recently in 2006.[10] Before the most recent reenactment of the statute, several committees in the House and Senate compiled extensive evidence on the effectiveness of and necessity for the law. The House Judiciary

7. 28 C.F.R. § 51.52(c).

8. Section 4(c) of the act defined a "test or device" as "any requirement that a person as a prerequisite for voting or registration for voting (1) demonstrate the ability to read, write, understand, or interpret any matter, (2) demonstrate any educational achievement or his knowledge of any particular subject, (3) possess good moral character, or (4) prove his qualifications by the voucher of registered voters or members of any other class." 42 U.S.C. § 1973b(c).

9. Section 4(f)(3) of the act has included this expanded definition since the 1975 Amendments. 42 U.S.C. § 1973b(f)(3).

10. *See* Pub L. No. 109-246, 120 Stat. 577 (2006).

Committee held 12 oversight hearings, compiling a record of 12,000 pages.[11] The Senate Judiciary Committee added nine more hearings, collecting another 15,000 pages of testimony and evidence.[12] The committees took testimony from dozens of witnesses, including voting rights scholars, elected officials, and nongovernmental organizations. Congress further relied on the National Commission on Voting Rights' report on its nationwide investigation.[13]

The debate in Congress took several months and even though the extension passed overwhelmingly, there were times when the debate turned contentious. Some House members questioned whether it was appropriate to continue to use data from 1964 to determine which jurisdictions were covered. Others questioned the need for language assistance provisions. In the Senate, members also voiced concerns about the 1964 coverage formula, whether a 25-year reauthorization was too long, and the precise definition of "retrogression" (see Part D below).[14] Despite these concerns, Congress ultimately concluded that "vestiges of discrimination in voting continue to exist,"[15] and the House Judiciary Committee concluded that "there is a demonstrated and continuing need to reauthorize the temporary provisions."[16] Those conclusions were supported by several indicators of continuing and fairly widespread discrimination in voting.[17] In the end, Congress made relatively few amendments to the law, and did not attempt to re-determine the coverage formulas. The amended Section 5 in 2006 passed by a unanimous vote in the Senate and a 390-33 vote in the House. President Bush signed it into law on July 27, 2006.

11. Brief of Reps. John Conyers, Jr., F. James Sensenbrenner, Jr., Jerrold Nadler, and Melvin L. Watt, and Former Rep. Steve Chabot as *Amici Curiae* in Support of Appellees at 17, Northwest Austin Mun. Util. Dist. No. One v. Holder, 129 S. Ct. 2504 (2009), http://www.abanet.org/publiced/preview/briefs/pds/07-08/08-322_AppelleeAmCu3Repsand1FmrRep.pdf (last visted Dec. 11, 2009).

12. *Id.*

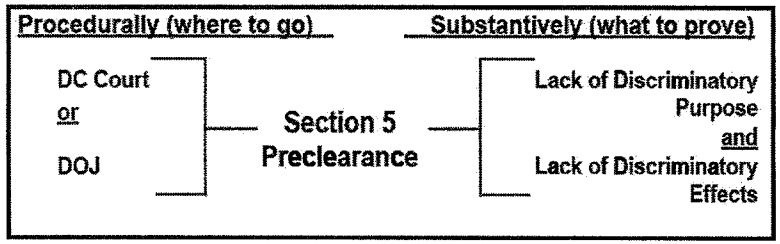
13. Northwest Austin Mun. Util. Dist. No. One v. Mukasey, 573 F. Supp. 2d 221, 228–29 (D.D.C. 2008) (quoting H.R. Rep. No. 109-478 (2006)), *rev'd*, 129 S. Ct. 2504 (2009); Nathaniel Persily, *The Promise and Pitfalls of the New Voting Rights Act*, 117 Yale L.J. 174, 179–92 (2007).

14. Nathaniel Persily, *The Promise and Pitfalls of the New Voting Rights Act*, 117 Yale L.J. 174, 183–84 (2007).

15. Pub. L. No. 109-246, § 2(b)(2).

16. H.R. Rep. No. 109-478, at 53 (2006).

17. Northwest Austin Mun. Util. Dist. No. One, 573 F. Supp. 2d 221, 251 (citing several examples included in the legislative history); *see also* H.R. Rep. No. 109-478, at 25-29 (2006).



Covered jurisdictions must obtain preclearance for any change in a standard, practice, or procedure with respect to voting.

B. PRECLEARANCE PROCEDURES

As described above, a state (or other covered jurisdiction) has the choice of seeking either administrative or judicial preclearance. The substantive legal standards under either procedure are the same. But a state that has been denied administrative preclearance for a particular plan can seek judicial preclearance for that same plan from the federal court in Washington, D.C.[18] Also, the court in Washington is the only federal district court with the power to preclear a redistricting plan; a federal district court in the redistricted state cannot grant preclearance.

Because administrative preclearance is typically faster and less expensive than litigating in the D.C. court, most states initially seek approval from the attorney general. The Department of Justice has issued federal regulations that set forth at length the procedures for submitting a voting change to the attorney general. Until the *entire* redistricting plan is precleared by federal officials in Washington (either the attorney general or the D.C. district court), *no* part of the plan can actually be implemented by the state.

C. THE "EFFECTS PRONG"

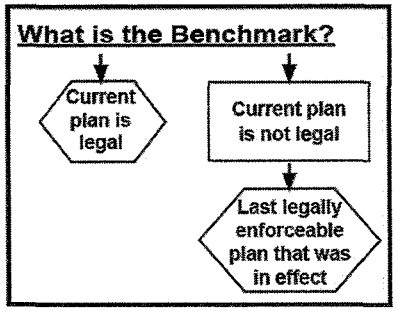
A change in a state's districting plan is considered to have an impermissibly discriminatory effect under Section 5's "effects prong" if it will lead to a "retrogression" in the position of members of a racial or language minority group.[19] "Retrogression" simply refers to any worsening of the position of minority voters. By definition, it requires a "bench-

18. *See* Lopez v. Monterey County, 525 U.S. 266, 270–71, 283 (1999).

19. Bossier Parish I, 520 U.S. 471, 487; City of Lockhart v. United States, 460 U.S. 125, 134 (1983); Beer, 425 U.S. 130, 141.

mark" against which one can measure a state's new plan. Normally, the benchmark will be the plan currently in effect when the new plan is submitted for preclearance. If the current plan is an unconstitutional racial gerrymander (discussed below) or is not legally enforceable under Section 5, the last constitutional, legally enforceable plan used by the state will be designated as the benchmark.[20]

Thus, when states redistrict in 2011, the benchmark will generally be the plans that were in effect for the November 2010 elections. Using the most current demographic and political data available, a state will have to make a comprehensive survey of the opportunities for minority group members to exercise their electoral franchise effectively under the old plan. Specifically, a state should assess minorities' opportunities to participate meaningfully in the state's political processes.[21] If a proposed plan would lead to a decline in those opportunities, it would likely be denied preclearance on the ground that it had a retrogressive effect.



To determine whether a districting plan will lead to "retrogression," the attorney general or D.C. district court uses a prior, constitutional plan as a benchmark.

Central to this inquiry is the question whether minority voting strength would be reduced by the proposed redistricting.[22] Such reductions can take place under at least two entirely different scenarios. *First*, minority voting strength may be reduced by "fragmenting" minority concentrations and dispersing minority voters into two or more districts where they constitute an ineffective minority of the electorate. *Second*, minority voting strength may be reduced by over-concentrating, or "packing," minority voters into one district, or a small number of districts, and thus effectively wasting votes that might have been used to create an additional effective minority opportunity district.[23] Clearly, determining what

20. *See* Abrams v. Johnson, 521 U.S. 74, 96–97 (1997); 28 C.F.R. § 51.54(b)(1).
21. 28 C.F.R. § 51.58.
22. *Id.* § 51.59(b).
23. *Id.* § 51.59(c), (d).

constitutes discriminatory fragmenting or packing is a difficult question that implicates fundamental issues about the nature of elections and representation. Congress amended Section 5 in 2006 to make clear that the "purpose" of Section 5 is to "protect the ability" of minority citizens to "*elect* their preferred candidates of choice" (emphasis added).[24]

Many of these same questions and issues are analyzed at length in the discussion of Section 2 of the Voting Rights Act, below. As for Section 5, suffice it to say that these questions and issues will often be subject to legitimate, even heated, dispute, and therefore a state should make precise assessments of minority voting opportunities under both their current plan and various proposed plans *before* finally adopting any plan and most certainly before submitting any plan for preclearance.

The analysis of retrogressive effect becomes even more complex when a state gains or loses a congressional seat due to the post-census reapportionment. In *Abrams v. Johnson*,[25] the Supreme Court addressed the question of whether there is a retrogressive effect when a state's total number of districts increases but the number of minority opportunity districts remains the same. The appellants in *Abrams* unsuccessfully argued that when the size of Georgia's congressional delegation increased from ten seats to eleven following the 1990 census, Section 5 would be violated by any plan that continued to include only one majority-minority district. The Court rejected this contention, stating, "[u]nder that logic, each time a State with a majority-minority district was allowed to add one new district because of population growth, it would have to be majority-minority."[26] The Court has not yet addressed the consequences for retrogression when a state *loses* a congressional seat because of a decrease (or a relatively small increase) in population. That issue may arise after the 2010 census.

24. 42 U.S.C. § 1973c(b), (d); *see also* Fannie Lou Hamer, Rosa Parks, & Coretta Scott King Voting Rights Act Reauthorization and Amendments Act of 2006, Pub. L. No. 109-246, § 2(b)(6), 120 Stat. 577, 578 ("The effectiveness of the Voting Rights Act of 1965 has been significantly weakened by the United States Supreme Court decision[] in . . . *Georgia v. Ashcroft*, which [has] misconstrued Congress' original intent in enacting the Voting Rights Act of 1965 and narrowed the protections afforded by section 5 of such Act."); H. Rep. 109-148, at 68–72 (noting that *Georgia*'s holding would lead to results that were "*clearly not* the outcome that Congress intended the Voting Rights Act and Section 5 to have on minority voters" and rejecting the Supreme Court's view) (emphasis in original).
25. 521 U.S. 74 (1997).
26. *Id.* at 97–98.

D. THE "PURPOSE PRONG"

The "purpose prong" of Section 5 asks whether a new districting plan has "the purpose . . . of denying or abridging the right to vote on account of race or color, or [membership in a language minority group]."[27] In January 2000, the Supreme Court in *Bossier Parish II*[28] held that the purpose prong, like the effects prong, focuses entirely on retrogression. Congress overruled this decision by adding section 1973c(c) when it amended and reauthorized the Voting Rights Act in 2006.[29] Thus, a redistricting plan enacted with a discriminatory purpose, even if it is nonretrogressive, will not be precleared.

The Court in *Bossier Parish I* listed several considerations relevant to the purpose inquiry, including:

- the historical background of the state's redistricting decision;
- the specific sequence of events leading up to the enactment of the redistricting plan;
- departures from the normal procedural sequence;
- the legislative history of the plan, especially any contemporary statements by members of the legislature;
- the plan's retrogressive effect, if any; and
- the plan's likelihood of diluting the voting power of minorities.[30]

The Department of Justice's regulations suggest several additional factors that may be relevant to the purpose inquiry, including:

- the extent to which reasonable and legitimate justifications explain the new plan's noteworthy features;
- the extent to which available alternative plans satisfying the state's legitimate governmental interests were considered;

27. 42 U.S.C. § 1973c.
28. Reno v. Bossier Parish Sch. Bd., 528 U.S. 320 (2000) (Bossier Parish II).
29. 42 U.S.C. § 1973c(c).
30. Reno v. Bossier Parish Sch. Bd., 520 U.S. 471, 488–89 (1997) (citing Village of Arlington Heights v. Metro. Hous. Dev. Corp., 429 U.S. 252, 266–68 (1977)); *see also* City of Pleasant Grove v. United States, 479 U.S. 462, 469–70 (1987); Busbee v. Smith, 549 F. Supp. 494, 516–17 (D.D.C. 1982) (three-judge court), *summarily aff'd*, 459 U.S. 1166 (1983).

- the extent to which the state followed pre-established, objective guidelines and fair and conventional procedures in adopting the new plan;
- the extent to which the state afforded minority group members an opportunity to participate in the decisions involving the new plan;
- the extent to which the state took the concerns of minority group members into account in formulating the new plan; and
- the extent to which the plan departs from objective redistricting criteria set by the state, ignores other relevant factors such as compactness and contiguity, or displays a configuration that inexplicably disregards available natural or artificial boundaries.[31]

As these lists make clear, the criteria used to evaluate a plan under Section 5's purpose prong are vast and comprehensive. It is thus possible that, even in the absence of blatant "smoking gun" evidence of racism and explicit statements of retrogressive or discriminatory intent, the attorney general (or the federal district court in D.C.) will nonetheless find that a plan cannot satisfy Section 5's purpose prong. Thus, legislators and legislative staffers who in fact act in good faith must nonetheless take care not to leave the impression that their redistricting plans are marred by an impermissible retrogressive or discriminatory purpose.

E. THE CONTINUING CONSTITUTIONALITY OF SECTION 5

The constitutionality of Section 5 was challenged in *Northwest Austin Municipal Utility District Number One (NAMUDNO) v. Holder* in 2009.[32] The case involved a small utility district in Texas that had elected board members. The utility district was founded in 1987, and there was no evidence that it had ever engaged in racial discrimination; however, under Section 5, it was still required to preclear all changes to its election procedures. The utility district challenged the constitutionality of Section 5, and asked in the alternative that it be allowed to "bail out" of the Section 5 preclearance requirements (see discussion below).

The utility district lost before a three-judge panel in the district court, which held that Section 5 was constitutional and that only jurisdictions

31. 28 C.F.R. §§ 51.57, 51.59.
32. 129 S. Ct. 2504 (2009).

that registered their own voters (which the utility district did not) could seek a bailout. The case went to the Supreme Court on appeal. After oral argument, many observers doubted that Section 5 would survive, but the Court ultimately decided—in an 8-1 vote—to resolve the case on statutory grounds, interpreting the bailout provision to allow the utility district to seek an exemption from Section 5's requirements.

Section 5 remains valid and applicable to redistricting, but some members of the Court expressed concerns about two issues. First, several members of the Court were skeptical that Section 5 is still necessary, given how few preclearance requests have been denied in recent years. Second, some Justices on the Court expressed concern that the Act still uses voting statistics from 1964 to determine which states are covered and thus subject to the preclearance requirements. These Justices perceived an affront to the sovereign dignity of the covered states.[33] The *NAMUDNO* decision appeared to be an invitation to Congress to update the statute, particularly the determination of which states and portions of states are covered. It is uncertain whether Congress will act on the Court's invitation, and if it does not, whether the Court will strike down Section 5 if given another opportunity.

F. BAILOUT

One important effect of the Supreme Court's decision has been to increase the importance of the bailout provisions of the Voting Rights Act. Section 4(a) of the Voting Rights Act authorizes a "State or political subdivision" to bail out of Section 5's preclearance requirements if the jurisdiction has met a rigorous set of criteria. Specifically, the jurisdiction must show that during the previous ten years,

- no "test or other device has been used within such state or political subdivision for the purpose or with the effect of denying or abridging the right to vote on account of race or color";

33. Representatives of the covered states were less concerned. Every senator, including those from the covered states, voted for the 2006 reauthorization. Six covered or partially covered states filed friend of the court briefs in support of the constitutionality of Section 5 in *NAMUDNO*, along with numerous representatives from covered jurisdictions. Only one governor from a covered state filed an opposing brief, and one governor filed a brief in support of neither side.

- "no final judgment of any court of the United States . . . has determined that denials or abridgments of the right to vote on account of race or color have occurred anywhere in the territory";
- "no Federal examiners or observers . . . have been assigned to" the jurisdiction;
- the jurisdiction has complied with the provisions of Section 5;
- "the Attorney General has not interposed any objection (that has not been overturned by a final judgment of a court) and no declaratory judgment has been denied" under Section 5; and
- the jurisdiction has "eliminated voting procedures and methods of election which inhibit or dilute equal access to the electoral process; engaged in constructive efforts to eliminate intimidation and harassment of persons exercising rights protected [by the Voting Rights Act]; and . . . engaged in other constructive efforts, such as expanded opportunity for convenient registration and voting[.]"[34]

Before 2009, this provision was rarely used. The act appeared to limit bailout eligibility to those states or "political subdivision[s]" that actually registered voters. Only 17 such jurisdictions, all in Virginia, had bailed out. However, in *NAMUDNO*, the court held that *all* political subdivisions—meaning, simply, any political division of the state that discharges some governance function—may bail out.[35]

The *NAMUDNO* decision has sparked a new interest in understanding and using the bailout procedures. Indeed, bailout for small entities may become an important part of Section 5 jurisprudence in the coming years.[36]

G. THE RELATIONSHIP BETWEEN SECTION 5 AND SECTION 2

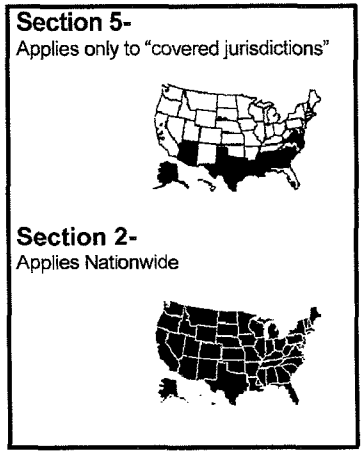
One very important change in Section 5 law occurred in 1997. Previously, the attorney general had a policy of refusing to preclear any plan

34. 28 U.S.C. § 1973b(a)(1)(A)–(F).

35. 129 S. Ct. 2504 (2009). Following the decision, the Northwest Austin Municipal Utility District Number One became the eighteenth political subdivision to bail out.

36. Sean Reilly, *Focus: Voting Rights Bailout*, Mobile Press Register, June 29, 2009.

that clearly violated the Justice Department's understanding of Section 2 of the Voting Rights Act—even if the plan was free of discriminatory purpose and effect, as those terms are generally used in Section 5 cases.[37] As discussed below, Section 2 prohibits all jurisdictions from impermissibly diluting the voting strength of minority group members, and uses different substantive standards and burdens of proof than does Section 5. Thus, the attorney general's pre-1997 policy, embodied in a Justice Department regulation that expressly incorporated Section 2 standards into Section 5, significantly increased the attorney general's power to deny preclearance to states' new districting plans. In 1997, the Supreme Court, in *Bossier Parish I*, effectively struck down the Justice Department's regulation when it held that preclearance cannot be denied solely on the basis of a perceived Section 2 violation.[38]



Unlike Section 2, which applies nationwide, Section 5 of the Voting Rights Act applies only to nine entire states and part of seven other states. Eighteen jurisdictions have "bailed out" of Section 5's preclearance requirements, including 17 jurisdictions in Virginia.

The Court did, however, find that "Section 2 evidence" showing that the new plan dilutes the voting power of minorities may be relevant to whether the jurisdiction acted with a discriminatory purpose under Section 5. Thus, although a plan can no longer be refused preclearance *solely* because of evidence of a Section 2 violation, that evidence may be used to support a finding of discriminatory purpose.[39]

37. 28 C.F.R. § 51.55(b)(2) (1997), *removed by* Order No. 2149-98, 63 Fed. Reg. 24,108, 24,109 (1998).
38. 520 U.S. 471, 476–85.
39. *Id.* at 486–90.

CHAPTER 4

Section 2 of the Voting Rights Act

Section 2 of the Voting Rights Act,[1] unlike Section 5, applies nationwide. Congress passed Section 2 to help effectuate the Fifteenth Amendment's guarantee that no citizen's right to vote shall "be denied or abridged . . . on account of race, color, or previous condition of servitude."[2] In 1982, the act was amended in response to the Supreme Court's decision in *Mobile v. Bolden*, where the Court held that in order to challenge discriminatory voting practices, plaintiffs had to prove intentional discrimination on the basis of race, rather than simply demonstrating that a policy had a racially discriminatory effect.[3] In response to this decision, Congress amended the act to restore a standard allowing liability premised upon discriminatory impact rather than requiring evidence of discriminatory intent.

Section 2 prohibits what is referred to as "minority vote dilution"—the minimization or canceling out of minority voting strength. Section 2(a) of the Act prohibits any electoral practice or procedure that "results in a denial or abridgement of the right of any citizen . . . to vote on account

1. 42 U.S.C. § 1973.
2. U.S. Const. amend. XV.
3. Other factors included evidence such as a history of discrimination, divisive campaign efforts, and the number of minority legislators elected in a region.

of race or color [or membership in a language minority group]."[4] Section 2 (b) specifies that the right to vote has been abridged or denied if,

> based on a totality of circumstances, it is shown that the political processes leading to nomination or election . . . are not equally open to participation by members of a [racial or language minority group] in that its members have less opportunity than other members of the electorate to participate in the political processes and to elect representatives of their choice.[5]

Section 2 thus prohibits any practice or procedure that, interacting with social and historical conditions, impairs the ability of a protected minority group to elect its candidates of choice on an equal basis with other voters.

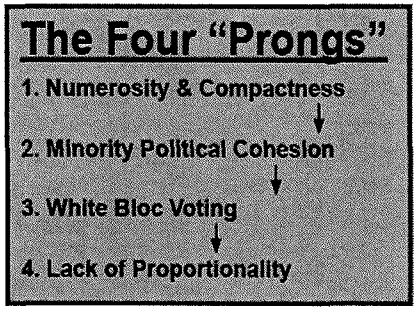
A. ESTABLISHING A SECTION 2 CLAIM: THE FOUR PRONGS OF *GINGLES* AND *DE GRANDY*

In the context of redistricting, where Section 2 has been applied most frequently, the law poses the following question: When and how must a state draw district lines to avoid diluting the voting power of a protected minority group?[6] Or, more specifically, when must a state create "majority-minority" districts—districts in which a minority group constitutes an effective voting majority?[7]

On its face, Section 2 does not provide a clear framework to answer these questions. In 1986, in *Thornburg v. Gingles*,[8] however, the Supreme Court tried to articulate such a framework. Under the test created in *Gingles*, the first step in determining whether a majority-minority district is mandated by Section 2 is to ask the following three questions:

4. 42 U.S.C. § 1973(a).
5. *Id.* § 1973(b).
6. At times, for brevity's sake, this guide refers to a "protected minority group" or a "minority group" or a "minority" as shorthand for a racial- or language-minority group whose members are protected by the Voting Rights Act.
7. As discussed below, there are competing conceptions of an effective voting majority. Courts have not universally accepted any one of these approaches.
8. 478 U.S. 30, 50 (1986).

(1) Is the minority group "sufficiently large and geographically compact to constitute a majority" in a single-member district?[9]
(2) Is the minority group "politically cohesive"?
(3) Does the white majority vote "sufficiently as a bloc to enable it—in the absence of special circumstances...—usually to defeat the minority's preferred candidate"?[10]



Courts must consider four questions when determining whether a state must create a majority-minority district. Gingles *provides the first three prongs,* De Grandy *provides the fourth.*

If the answer to any of these questions is "No," then Section 2 does not require the state to create a majority-minority district.

A negative answer to first prong of the *Gingles* test means that a minority could not have constituted an effective voting majority in any reasonably drawn alternative district, and therefore the minority's voting preferences could not be satisfied under *any* plan. A negative answer to either the second or the third prongs means that there is no "legally significant racially polarized voting" to be remedied—either minority voters have not sufficiently coalesced behind a particular set of candidates or white voters have not usually voted to defeat the candidates preferred by minority voters. As the Court has explained, satisfying the first and second prongs together "establish[es] that the minority has the potential to elect a representative of its own choice in some single-member district," and satisfying the second and third prongs together "establish[es] that the challenged districting [plan] thwarts a distinctive minority vote by submerging it in a larger white voting population. . . . Unless these points are established, there neither has been a wrong nor can be a remedy."[11]

9. The test enunciated in *Gingles* originally applied only to challenges brought against multi-member districting plans. In 1993, however, the Court made clear that the three-pronged *Gingles* test applies to single-member districting schemes as well. *See* Growe v. Emison, 507 U.S. 25, 40 (1993).
10. Gingles, 478 U.S. 30, 51.
11. Growe v. Emison, 507 U.S. 25, 40–41 (citations omitted).

The *Gingles* requirements do not complete courts' Section 2 inquiries. Even if the answer to all three *Gingles* questions is "Yes," the court must still determine whether, under the "totality of circumstances," the minority group has less opportunity than whites to participate in the political process and to elect representatives of its choice. Only when all these conditions are met must a majority-minority district be created. Although courts have considered a variety of circumstances in making this determination,[12] one factor is particularly important: the "proportionality" or lack thereof, between the number of majority-minority districts and the minority's share of the state's relevant population. It would be very difficult, for example, for a minority group to win a Section 2 case if it constituted 20 percent of the population but effectively controlled 30 percent of the state's districts.

The Supreme Court analyzed the proportionality factor in 1994 in *Johnson v. De Grandy*.[13] The Court assumed for the purposes of deciding *De Grandy* that all three of the *Gingles* factors were satisfied, yet it rejected the plaintiffs' Section 2 claim. As the Court explained, the totality of circumstances did not support a finding of dilution because the "minority groups constitute effective voting majorities in a number of . . . districts substantially proportional to their share in the population."[14] Section 2, in other words, does not mandate that a state create the maximum possible number of majority-minority districts.[15] Although rough proportionality

12. For example, courts sometimes consider the following factors, derived from the Senate report accompanying the 1982 amendments to the Voting Rights Act: the extent of any history of official discrimination with respect to the minority's right to vote; the extent to which potentially discriminatory voting practices or procedures, like majority voting requirements or anti–single shot provisions, have been used; if there is a candidate-slating process, whether minority candidates have been denied access to it; the extent of any discrimination against minorities in education or other areas, which might hinder effective participation in the political process; whether political campaigns have been characterized by racial appeals; the extent to which minority group members have been elected to public office; whether there is a lack of responsiveness on the part of elected officials to the minority groups' particularized needs; and whether the policy supporting the use of the voting policy or practice is tenuous. Gingles, 478 U.S. 30, 36–38 (citing Senate Report No. 97-417 (1982)).

13. 512 U.S. 997 (1994).

14. *Id.* at 1024.

15. *Id.* at 1017.

does not automatically protect a state from liability under Section 2, it is a strong "indication that minority voters have an equal opportunity, in spite of racial polarization, 'to participate in the political process and to elect representatives of their choice.'"[16] As Justice O'Connor explained in a separate opinion, proportionality "is *always* relevant evidence in determining vote dilution, but it is *never* itself dispositive."[17]

Although these cases provide a helpful framework for analyzing potential Section 2 claims, many issues concerning the interpretation of Section 2 remain unresolved. Important aspects of these cases were disputed amongst the Justices, and changes in the Court's composition may make it unwise to assume that what has been supported in the past would necessarily receive similar backing today. Even setting aside the changes in the Court's composition, many critical issues have simply never been fully addressed by the highest Court, or have been discussed only in the vaguest terms providing only murky guidance. With respect to the second and third *Gingles* prongs, there are major questions about what constitutes "legally significant racially polarized voting" and what evidence should be used when analyzing it. As for the "fourth prong" enunciated in *De Grandy*, the Court has left open a number of questions relating to the proper measure of "substantial" or "rough" proportionality.

As lower courts have stepped in to fill these voids, they have given different—even conflicting—answers to many of these questions. It is therefore impossible to give a definitive account of what Section 2 requires in every state and in every conceivable circumstance. There is no substitute for consulting the Section 2 case law that applies within one's particular jurisdiction. It is possible, however, to broadly discuss some of the important issues that one should consider when determining whether a plaintiff can bring a viable Section 2 claim.

16. *Id.* at 1020 (citing Voting Rights Act, 42 U.S.C. § 1973).

17. *Id.* at 1025 (O'Connor, J., concurring). In LULAC, the Court reaffirmed that proportionality mitigates against finding a Section 2 violation, while making clear that the proportionality inquiry does not allow a state to "trade off the rights of some members of a racial group against the rights of other members of that group." LULAC, 548 U.S. 399, 437. LULAC holds that the appropriate question under Section 2 is not whether the line-drawing in a plan as a whole dilutes minority voting strength, but whether the line-drawing as to particular districts challenged under that plan dilutes minority voting strength. In other words, the proportionality inquiry does not allow a state to remedy vote-dilution injuries suffered by minorities in one part of a state simply by creating a majority-minority district elsewhere in the state.

B. THE FIRST PRONG OF THE *GINGLES* TEST

The first prong of the *Gingles* test asks whether a minority group is "sufficiently large and geographically compact to constitute a majority" in an alternative single-member district.[18] Consequently, there are two important issues related to the first prong: *numerosity* (in other words, the definition of "sufficiently large") and *geographical compactness*. Although these two issues may in some circumstances be interrelated, they raise distinct legal complications.

1. *Numerosity*

At first glance, the question whether a minority population is "sufficiently large" to constitute a majority in an alternative single-member district seems as if it would be relatively simple to answer. In order to determine the size of a population, however, one must first answer two threshold questions:

- *First,* what is the proper population base—or denominator—that one should use to make the calculation? Should one use the total population of the hypothetical district or some subset of that figure, like voting-age population or the population of *citizens* of voting age?
- *Second*, what percentage of the proper population base constitutes a "majority" for these purposes? Must the minority group simply exceed 50 percent of the given population base, or must it constitute an "effective" voting majority that can actually elect its preferred candidate?

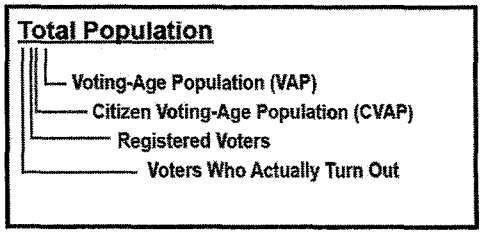
While recent Supreme Court decisions provide significant guidance on these questions, the lower courts retain discretion in choosing the figures that they will use.

a. The Denominator: What Is the Proper Population Base?

There is a wide variety of population bases that courts might use—and have used—to evaluate whether a minority group constitutes a majority

18. Gingles, 478 U.S. 30, 50.

in a district. The options include the total population, the voting-age population (VAP), the population of *citizens* of voting age (CVAP), the population of registered voters, the population of actual voters who turned out in a recent election or set of elections, the population adjusted for growth since the most recent census, and the population adjusted for the alleged undercounting of minorities.



Courts may choose from a wide variety of population bases in answering the question of whether a minority population is "sufficiently large" to constitute a majority in a district.

Of course, selecting one of these methods over another can drastically alter the results and have a dispositive effect on the viability of a plaintiff's claims. In *McNeil v. Springfield Park District,*[19] for example, the Court of Appeals for the Seventh Circuit rejected a Section 2 claim where blacks comprised only 43.7 percent of the voting age population in the plaintiffs' proposed remedial district, even though 50.4 percent of the district's total population was black. As the court explained in its decision, the first prong of the *Gingles* test "roughly measures minority voters' potential to elect candidates of their choice. Because only minorities of voting age can affect this potential, it is logical to assume that the Court intended the majority requirement to mean a voting age majority."[20] Likewise, in *Brewer v. Ham*, the Court of Appeals for the Fifth Circuit explained that because only persons of voting age can vote, "[i]t would be a Pyrrhic victory for a court to create a single-member district in which a minority population dominant in absolute, but not in voting age numbers, continued to be defeated at the polls."[21]

The Supreme Court has not directly resolved which of these population bases should be used in establishing a Section 2 claim,[22] and its opinions have provided mixed signals. In *LULAC v. Perry*,[23] the Court

19. 851 F.2d 937 (7th Cir. 1988).
20. *Id.* at 945.
21. Brewer v. Ham, 876 F.2d 448, 452 (5th Cir. 1989) (quotation marks omitted).
22. *See* De Grandy, 512 U.S. 997, 1008–10 (expressly declining to decide this question).
23. LULAC, 548 U.S. 399, 429.

avoided formally ruling on the broader issue. But the Court did appear to endorse using a population base of voting-age citizens (CVAP). In finding that a proposed plan would not count as an opportunity district (a district where minority voters have the capacity to elect a candidate of their choice), the Court noted that "Latinos to be sure, are a bare majority of the voting-age population . . . but only in a hollow sense, for the parties agree that the relevant numbers must include citizenship. This approach fits the language of Section 2 because only eligible voters affect a group's opportunity to elect candidates."[24] The Court appeared to employ a different standard in the more recent case of *Bartlett v. Strickland*,[25] where the majority opinion consistently referred to voting age population (VAP) without reference to citizenship.[26]

Before the *LULAC* and *Bartlett* decisions, however, a few lower courts had used the overall minority population in assessing the first *Gingles* prong.[27] But, consistent with the Supreme Court's recent decisions, courts will likely use either VAP or CVAP as a measure of a group's population base in deciding claims under Section 2 of the Voting Rights Act. As between VAP and CVAP, where there is a considerable difference between the two figures, the *LULAC* decision suggests that courts should use the more meaningful number incorporating citizenship rates.[28] Some lower courts have long adhered to this rule. For example, in *Cano v. Davis*, the U.S. District Court for the Central District of California noted that "the purpose of the first *Gingles* pre-condition is to determine whether minority voters have the *potential* to form an effective majority district; because non-citizens cannot register to vote . . . they should not be included in the figures used to determine whether an additional district can be drawn in which the minority group would have sufficient voting power to elect an additional representative of choice."[29] This issue will likely be in the forefront of post-2010 redistricting litigation.

24. *Id.*
25. 129 S. Ct. 1231 (2009).
26. *Id.* at 1250 (Souter, J., dissenting).
27. *See, e.g.*, New Rochelle Voter Defense Fund v. City of New Rochelle, 308 F. Supp. 2d 152 (S.D.N.Y. 2003).
28. LULAC, 548 U.S. 399, 429.
29. Cano v. Davis, 211 F. Supp. 2d 1208, 1233–34 (C.D. Cal. 2002) (citing Romero v. City of Pomona, 883 F.2d 1418 (9th Cir. 1989)), *aff'd*, 537 U.S. 1100 (2003); Meza v. Galvin, 322 F. Supp. 2d 52 (D. Mass. 2004); Chen v. City of Houston, 206 F.3d 502 (5th Cir. 2000); Negron v. City of Miami Beach, 113 F.3d 1563, 1568 (11th Cir. 1997); Campos v. City of Houston, 113 F.3d 544, 548 (5th Cir. 1997). *But see* Barnett v. City of Chicago, 969 F. Supp. 1359, 1421 (N.D. Ill. 1997) (rejecting CVAP as a "methodological quagmire"), *aff'd in part and vacated in part*, 141 F.3d 699 (7th Cir. 1998).

b. The Numerator: When Is the Minority Group "Sufficiently Large"?

The first prong of the *Gingles* test asks whether the minority group is "sufficiently large . . . to constitute a [] majority" in a district. But the *Gingles* Court also repeatedly referred to "effective voting majorit[ies]"[30] As a result, there has been some disagreement among lower courts as to the proper definition of "majority" for purposes of *Gingles'* first prong. Can a group constitute an "effective voting majority" even if it accounts for less than 50 percent of the population in a district? Conversely, can a group account for more than 50 percent of the population but still not constitute an "effective voting majority" capable of electing their preferred candidates over the opposition of most of the white voters in the district?

The Court answered the first question in *Bartlett v. Strickland*.[31] Resolving a question that had divided the lower courts for many years, the Court held that in order to satisfy the first *Gingles* factor, a minority group must constitute more than 50 percent of the voting-age population in a proposed majority-minority district. Concerned with developing a judicially manageable standard, the Court held that only upon reaching the 50 percent mark could a minority population qualify as a group capable of electing a candidate of its choice. The Court, with Justice Kennedy writing for the majority, held that "the majority-minority rule relies on an objective, numerical test: Do minorities make up more than 50 percent of the voting-age population in the relevant geographic area? This rule provides straightforward guidance to courts and to those officials charged with drawing district lines to comply with Section 2."[32]

As a result, if a minority group constitutes less than 50 percent of the population in a hypothetical district, it cannot prevail on a Section 2 claim, even if the group would be able to regularly elect the candidate of its choice with the reliable support of "cross-over" white voters. Under

30. *See* Thornburg v. Gingles, 478 U.S. 30, 38.
31. Bartlett v. Strickland, 129 S. Ct. 1231 (2009).
32. *Id.* at 1245.

Bartlett, while legislators remain permitted to draw such cross-over districts, they are not required by the Voting Rights Act to do so.[33]

Bartlett made clear that a numerical majority is a necessary condition for satisfying *Gingles'* first prong, but it did not resolve the question of how much beyond a mere numerical majority-minority voters must be in a district in order to elect their candidate of choice. If, for example, white voters are more cohesive than black voters, the threshold for an effective majority could be substantially greater than 50 percent. As one court explained, an opportunity district is "one in which a black majority has a practical opportunity to elect the candidate of its choice. A simple majority is not always sufficient to provide this opportunity."[34]

A numerical majority may also fail to be an "effective" majority if the population is based on some criteria other than actual voters. Assume, for example, that whites and blacks are equally cohesive, but that a higher percentage of blacks are not registered to vote, have higher non-voting age percentages, or are unable to make it to the polls on Election Day. Under these circumstances, blacks may account for more than half the voting age population in a district, yet the actual electorate may be majority white and capable of regularly defeating black-preferred candidates. Courts receptive to this argument have evaluated minority voting strength using adjusted figures: beginning with a simple majority (50 percent plus one voter) and adding 5 percent for lower turnout, 5 percent for lower voter registration figures, and 5 percent for the larger number of non-voting age residents. This yields an adjusted required majority of 65 percent, using total population as the denominator.[35] Where data on voting age population is available, some

33. Similarly, in *LULAC v. Perry* the Court found that influence districts are not required by Section 2. These districts are areas where a minority group, although too small to control an election, is of sufficient size to "influence" the politics of the district in some way or to influence the representative who will ultimately be elected from the district, even though most members of the minority group will have voted against that representative. The Court found that "while the presence of districts 'where minority voters may not be able to elect a candidate of choice but can play a substantial, if not decisive, role in the electoral process' is relevant to the § 5 analysis, the lack of such districts cannot establish a § 2 violation." LULAC, 548 U.S. 399, 446 (internal citations omitted).

34. African Am. Voting Rights Legal Defense Fund, Inc. v. Villa, 54 F.3d 1345, 1348 n.4 (8th Cir. 1995).

35. Ketchum v. Byrne, 740 F.2d 1398, 1413 (7th Cir. 1984).

courts have used 60 percent of the VAP as the basis to analyze minority voting strength.[36] These standards have never been litigated before the Supreme Court, and, at least in this rough form, may be obsolete in the face of increasingly sophisticated data.

2. Compactness

In addition to asking whether a minority group is "sufficiently large," the first prong of the *Gingles* test also asks whether a minority group is "sufficiently . . . geographically compact" to constitute a majority in a new district. In *LULAC v. Perry*,[37] the Supreme Court clarified that *Gingles'* compactness requirement applies to plaintiffs and states alike. As part of a challenged redistricting plan, Texas had dismantled a pre-existing, geographically compact majority-minority Latino congressional district, and replaced it with a district that stretched more than 300 miles that combined two geographically separated groups of Latinos with divergent needs and interests. *LULAC* held that, just as a minority group must demonstrate they are sufficiently large and geographically compact to constitute a majority in a district, a state similarly cannot dismantle a compact majority-minority district and remedy the Section 2 violation by replacing it with "a district that combines two far flung segments of a racial group with disparate interests."[38]

For some time, there have been two competing definitions of compactness. Some advocates think of "compactness" as a question of geometry. These advocates, whether they use a mathematical formula or they "eyeball" it, analyze a district's compactness in terms of its shape on a map. In particular, they are likely to focus on the regularity or jaggedness of the district's edge and the degree to which the district's territory is dispersed around its center. The smoother a district's border, and the more its shape resembles a square or a circle rather than a spider or a string bean, the more likely it will be deemed "compact" under this view.

Others take a more "functional" approach to compactness, which analyzes the distribution of a district's population in relation to such

36. *See* Campuzano v. Ill. State Bd. of Elections, 200 F. Supp. 2d 905, 910 (N.D. Ill. 2002); Jeffers v. Clinton, 756 F. Supp. 1195, 1198–99 (E.D. Ark. 1990), *aff'd*, 498 U.S. 1019 (1991); United States v. Euclid City School Bd., 632 F. Supp. 2d 740, 768–69 (N.D. Ohio 2009).

37. League of United Latin American Citizens v. Perry, 548 U.S. 399 (2006).

38. *Id.* at 433.

features as topography (mountain ranges, rivers, bays, etc.), lines of communication and transportation, recognized neighborhoods, and local government boundaries. This approach asks whether candidates or legislators could explain to their constituents the boundaries of their districts in simple, common-sense terms, based on recognizable geographic referents. An example might be a district containing a particular and easily recognized part of a county with discernable borders. Under a functional notion of compactness, the question is not whether the district is aesthetically pleasing when viewed "vertically" (as on a map), but whether it makes sense to the person on the street, looking "horizontally."

Compactness is measured differently in Section 2 cases than in racial-gerrymandering cases brought under the Fourteenth Amendment. In racial-gerrymandering cases, the Court has at times referred to geometric shape and objective measures of jaggedness and dispersion, and at other times focused on whether the use of race subordinated other more functional concerns, such as respect for city and county lines and for recognizable communities of interest.[39] But *LULAC* held that—unlike the racial-gerrymandering cases, which focus on the shape of the district—the "first *Gingles* condition refers to the compactness of the minority population, not to the compactness of the contested district."[40]

The Court in *LULAC* noted that "no precise rule has emerged governing Section 2 compactness" but emphasized the need to recognize several of the non-geographic factors.[41] For example, the Court emphasized the importance for compactness of shared political and cultural interests in addition to geographic concerns. Seeking to avoid racial essentialism—the idea that members of a particular minority group automatically share identical views—the Court noted that there are divergent interests even within groups that are racially or ethnically homogenous. Justice Kennedy declared that if the Court did not account for the differences between people of the same race it would do a disservice to the Voting Rights Act's dual goals of preventing electoral discrimination and "foster[ing] our transformation to a society that is no longer fixated on race."[42] In deciding that one of the challenged majority-minority districts could not remedy a Section 2 violation, the *LULAC* majority "emphasize[d]" that it was not only the

39. See the discussion in Chapter 5 on compactness in the context of *Shaw*-type racial gerrymandering claims.
40. 548 U.S. 399, 433 (quotation marks omitted).
41. *Id.*
42. *Id.* at 434 (citing Georgia v. Ashcroft, 539 U.S. 461, 490 (2002)).

"enormous geographical distance" separating two communities that had been joined together, but also "the disparate needs and interests of these populations—not either factor alone—that renders [the challenged district] noncompact for Section 2 purposes."[43]

The compactness standard of the first *Gingles* prong, therefore, includes both geographic factors, traditional non-geographic components like historical boundaries and man-made elements, and an awareness of communities of interest, even within recognized minority groups. In practice, it is possible the cultural and political concerns will largely be swallowed by geographic considerations, but where such cleavages exist within minority communities, they may prove important.

C. THE SECOND AND THIRD PRONGS: RACIALLY POLARIZED VOTING

The second and third prongs of the *Gingles* test—minority political cohesiveness and white bloc voting—together form the inquiry into racially polarized voting. Racial polarization exists, the Court explained in *Gingles,* "where there is a consistent relationship between [the] race of the voter and the way in which the voter votes . . . or to put it differently, where black voters and white voters vote differently."[44] Although the first prong of the *Gingles* test is critical, racially polarized voting has been described as the "linchpin" and the "true test" of vote dilution claims.[45] If there is no racially polarized voting, "it cannot be said that the ability of minority voters to elect their chosen representatives is [less than] that of white voters."[46]

1. *Statistical Methods for Identifying Racially Polarized Voting*

The inquiry into racially polarized voting typically entails the use of complex statistical analysis. Traditionally, courts relied upon two statistical methods to examine the question of polarization: "homogeneous precinct analysis" and "bivariate ecological regression analysis." In recent years, courts have begun to adopt a third method: "ecological in-

43. *Id.* at 435.
44. Gingles, 478 U.S. 30, 53 n.21 (internal quotation marks omitted; bracket in original).
45. *Id.* at 93 (O'Connor, J., concurring in the judgment).
46. *Id.* at 48 n.15

ference," sometimes referred to as "King's EI."[47] Each of these methods allows experts, using aggregate data, to draw certain conclusions about voting preferences of groups of voters—specifically, how members of particular racial or ethnic groups cast their ballots. Because the secret ballot prevents the tabulation of electoral data at the individual level, voting behavior typically must be inferred from precinct-level electoral data.

Homogeneous precinct analysis is simply the tallying of votes cast in precincts overwhelmingly populated by members of one racial or ethnic group. For example, one could get some idea of how white voters are voting by looking only at overwhelmingly white precincts, and one could then do the same for overwhelmingly black or Hispanic precincts. If, to take one extreme and entirely hypothetical example, everyone in a state lived in an all-white, an all-black, or an all-Hispanic precinct, one could simply add up the results of each of these three types of precincts and achieve a perfect understanding of how members of the three different groups voted. Conversely, if everyone in the state lived in a precinct in which the racial and ethnic composition was precisely the same as the statewide average, it would be impossible to draw any conclusion about the voting behavior of whites, blacks, and Hispanics by conducting a homogeneous precinct analysis.

Of course, in reality, every jurisdiction is somewhere in between—neither perfectly segregated nor perfectly integrated. Therefore, political scientists and other experts typically use a more sophisticated form of analysis, known as bivariate ecological regression analysis, to estimate voting behavior by race. Like homogeneous precinct analysis, bivariate ecological regression discerns relationships between the racial composition of voting precincts and the total votes cast for each candidate in those precincts. Unlike homogeneous precinct analysis, it takes into consideration data from all precincts, not just those that are overwhelmingly populated by members of one racial or ethnic group.

Though many courts have continued to rely upon a combination of homogenous precinct analysis and ecological regression,[48] and some courts (including the Supreme Court) appear in some cases to have used only

47. In reference to the method's originator, Harvard professor and statistician Gary King.

48. *See, e.g.,* Rodriguez v. Bexar County, 385 F.3d 853, 865–66 (5th Cir. 2004); United States v. Blaine County, 363 F.3d 897, 915 n.27 (9th Cir. 2004); Rural W. Tenn. African Am. Affairs Council v. Sundquist, 209 F.3d 835, 839 (6th Cir. 2000).

regression or only ecological inference,[49] many courts have moved to relying upon a combination of all three statistical methods. Several courts have found evidence gleaned from using all three of these methods more convincing than that produced by using only one.[50] Courts have avoided adopting a strict guideline for the use of these methodologies, both for selecting amongst them and in acting upon the statistical conclusions they produce. As one court stated:

> It is important to keep in mind . . . that the court's job is to assess the broader legal principles described in *Gingles*; it is neither to be wedded to, or hamstrung by, blind adherence to statistical outcomes. Statistics are tools to aid the Court's analysis. There are no bright line absolutes to which this Court must adhere in assessing the question of whether racial bloc voting existed...As a result, while courts have found certain particular statistical or mathematical outcomes to be compelling evidence *in the context of the cases before them,* no decision out of either the Supreme Court or the Sixth Circuit (or any other Circuit for that matter) requires the use of a particular statistical methodology, or demands a particular statistical outcome before a court may conclude that racial bloc voting exists.[51]

In the absence of strict guidelines, these methods often are the subject of contentious litigation and "battles of the experts."

49. *See, e.g., LULAC*, 548 U.S. 399, 467; Old Person v. Cooney, 230 F.3d 1113, 1122–27 (9th Cir. 2000) (using only regression); Cottier v. City of Martin, 466 F. Supp. 2d 1175 (D.S.D. 2006) (appearing to use only ecological inference).

50. *See* Levy v. Lexington County, No. 03-3093, 2009 U.S. Dist. LEXIS 13385 (D.S.C. Feb. 19, 2009) (noting that the court found the use of homogeneous precinct, ecological regression, and ecological inference [EI] more reliable than analysis using EI alone); United States v. City of Euclid, 580 F. Supp. 2d 584, 598 (N.D. Ohio 2008) (endorsing an expert's view that "while King's EI method is an improvement upon HPA [homogeneous precinct analysis] and BERA [bivariate ecological regression analysis], it does not replace these two traditional methods. Instead, experienced political scientists use all three methods, not only to estimate voting behavior, but as a method for cross-checking the reliability of estimates.").

51. 580 F. Supp. 2d 584, 596.

Aside from these methodological matters, there are a host of important questions relating to the racially polarized voting inquiry for which courts have given varied and inconsistent answers. Courts have often used statistical findings as a place to commence their analysis rather than relying on those findings to reach a conclusion. Anecdotal evidence is often used to supplement statistical findings.[52]

2. What Is "Minority Political Cohesiveness"?

Courts have voiced some disagreement with respect to what constitutes "minority political cohesiveness" under *Gingles*' second prong. In *Gingles*, the Supreme Court declared that one purpose of the inquiry into racially polarized voting is "to ascertain whether minority group members constitute a politically cohesive unit. . . . A showing that a significant number of minority group members usually vote for the same candidates," the Court explained, "is one way of proving the political cohesiveness necessary to a vote dilution claim."[53]

Following this suggestion from the Supreme Court, most lower courts have limited their political-cohesiveness inquiries to a study of voting patterns. As the Court of Appeals for the Ninth Circuit stated in *Gomez v. City of Watsonville*,[54] an inquiry into political cohesiveness should be directed at "whether the minority group has expressed clear political preferences that are distinct from those of the majority" and should be "judged primarily on the basis of the voting preferences expressed in actual elections."[55] An indication of minority cohesion exists when there has been sustained minority support for candidates in past elections, though courts sometimes disagree on whether support for minority candidates warrants special attention.

Although many courts rely on statistical evidence of voting patterns,[56] others have stated that the inquiry into cohesiveness "'does not stop with

52. *See, e.g.*, *id.* at 600–01; Whitfield v. Democratic Party of Ark., 890 F.2d 1423, 1428 (8th Cir. 1989); Rural W. Tenn., 209 F.3d 835, 844; Askew v. City of Rome, 127 F.3d 1355, 1377 (11th Cir. 1997).

53. Gingles, 478 U.S. 30, 56; *see also* Jamison v. Tupelo, 471 F. Supp. 2d 706 (N.D. Miss. 2007); Bone Shirt v. Hazeltine, 336 F. Supp. 2d 976 (D.S.D. 2004).

54. 863 F.2d 1407 (9th Cir. 1988).

55. *Id.* at 1415.

56. Bone Shirt v. Hazeltine, 336 F. Supp. 2d 976 (D.S.D. 2004) (proving this factor typically requires statistical evaluation of elections).

bare statistics.'"[57] A few courts have been willing to entertain evidence beyond voting preferences to determine whether a minority group has distinctive group interests.[58] In *Sanchez v. Bond*,[59] for instance, the Court of Appeals for the Tenth Circuit affirmed a district court's finding that Hispanics in Saguache County, Colorado, were not politically cohesive. Although statistical evidence indicated that voting was racially polarized, the district court relied on testimony by a single lay witness that Hispanics had "differing political objectives."[60] As the court explained, there is "nothing in *Gingles* . . . to suggest that a trial court is *prohibited* from considering lay testimony in deciding whether a minority group is politically cohesive."[61] Another court has held that "[e]vidence that 'a specified group of voters share common beliefs, ideals, principles, agendas, concerns, and the like such that they generally unite behind or coalesce around particular candidates and issues, demonstrates cohesion.'"[62]

Complicating matters further, there is some disagreement—even among courts that focus solely on election data—about what level of voting alignment constitutes political cohesiveness. The Supreme Court's use of the term "significant number" in *Gingles* did not clarify matters much. Courts face many of the same problems in this assessment that, as we will discuss below, plague them in evaluating minority preferred candidates. Some courts, for instance, have required a showing that 60 percent of minority group members vote together for the same candidates in a two-way race; other courts have not adopted such a standard.[63] When there are three or more candidates in the field, the issue becomes more complicated, and courts have not reached consensus on how best to determine minority political cohesion in such contests.

Similarly, the question of political cohesiveness is significantly more complicated in regions with more than one minority group. In these cases,

57. *Id.* at 1004 (quoting Whitfield, 890 F.2d at 1428).

58. *See* Monroe v. City of Woodville, 881 F.2d 1327, 1331 (5th Cir. 1989); Houston v. Haley, 859 F.2d 341, 346 (5th Cir. 1988).

59. 875 F.2d 1488 (10th Cir. 1989).

60. *Id.* at 1496.

61. *Id.* at 1493.

62. Bone Shirt, 336 F. Supp. 2d 976, 1004 (quoting League of United Latin Am. Citizens, Council No. 4434 v. Clements, 986 F.2d 728, 744 (5th Cir. 1993)); *see also* Askew NAACP v. City of Rome, 127 F.3d 1355, 1377 (11th Cir. 1997) (both empirical and anecdotal evidence demonstrated cohesion).

63. *See, e.g.*, Marylanders for Fair Representation, Inc. v. Schaefer, 849 F. Supp. 1022, 1056 (D. Md. 1994) (three-judge court).

courts have grappled with the question of what kind of evidence must be shown to prove that the two different minority groups—African-Americans and Hispanics, for example—are politically cohesive not only internally, but also with each other. As in other areas, courts have reached differing conclusions regarding cohesiveness between minority groups.[64]

3. What Evidence Does a Court Use to Determine Racial Polarization?

Courts also have failed to reach a consensus about what data set to use when evaluating the degree of racial polarization in a community. In determining whether a white majority votes sufficiently as a bloc "to enable it . . . usually to defeat the minority's preferred candidate," it is necessary first to answer several preliminary questions, including: how to determine the minority's preferred candidate (specifically, whether the races of the candidates are relevant), whether to examine elections for offices other than the one at issue, and how many past elections should be considered. These questions are crucial in Section 2 cases because their answers will often dictate the conclusions reached. As one court put it in discussing the plaintiffs' and defendants' experts: "Their conclusions differed because of the differences in the statistical evidence they chose to evaluate."[65]

a. How Does One Determine the Minority-Preferred Candidate?

To determine whether minority-preferred candidates are usually defeated, it is necessary first to determine the identity of the minority-preferred candidates. As one court has stated, "[a]scertaining whether legally significant white bloc voting exists begins with identification of the minority members' 'preferred candidates' or 'representatives of choice.'"[66] In identifying the preferred candidate, courts have taken different approaches on two key issues. *First*, courts have not agreed on whether a candidate's

64. Samuel Issacharoff, *Groups and the Right to Vote*, 44 EMORY L.J. 869, 886 n.81; LULAC v. Perry, 548 U.S. 399 (2006); Note, *The Ties That Bind: Coalitions and Governance Under Section 2 of the Voting Rights Act*, 117 HARV. L. REV. 2621, 2629 (2004); Campos v. City of Baytown, 840 F.2d 1240, 1244–45 (5th Cir. 1988).

65. S. Christian Leadership Conference v. Sessions, 56 F.3d 1281, 1293 n.23 (11th Cir. 1995) (en banc).

66. Collins v. City of Norfolk, 883 F.2d 1232, 1237 (4th Cir. 1989).

race is relevant to the determination. *Second*, among those courts that have held that any candidate, regardless of race, can be minority-preferred, there has been disagreement as to what evidence should be used to determine minority preference.

Gingles did not settle whether and to what extent the race of a candidate is relevant to the inquiry into minority preference. Justice Brennan's opinion in *Gingles* expressly stated that "it is the *status* of the candidate as the *chosen representative of a particular racial group,* not the race of the candidate, that is important"[67]—but this section of his opinion did not garner a majority of the Justices' votes. Even with respect to the plurality opinion, all of the evidence that Justice Brennan relied upon in affirming the lower court's finding of vote dilution pertained to elections in which black candidates had competed against white candidates.[68]

Consistent with *Gingles*, the lower courts have found that the minority-preferred candidate can sometimes be a white candidate. For example, in *Ruiz v. City of Santa Maria*, the Ninth Circuit joined other courts in "rejecting the position that the 'minority's preferred candidate' must be a member of the racial minority. To hold otherwise would . . . provide judicial approval to 'electoral apartheid.'"[69] But most courts have not adopted Justice Brennan's position that the candidate's race is completely irrelevant, and have found that the race of candidates can be relevant in identifying minority-preferred candidates.[70] Some courts require a lower quantum of evidence to demonstrate that a minority candidate is minority-preferred,[71] while others have held minority and non-minority candidates to the same evidentiary standard.[72]

67. Gingles, 478 U.S. 30, 68 (1986) (plurality opinion).

68. *Id.* at 41, 59–60, 80–81 (appendices).

69. Ruiz v. City of Santa Maria, 160 F.3d 543, 551 (9th Cir. 1998) (internal citations omitted).

70. *See, e.g., id.* at 551 ("Most circuits have rejected Justice Brennan's position on the lack of importance of a candidate's race.").

71. For discussion of such cases, *see* Ellen Katz et al., *Documenting Discrimination in Voting: Judicial Findings Under Section 2 of the Voting Rights Act Since 1982*, 39 U. MICH. J. L. REFORM 643, 666 n.111 (2006) (citing Sanchez v. Colorado, 97 F.3d 1303, 1320–21 (10th Cir. 1996); Jenkins v. Red Clay Consol. Sch. Dist. Bd. of Educ., 4 F.3d 1103, 1129 (3d Cir. 1993); De Grandy v. Wetherell, 815 F. Supp. 1550, 1572–73 (N.D. Fla. 1992); Citizens for a Better Gretna v. City of Gretna, 636 F. Supp. 1113, 1133 (E.D. La. 1986), *aff'd*, 834 F.2d 496 (5th Cir. 1987)).

72. *See, e.g.*, Ruiz, 160 F.3d 543, 549–50; Lewis v. Alamance County, 99 F.3d 600, 615 (4th Cir. 1996); Gomez v. City of Watsonville, 863 F.2d 1407,

Courts that have been reluctant to identify white candidates as minority-preferred have expressed uncertainty about whether the white candidate supported by minority voters represents their considered preference, and whether the capacity to elect a candidate of choice, as long as that candidate is white, demonstrates an absence of racial polarization. As one court explained, "when there are only white candidates to choose from[,] it is virtually unavoidable that certain white candidates would be supported by a large percentage . . . of black voters."[73] Some courts thus have held that elections in which only white candidates participate (white-versus-white races) should not be considered at all in determining whether voting patterns exhibit legally significant racial polarization because minority voters cannot be said to have truly equal electoral opportunity if they can elect only their favorite *white* candidates. As one court stated:

> When white bloc voting is 'targeted' against [minority] candidates, [minority] voters are denied an opportunity enjoyed by white voters, namely the opportunity to elect a candidate of their own race. If [minority] voters nevertheless are able to elect many or most of their preferred candidates who are white, a court that refuses to consider candidate race will be unable to conclude that the white majority votes sufficiently as a bloc to enable it . . . *usually* to defeat the minority's preferred candidate. . . . But the Act's guarantee of equal opportunity is not met when, . . . 'candidates favored by [minorities] can win, but only if the candidates are white.'"[74]

Most courts have opted for a middle ground, refusing to exclude white-versus-white elections altogether, but giving more weight to elections involving minority candidates.[75] In making these assessments, courts

1416 (9th Cir. 1988); Black Political Task Force v. Galvin, 300 F. Supp. 2d 291, 303 (D. Mass. 2004), *aff'd*, 543 U.S. 997 (2004); Rodriguez v. Pataki, 308 F. Supp. 2d 346, 388–89 (S.D.N.Y. 2004); Armour v. Ohio, 775 F. Supp. 1044, 1057 (N.D. Ohio 1991).

73. Westwego Citizens for a Better Gov't v. City of Westwego, 872 F.2d 1201, 1208 n.7 (5th Cir. 1989) (internal quotation marks omitted; ellipsis in original); *see also* Lewis v. Alamance County, 99 F.3d 600, 605 (4th Cir. 1996).

74. Ruiz, 160 F.3d 543, 552 (alternations in original; third ellipsis added; citation omitted).

75. Rural W. Tenn., 209 F.3d 835, 840–41; Davis v. Chiles, 139 F.3d 1414, 1417 & n.5 (11th Cir. 1998); Sanchez, 97 F.3d 1303, 1320–21; Uno v. City of

have taken several different approaches. Some courts have looked not only at electoral results but also at additional factors, such as minority financing of candidates, the extent to which candidates campaigned in minority areas, and the reasons minority candidates might not have run in the election.[76] Others have explicitly rejected this approach and use an objective test that considers only which candidate receives the most votes from minority voters.[77] In practice, many courts do not hold to a strict division between these approaches, relying on elements of both.[78]

Courts have also faced difficulties in deciding how to weigh and assess primary elections and multi-candidate elections when identifying the minority-preferred candidate. Some courts have used primary elections as a way of assessing minority-preferred candidates, especially when these elections represent some of the only competitive races in a district, or when there is reason to believe minority support for a candidate in a general election is premised upon party support (see discussion below on causation).[79] Courts that do so often hold that a general-election candidate supported by a minority group is not necessarily the minority group's choice if another candidate receiving much more support from that minority group failed to advance to the general election.[80] Some courts, however, avoid relying upon party primaries, fearing that the voters who participate in primary elections differ from voters in general election.[81]

Holyoke, 72 F.3d 973, 981, 988 n.8 (1st Cir. 1995); S. Christian Leadership Conf., 56 F.3d 1281, 1303; Clarke v. City of Cincinnati, 40 F.3d 807, 812 (6th Cir. 1994); Nipper v. Smith, 39 F.3d 1494, 1540 (11th Cir. 1994) (en banc); Jenkins v. Red Clay School Dist., 4 F.3d 1103, 1125–29 (3d Cir. 1993); Magnolia Bar Ass'n v. Lee, 994 F.2d 1143, 1149 (5th Cir. 1993). It is not uncommon for a court, despite declaring that white-versus-white elections are potentially relevant, to consider only elections involving minority candidates. *See, e.g.*, Gomez v. City of Watsonville, 863 F.2d 1407 (9th Cir. 1988); City of Carrollton Branch of the NAACP v. Stallings, 829 F.2d 1547 (11th Cir. 1987).

76. *See, e.g.*, Sanchez, 97 F.3d 1303, 1320–21; Jenkins, 4 F.3d 1103, 1129.

77. Ruiz, 160 F.3d 543, 552.

78. Ellen Katz et al., *supra* note 71, at 667 & n.118.

79. *See, e.g.*, Black Political Task Force v. Galvin, 300 F. Supp. 2d 291, 305–06 (D. Mass. 2004).

80. Ruiz, 160 F.3d 543, 551.

81. Katz et al., *supra* note 71, at 670 n.134.

b. Should One Look at Results from "Exogenous" Elections?

Another issue that arises in the context of the polarized-voting inquiry is whether a court should consider election results from races for different offices than those at issue—and, if so, whether the electorate for the two offices can differ without making the evidence irrelevant. For example, in a case involving a state legislative district, should a court consider the vote in a gubernatorial election in the district? Or can it look to the results of the presidential election? The relevance of such "exogenous" elections is especially important where a court considers only campaigns involving white candidates, since there may not have been enough minority candidacies for the office at issue to conduct an adequate statistical analysis of racial bloc voting.

Some courts have refused to consider "exogenous" elections in Section 2 cases.[82] Others have allowed such elections to play only a very minimal role in the court's deliberation.[83] Many courts have allowed evidence from exogenous elections while noting that these elections are less probative of the ability of minority candidates to elect the candidate of their choice.[84] And a few courts have placed a great deal of weight on the exogenous elections.[85]

82. *See, e.g.*, City of Carrollton Branch of the NAACP, 829 F.2d 1547, 1560.

83. *See, e.g.*, Smith v. Clinton, 687 F. Supp. 1310, 1317 (E.D. Ark. 1988) ("Nor are we persuaded by evidence of some success by black candidates in school-board elections or other local races, because the electoral structure at issue here has no effect on these candidates.").

84. *See, e.g.*, NAACP v. Fordice, 252 F.3d 361, 370 (5th Cir. 2001) (stating that "Wilson correctly observes that exogenous elections are less probative than elections for the particular office at issue, but he fails to fully address the critical evidentiary reality that 'the exogenous character of . . . elections does not render them nonprobative . . . .'" (quoting Rangel v. Morales, 8 F.3d 242, 247 (5th Cir. 1993) (alteration in original)); *see also* Rural W. Tenn., 209 F.3d 835, 841 (discounting the results of exogenous elections, and instead relying primarily on the results of 10 recent endogenous elections involving both black and white candidates); Clark v. Calhoun County, 88 F.3d 1393, 1397 (5th Cir. 1996) (stating that results of exogenous elections are "less probative" and of "limited relevance").

85. *See, e.g.*, Meza v. Galvin, 322 F. Supp. 2d 52, 69 (D. Mass. 2004) (finding that evidence of a successful senate and city council run by Hispanic candidates suggested that plaintiffs had failed to sufficiently demonstrate bloc voting on the part of the majority); Garza v. County of Los Angeles, 756 F. Supp. 1298, 1335–36 (C.D. Cal. 1990) (relying primarily on exogenous rather than endogenous elections, where "relatively marginal" Hispanic candidates had repeatedly failed to gain significant minority support, to make a finding of Hispanic political cohesiveness).

In general, courts have endorsed a "flexible approach to the evidence."[86] These courts have considered the results of exogenous elections where the available data are otherwise sparse or where the exogenous elections involve minority candidates.[87] In *Citizens for a Better Gretna v. City of Gretna*[88] for instance, the Fifth Circuit considered evidence from two statewide races involving black candidates—Jesse Jackson's 1984 bid for the Democratic presidential nomination and a 1979 election for Louisiana's Secretary of State—because the court had statistical data for only two alderman seat elections in which black-preferred candidates had competed.[89] Whether exogenous elections should be considered will likely become a hotly disputed issue during the upcoming redistricting cycle as parties dispute the significance of, and the data regarding, the election of President Obama.

c. How Many Elections Should Be Analyzed?

Another question related to the reliability of the data used in the racially polarized voting inquiry is how many past elections a court should consider. This decision turns on two factors that are at cross-purposes. On the one hand, more electoral results means more data, which in turn means more reliable statistical conclusions. On the other hand, circumstances often change over time, so the information gleaned from old elections may no longer be probative.

In *Gingles*, the Supreme Court stated a clear preference for data spanning some significant period of time. "Because loss of political power through vote dilution is distinct from the mere inability to win a particular election," the Court explained, "a pattern of racial bloc voting that extends over a period of time is more probative . . . than are the results of a single election."[90] In *Gingles* itself, the Court rested its conclusion pri-

86. Jenkins, 4 F.3d 1103, 1134.

87. Goosby v. Town Bd. of Town of Hempstead, 180 F.3d 476, 497 (2d Cir. 1999); Sanchez, 97 F.3d 1303, 1324–25; Clark v. Calhoun County, 88 F.3d 1393, 1397 (5th Cir. 1996); S. Christian Leadership Conf. v. Sessions, 56 F.3d 1281, 1293 (11th Cir. 1995); Jenkins, 4 F.3d 1103, 1134.

88. 834 F.2d 496 (5th Cir. 1987).

89. *Id.* at 502 & n.15.

90. Gingles, 478 U.S. 30, 57 (citation omitted).

marily on the basis of three election cycles.[91] But, the Supreme Court added, the number of elections that must be studied "will vary according to pertinent circumstances."[92] For instance, "where a minority group has begun to sponsor candidates just recently," only a few elections may be available for examination.[93]

Courts' experiences since *Gingles* have made clear that the number of years examined will vary depending on the circumstances. In *Jenkins v. Red Clay Consolidated School District Board of Education*,[94] the Court of Appeals for the Third Circuit looked as far back as 10 years to analyze several election cycles.[95] In *Gretna*, meanwhile, the Fifth Circuit rested its decision on evidence from only two elections.[96]

How far back a court will go in analyzing election results may ultimately turn on whether a court has "multiple electoral contests" to analyze. If there are multiple *recent* electoral contests (whether "exogenous" or "endogenous") available for analysis, it is less likely that a court will look to the past. Where, however, there are fewer recent elections to examine, a court is more likely to resort to such history.[97]

4. What Constitutes "Legally Significant" Racially Polarized Voting?

As the *Gingles* test makes clear, a successful Section 2 claim entails more than mere racially polarized voting. The racial polarization must be "legally significant." There are at least two questions related to the concept of "legal significance." *First*, can the *reasons* underlying the racial polarization ever be relevant to a vote dilution inquiry? That is, should evidence that racial polarization is due to factors other than race defeat a vote dilution claim? *Second*, what degree of racial-bloc voting must exist for a successful vote dilution claim? At what point is white-bloc voting so great that it will "usually . . . defeat the minority's preferred candidate?"

91. *Id.* at 80–81 (appendices).
92. *Id.* at 57 n.25.
93. *Id.* The court also stressed that the *Gingles* test sometimes can be satisfied even if *some* elections were not racially polarized.
94. 4 F.3d 1103 (3d Cir. 1993).
95. *Id.* at 1130.
96. Gretna, 834 F.2d 496, 502–03.
97. *See, e.g.*, Hines v. Mayor and Town Council of Ahoskie, 998 F.2d 1266, 1272 (4th Cir. 1993); Baird v. Consol. City of Indianapolis, 976 F.2d 357, 359 (7th Cir. 1992).

a. Are the Reasons for Racial Polarization Relevant?

On its face, the *Gingles* test does not seem to require that race be the sole cause of racially polarized voting. Nevertheless, judges—including Supreme Court Justices—have reached different conclusions with respect to whether evidence of the reasons for racial polarization is relevant.[98] In a section of *Gingles* that commanded only four Justices' votes, Justice Brennan endorsed the view that the reasons for racial polarization have no bearing on the Section 2 inquiry.[99] However, Justice O'Connor, writing for herself and three other Justices, reached a different conclusion. Justice O'Connor argued that evidence that a minority-preferred candidate was rejected by white voters for reasons other than race "would seem clearly relevant in answering the question whether bloc voting by white voters will consistently defeat minority candidates. Such evidence would suggest that another candidate, equally preferred by the minority group, might be able to attract greater white support in future elections."[100]

Lower courts have taken a number of approaches when considering the role of causation in evaluations of racially polarized voting. At least nine circuit courts of appeals consider the reasons for racial polarization, either implicitly or explicitly.[101] And a number of courts have held that a plaintiff cannot win a Section 2 case where racially polarized voting is caused by reasons other than racial animus.[102] These courts highlight the fact that Section 2 speaks of the denial or abridgement of the right to vote "*on account of race or color*" (emphasis added). In considering causation, most courts do not require plaintiffs to disprove that factors other than race caused divergent voting patterns, but instead require plaintiffs to demonstrate that voting patterns have a causal linkage to race when defendants proffer evidence supporting an alternative explanation.[103]

It can be difficult to demonstrate that race is the underlying cause of racial polarization, especially because minority voting patterns often track

98. The Eleventh Circuit has considered the issue twice, only to split evenly on both occasions. *See* Solomon v. Liberty County, 899 F.2d 1012 (11th Cir. 1990) (en banc); Nipper v. Smith, 39 F.3d 1494 (11th Cir. 1994) (en banc).
99. Gingles, 478 U.S. 30, 61–64 (plurality opinion).
100. *Id.* at 100 (O'Connor, J., concurring in the judgment).
101. *See* Ellen Katz et al., *supra* note 71, at 671 n.138 (collecting cases).
102. *E.g.*, Clarke v. City of Cincinnati, 40 F.3d 807, 812–14 (6th Cir. 1994); LULAC v. Clements, 999 F.2d 831, 850–54 (5th Cir. 1993) (en banc).
103. *See* Ellen Katz et al., *supra* note 71, at 671 (discussing cases).

partisan voting. One of the strongest determinants of voting behavior, other than race, is a voter's party identification. Thus, a court may question whether party affiliation, rather than race, explains differences in the voting patterns of white and minority voters. For example, political party affiliation may in part explain minority voters' preferences for a minority Democrat running against a white Republican. And in some areas, race and party affiliation may be so closely correlated that it is difficult to separate the two. One possible way to control for the effect of party identification is to analyze results from party primary elections, as discussed earlier, where presumably all the voters share the same partisan leanings. But the connection between race and party may be too complex to assess merely by examining primary elections.

b. What Degree of Racial Bloc Voting Is Legally Significant?

The *Gingles* test requires a certain degree of racial bloc voting before it is considered "legally significant." The Court explained that this "legally significant" threshold is intended to distinguish between structural vote dilution and the "mere loss of an occasional election."[104] "[I]n general, a white bloc vote that normally will defeat the combined strength of minority support plus white 'crossover' votes rises to the level of legally significant white bloc voting."[105] The Court in *Gingles*, however, refused to specify the point at which racially polarized voting would become legally significant and stated that there is "no simple doctrinal test for the existence of legally significant racial bloc voting."[106] Rather, the Court explained that legal significance would vary "from district to district" and "according to a variety of factual circumstances."[107]

Unfortunately, the law is not clear on what constitutes legally significant bloc voting.[108] As one court put it, "The level of white bloc voting sufficient to defeat a minority preferred candidate varies according to a variety of factual circumstances. Thus, no mathematical formula or simple doctrinal test is available to determine whether plaintiffs satisfied the third factor."[109]

104. Gingles, 478 U.S. 30, 51 (1986).
105. *Id.* at 56.
106. *Id.* at 58.
107. *Id.* at 55–56, 58.
108. Yet another issue that courts have grappled with is how the third prong defines the word "usually" in the phrase "usually to defeat the minority's preferred candidate." Contrary to the everyday meaning of the word, some courts have stated that "usually" means "something more than just 51%." Lewis v. Almance County, 99 F.3d 600, 606 n.4 (4th Cir. 1996).

In *Gingles* itself, the Supreme Court affirmed a finding of vote dilution where white support for black candidates ranged between 8 percent and 50 percent in primary elections and between 28 percent and 50 percent in general elections.[110] But in *Bartlett v. Strickland*, although the third *Gingles* prong had been conceded by the parties, the Supreme Court noted that it was "skeptical that the bloc-voting test could be satisfied here, for example, where minority voters in District 18 cannot elect their candidate of choice without support from almost 20 percent of white voters."[111] The Court's statement in *Bartlett* could signal an inclination on the Court's members to tighten the conception of legally significant bloc voting.

D. THE "FOURTH PRONG": PROPORTIONALITY

Since the Supreme Court singled it out as a particularly important factor in *Johnson v. De Grandy*,[112] proportionality has become an increasingly crucial issue in Section 2 cases. As a practical matter, if the number of majority-minority voting districts in a given jurisdiction is at least roughly proportional to the minority's share of the relevant population, it may be difficult for Section 2 plaintiffs to prove a violation. If, on the other hand, all three *Gingles* factors are clearly satisfied and the proportion of districts that are majority-minority is substantially smaller than the minority's share of the population, a state may be found liable.

As with the *Gingles* factors, there are a number of issues that arise in the context of evaluating proportionality that still remain uncertain. Proportionality raises the same concerns about the proper population base discussed earlier. In *De Grandy*, the Court expressly declined to rule on this issue.[113] In *LULAC*, the Court appeared to use CVAP as the appropriate measure: "The relevant proportionality inquiry compares the percentage of total districts that are Latino opportunity districts with the Latino share of the citizen voting-age population."[114] Although

109. Bone Shirt v. Hazeltine, 336 F. Supp. 2d 976, 1010 (D.S.D. 2004).
110. 478 U.S. 30, 59.
111. Bartlett v. Strickland, 129 S. Ct. 1231, 1244 (2009).
112. 512 U.S. 997 (1994).
113. Johnson v. De Grandy, 512 U.S. 997, 1017 n.14 (1994).
114. LULAC v. Perry, 548 U.S. 399, 403 (2006).

there are many possibilities, most courts have used VAP or CVAP as a population base.[115]

One important question is whether to measure proportionality regionally or statewide. In *De Grandy*, Hispanics constituted 50 percent of the voting-age population in Dade County and made up "supermajorities" in 50 percent of the State House districts located primarily within the county.[116] In contrast, Hispanics constituted 11.7 percent of the voting-age population of the entire state of Florida, meaning that a proportional share of House districts statewide would have been about 14 out of 120. Yet the only districts controlled by Hispanics in the whole state were the nine in Dade County. Clearly, then, the choice of the appropriate geographic scope for measuring proportionality was potentially significant.

The Supreme Court in *De Grandy* analyzed the proportion of Hispanics in the population in relation to the population in Dade County instead of at the state-wide level, and therefore rejected the plaintiff's Section 2 claim. The Court focused on the fact that, during and before the trial, the plaintiffs had failed to frame their dilution claim in statewide terms; both the parties and the district court had focused almost exclusively on the Dade County area.[117] The Supreme Court's decision therefore did not directly answer the issue of local versus statewide proportionality.

In *LULAC*, unlike in *De Grandy*, the parties did frame their claims in statewide terms. The plaintiffs alleged "injury to African American and Hispanic voters throughout the state" and the district court had considered the issue statewide.[118] The Supreme Court concluded that in such cases, proportionality should be considered statewide. But the Court cautioned that considering proportionality statewide does not mean that a state can satisfy Section 2 simply by showing rough proportionality without regard to where majority-minority districts are located and the manner in which they are drawn. The question of whether a minority's voting power has been diluted still requires an "intensely local appraisal"[119] of challenged districts because "the right to an undiluted vote does not belong to the 'minority as a group,' but rather to 'its individual members.'"[120] The *LULAC* Court re-emphasized that because the Section 2 right protecting against vote dilution is an individual right, "a State may not trade off the rights of some members of a racial group against the rights of other members of that group."[121]

115. *See* Barnett v. City of Chicago, 141 F.3d 699, 705 (7th Cir. 1998) (citing cases reaching different conclusions, but holding that CVAP is the "proper benchmark for measuring proportionality").
116. De Grandy, 512 U.S. 997, 1014.
117. *Id.* at 1021–22.
118. *See* LULAC v. Perry, 548 U.S. 399, 436 (quotation marks omitted).
119. *Id.* at 437 (quoting Gingles, 478 U.S. at 79).

120. *Id.* (quoting Shaw v. Hunt, 517 U.S. 899, 917 (1996)).
121. *Id.*

CHAPTER 5

The Constitutional Limits on Racial Gerrymandering

In 1993, in *Shaw v. Reno*,[1] the Supreme Court created a new constraint on the redistricting process, declaring that the excessive and unjustified use of race in redistricting is prohibited by the Equal Protection Clause of the Fourteenth Amendment. Throughout the 1990s, this doctrine played an important role in litigation over redistricting, resulting in the invalidation of plans in Alabama, Florida, Georgia, Louisiana, New York, North Carolina, South Carolina, Texas, and Virginia. Over the past decade, however, the frequency of *Shaw* claims has declined dramatically and districting plans typically have been upheld against such challenges.[2] These developments are due primarily to the Supreme Court's 2001 decision in *Easley v. Cromartie*,[3] which made it much easier for states to argue that their plans were motivated by *political* rather than *racial* considerations.

1. 509 U.S. 630 (1993).
2. *See, e.g.*, Prejean v. Foster, 83 F. App'x. 5 (5th Cir. 2003); Rodriguez v. Pataki, 308 F. Supp. 2d 346 (S.D.N.Y. 2004); Johnson-Lee v. City of Minneapolis, No. 02-1139, 2004 WL 2212044 (D. Minn. Sept. 30, 2004), *aff'd*, 170 Fed. App. 15 (8th Cir. 2006); Cano v. Davis, 211 F. Supp. 2d 1208 (C.D. Cal. 2002); Page v. Bartels, 144 F. Supp. 2d 346 (D.N.J. 2001); Wilkins v. West, 571 S.E.2d 100 (Va. 2002).
3. 532 U.S. 234 (2001).

The Supreme Court has phrased the test for a plaintiff bringing a *Shaw* claim in a number of different ways. In 1995, in *Miller v. Johnson*,[4] the Court struck down a Georgia districting plan on the ground that race had been "the *predominant factor* motivating the legislature's decision to place a significant number of voters within or without a particular district."[5] That conclusion will generally follow, the Court explained, where "the legislature subordinated traditional race-neutral districting principles . . . to racial considerations."[6] The test thus requires a court to determine, and then compare, how much the state legislature considered race and how much it considered "traditional race-neutral districting principles." Only if the former considerations outweighed the latter is the district presumptively unconstitutional under the *Miller v. Johnson* test.

One year later, Justice O'Connor reaffirmed that test, but explained it in slightly different terms: "[S]o long as they do not subordinate traditional districting criteria to the use of race for its own sake or as a proxy, States may intentionally create majority-minority districts, and may otherwise take race into consideration, without coming under strict scrutiny. . . . Only if traditional districting criteria are neglected *and* that neglect is predominantly due to the misuse of race" is the district presumptively unconstitutional.[7]

Most recently, in *Easley v. Cromartie*, the Court reaffirmed that a district may be invalidated pursuant to a *Shaw* claim only if "race *rather than* politics *predominantly* explains" the district's boundaries.[8] The Court also stated: "[T]he party attacking the legislatively drawn boundaries must show at the least that the legislature could have achieved its legitimate political objectives in alternative ways that are comparably consistent with traditional districting principles," and that those alternatives "would have brought about significantly greater racial balance."[9]

A. HOW A COURT DETERMINES THAT RACE WAS A FACTOR IN DISTRICTING

A court's inquiry into whether race predominated in the drawing of district lines is very fact-intensive and will therefore vary from case to case.

4. 515 U.S. 900 (1995).
5. *Id.* at 916 (emphasis added).
6. *Id.*
7. Bush v. Vera, 517 U.S. 952, 993 (O'Connor, J., concurring).
8. Easley v. Cromartie, 532 U.S. 234, 243.
9. *Id.* at 258.

As a practical matter, though, courts have relied on certain types of evidence as indicia of racial consideration, including district shape and demographics, statements made by legislators and their staff, and the nature of the data used in the districting process.

1. District Shape and Demographics

District shape is one of the principal categories of evidence upon which courts have relied in determining the role that race played in redistricting. The Supreme Court opinions in this area are replete with descriptions of "finger-like extensions," "serpentine district[s]," "narrow and bizarrely shaped tentacles," "hook-like shape[s]," "spindly legs," and "ruffled feathers," to name just a few. As the Supreme Court explained in *Shaw v. Reno* itself, "reapportionment is one area in which appearances *do* matter."[10]

Despite this focus on shape, the Court has made clear that a regular shape is not constitutionally required. So long as a district is not drawn for impermissible reasons, a district may take any shape, even a bizarre one.[11] A "bizarre" or "irregular" shape, however, in conjunction with certain racial and population-density data, may be "persuasive circumstantial evidence that race for its own sake, and not other districting principles, was the legislature's dominant and controlling rationale in drawing its district lines."[12]

The shape of North Carolina's Twelfth Congressional District, for example, was one of the primary reasons the Supreme Court in *Shaw v. Reno* concluded that race played an improper role in that state's redistricting. The district was approximately 160 miles long and, for much of its length, less than a mile wide. The Court described it as winding in a "snakelike fashion" through different neighborhoods in order to "'gobble[] in enough enclaves of black neighborhoods.'" In one instance it sharpened literally to a point before leapfrogging over another district.[13]

Few of the other districts struck down under *Shaw* have been as irregular as North Carolina's Twelfth, yet shape has played a role in each

10. Shaw v. Reno, 509 U.S. 630, 647.
11. Bush v. Vera, 517 U.S. 952, 999 (Kennedy, J., concurring).
12. Miller v. Johnson, 515 U.S. 900, 913. Absent any demographic data, a district's unusual shape could also give rise to an inference of political, rather than racial, motivation. *See* Hunt v. Cromartie, 526 U.S. 541, 547 n.3 (1999).
13. Shaw v. Reno, 509 U.S. 630, 635–36 (quotation marks omitted).

case. Courts found, for example, that the districts at issue in Georgia, Texas, and Virginia included "outlying appendages," "fingers," and "wings" that reached out to "grab" minority populations.[14] The court that struck down the Virginia congressional districting scheme, similarly, characterized the Third District as "unwieldy and distended" "fingers," connected to the hub of the district by means of "lightly populated territory, barren stretches of river, or other dubious connectors such as highway exits which appear to be leading the wrong way," divided counties and even cities, "excis[ing]" black populations along the way.[15]

In contrast, most districts that have survived a *Shaw* attack at the Supreme Court level have been relatively compact. Florida's Senate District 21, for instance, was characterized as "'demonstrably benign and satisfactorily tidy.'"[16] It was located entirely in the Tampa Bay area, had an end-to-end distance no greater than most Florida districts, and did not stand out in shape from a number of other districts.[17] Similarly, the California districting scheme at issue in *DeWitt v. Wilson* entailed "[n]o bizarre boundaries"; indeed, the court-appointed special masters who created the plan expressly rejected a number of proposals to create odd-looking districts.[18] On the other hand, the district upheld in *Easley v. Cromartie* was "the most geographically scattered district in North Carolina."[19] The Court nevertheless declined to strike it down because political considerations such as making the district "safe" for the Democratic Party and protecting incumbents also helped explain its unusual shape.

In the 16 years since the Supreme Court decided *Shaw v. Reno*, a pattern seems to have emerged, although the Court has not yet recognized it expressly. Every district that the Court has invalidated under the *Shaw* doctrine has had two key characteristics. First, the minority group's members have constituted more than 50 percent of the district's population,[20] and, second, the district has been drawn using census *blocks* rather than much larger, organic foundational units, such as election precincts or census tracts.[21] A census *block*, which is generally identical to a city

14. Miller v. Johnson, 515 U.S. 900, 917; Bush v. Vera, 517 U.S. 952, 965, 973, 979 (plurality opinion); Moon v. Meadows, 952 F. Supp. 1141, 1147 (E.D. Va. 1997) (three-judge court), *summarily aff'd*, 521 U.S. 1113 (1997).

15. Moon v. Meadows, 952 F. Supp. 1141, 1147.

16. Lawyer v. Dep't of Justice, 521 U.S. 567, 575, 580 (1997) (citation omitted).

17. *Id.* at 580–81 & n.8.

18. DeWitt v. Wilson, 856 F. Supp. 1409, 1413–15 (E.D. Cal. 1994) (three-judge court), *summarily aff'd in relevant part,* 515 U.S. 1170 (1995).

19. 532 U.S. 234, 263 (Thomas, J., dissenting).

20. *Compare* Shaw v. Hunt, 517 U.S. 899, 905–06 (1996) (invalidating a districting plan whose "overriding purpose" was the creation of a district with an African-American voting majority) (quotation marks omitted); Bush v. Vera, 517 U.S. 952, 972–73 (plurality opinion) (invalidating an "exceptional" majority-minority district whose "shape was essentially dictated by racial considerations"); Miller v. Johnson, 515 U.S. 900, 918 (invalidating a majority-minority district when it was "'undisputed that [the district] is the product of a desire by the General Assembly to create a majority black district'") (citations omitted); Silver v. Diaz, 522 U.S. 801 (1997), *summarily aff'g* 978 F. Supp. 96 (E.D.N.Y. 1997) (three-judge court) (invalidating a majority-minority district); *and* Meadows v. Moon, 521 U.S. 1113 (1997), *summarily aff'g* 952 F. Supp. 1141 (E.D. Va. 1997) (three-judge court) (invalidating a majority-minority district), *with* Lawyer v. Dep't of Justice, 521 U.S. 567, 581 (upholding a district in part because it was not a majority-minority district); Quilter v. Voinovich, 523 U.S. 1043 (1998), *summarily aff'g* 981 F. Supp. 1032 (N.D. Ohio 1997) (three-judge court) (declining to apply strict scrutiny to four districts where minority voters did not constitute a majority); *and* DeWitt v. Wilson, 515 U.S. 1170 (1995), *summarily aff'g* 856 F. Supp. 1409 (E.D. Cal. 1994) (three-judge court) (declining to apply strict scrutiny to California's 52 congressional districts, 17 of which were majority-white districts containing a minority population that exceeded 35%).

21. *Compare* Bush v. Vera, 517 U.S. 952, 961–64, 966–67, 972–76 (plurality opinion) (invalidating three districts drawn on a block-by-block basis, which resulted in boundary lines that "interlock 'like a jigsaw puzzle,'" "correlate almost perfectly with race," and are "unexplainable on grounds other than racial quotas established for those districts") (citations omitted); Shaw v. Hunt, 517 U.S. 899, 902, 905–07 (invalidating a district drawn on a block-by-block basis); Johnson v. Miller, 864 F. Supp. 1354, 1377–78 (S.D. Ga. 1994) (three-judge court) (invalidating a district where the legislature split precincts to include African-American voters in the challenged districts and engaged in a "block by block search for black voters to add to the [district]"), *aff'd*, 515 U.S. 900 (1995); Silver v. Diaz, 522 U.S. 801 (1997), *summarily aff'g* 978 F. Supp. 96, 110–11, 118 (invalidating a district that was at points "one-block long," and "curve[d] and weave[d] among street blocks" to pick up minority voters); Meadows v. Moon, 521 U.S. 1113 (1997), *summarily aff'g* 952 F. Supp. 1141, 1147 (invalidating a district drawn "based upon race at the census block level to divide precincts and apportion large numbers of voters based on race into, and out of, the [challenged district]"), *with* Hunt v. Cromartie, 529 U.S. 1014 (2000) (staying the judgment of a district court that had invalidated a plan drawn using whole, undivided precincts); Hunt v. Cromartie, 526 U.S. 541, 548–51, 554 (1999) (reversing the summary judgment of a district

block, on average contains only a few dozen residents. Because the Census Bureau reports relatively little information at the block level other than the total population and racial composition, and because blocks are more likely to be racially homogeneous than larger areas, some redistricters drawing districts on a block-by-block basis may have been tempted to sift adjoining blocks into separate election districts purely on the basis of racial data. That process can result in districts marred by extremely jagged boundaries. By contrast, a census *tract* is more likely to correspond with a readily identifiable neighborhood, because each tract has a population between 2,500 and 8,000 (on average, a population of 4,000) and its boundaries generally follow permanent, visible geographical features, such as roads, highways, rivers, canals, and railroads. Districts composed largely or entirely of whole, undivided census tracts therefore are less likely to have jagged edges or bizarre shapes. Similarly, election precincts generally contain scores of census blocks and hundreds or thousands of residents, and they are neatly nested within political subdivisions such as towns and counties. Reliance on census tracts and precincts can effectively foreclose the extraordinarily detailed, race-based line-drawing that the Supreme Court condemned in *Shaw v. Reno* and *Bush v. Vera* and helps ensure that district boundaries are neither dramatically irregular nor tightly correlated with race. Thus, the shape and demographics of districts built using whole tracts or whole precincts are less likely to generate constitutional concerns.

2. Statements by Legislators and Their Staff

As the Supreme Court made clear in *Miller v. Johnson*, bizarre shape is not a necessary element of a successful *Shaw* claim.[22] A plaintiff may use other evidence to prove that race was the predominant factor in the drawing of district lines. One such alternative category of evidence, on which courts have relied heavily in evaluating the role of race in districting, is direct evidence of legislators' motives. Such evidence can itself take a number of forms.

One form of motive evidence, which was invoked in striking down the North Carolina, Georgia, and Texas plans, is the acknowledgment

court that had invalidated a plan drawn using whole, undivided precincts); and DeWitt v. Wilson, 515 U.S. 1170 (1995), *summarily aff'g* 856 F. Supp. 1409, 1413–15 (declining to apply strict scrutiny to districts drawn using whole, undivided census tracts).

22. Miller v. Johnson, 515 U.S. 900, 912–13.

after the fact by participants in the districting process that race was an important consideration. In North Carolina, for example, the principal draftsman of the state plan admitted in his testimony at trial that the creation of majority-minority districts was a "principal reason" for the two districts at issue.[23] Similarly, in Georgia, the Court relied on testimony by the operator of the state's reapportionment computer, and the state's own concessions during the course of litigation, that racial considerations dominated the process.[24] As for Texas, the Court supported its conclusion by pointing to testimony by state officials in a previous trial (in defense to charges of political gerrymandering and minority vote dilution).[25] In a more recent case arising in North Carolina, the same type of evidence bolstered the opposite conclusion: After-the-fact affidavits from the two members of the General Assembly who were most active in redistricting stated that the challenged district was designed not with an impermissible racial motive, but rather to protect incumbents and thereby preserve the existing partisan balance in the state's congressional delegation.[26]

Documents and other evidence produced *during* the districting process are a second form of motive evidence that has been used to support a finding that race was a predominant factor in districting. In concluding that race was used impermissibly in the drawing of Texas's districts, for example, the Court pointed to a letter from a state legislator to the U.S. Department of Justice explaining that race was used as a proxy for political affiliation to protect incumbents.[27] Similarly, the district court that struck down the Virginia districting scheme (in a decision summarily affirmed by the Supreme Court) relied heavily on the state's "General Assembly Guidelines," which prohibited any change to the proposed plan that reduced the percentage of black voters in "the majority black district."[28] On the other hand, the Court upheld a North Carolina district despite contemporaneous comments by a state senator that the state's districting plan "provides for a fair, geographic, racial and partisan balance," and by a legislative staff member that he had "moved Greensboro['s]

23. Shaw v. Hunt, 517 U.S. 899, 906.
24. Miller v. Johnson, 515 U.S. 900, 918.
25. Bush v. Vera, 517 U.S. 952, 969-70 (plurality opinion).
26. Hunt v. Cromartie, 526 U.S. 541, 549.
27. Bush v. Vera, 517 U.S. 952, 970 (plurality opinion).
28. Moon v. Meadows, 952 F. Supp. 1141, 1144 (three-judge court), *summarily aff'd*, 521 U.S. 1113 (1997).

Black community into the 12th [district]."[29] The Court concluded that those statements did not indicate that race had been the predominant explanation for the district's design.

A third, but related, form of motive evidence, which was used against Georgia, North Carolina, Texas, and Virginia in striking down their plans, is a state's submission to the U.S. Department of Justice for preclearance under Section 5 of the Voting Rights Act. In each of these cases, the state's preclearance submissions had explicitly acknowledged the racial motive behind its districting or had made obvious its intent to comply with the Department of Justice's demands, which the Supreme Court later characterized as the "maximization" of minority representation.[30] The district court that invalidated the Virginia plan went so far as to call it "[s]triking[]" that the state had omitted any reference to race-neutral criteria in its preclearance submission.[31]

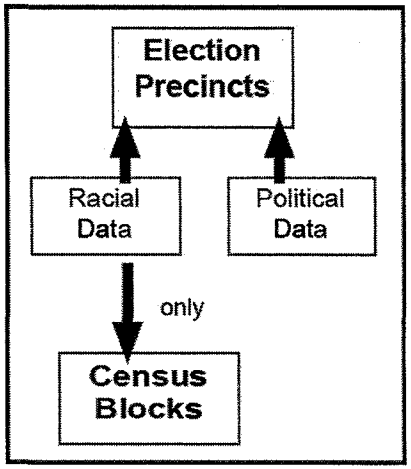
3. The Nature of Reapportionment Data

A third category of evidence that courts have used to evaluate the role that race played in the redistricting process is the nature of the reapportionment data employed by the state legislature. With the rise of sophisticated computer reapportionment programs in the last few decades, states are now able to draw districts with very intricately refined boundaries. Where the data used in this process is particularly sophisticated with respect to race, it may be used as a basis for a court's finding that race predominated in the process of drafting the plan.

Such heightened specificity of racial data was an important part of the cases against both Texas and Virginia. In the Texas case, for instance, the Supreme Court highlighted the fact that the state's redistricting program, "REDAPPL," contained racial data at the block-by-block level, whereas other data, like party registration and past voting statistics, were only available at the level of voter tabulation districts (which approximate election precincts).[32] This fact was used to support the conclusion that refinements to district boundaries below the level of voter tabulation districts were due predominantly to race: "Given that the districting software used by the state provided only racial data at the block-by-block level, the fact that District 30 . . . splits voter tabulation districts and even

29. Easley v. Cromartie, 532 U.S. 234, 253–54 (quotation marks omitted).
30. Miller v. Johnson, 515 U.S. 900, 921–27.
31. Moon v. Meadows, 952 F. Supp. 1141, 1145.
32. Bush v. Vera, 517 U.S. 952, 961–63 (plurality opinion).

individual streets in many places . . . suggests that racial criteria predominated over other districting criteria in determining the district's boundaries."[33] The district court that struck down the Virginia plan reached a similar conclusion.[34] And in *Easley v. Cromartie*, the Court upheld the challenged district in part because the state's redistricting software, unlike the Texas and Virginia programs, *did* provide both racial and political data.[35]



A census block, essentially identical to a city block, permits the Census Bureau to report block level data, such as total population and racial composition. Districts cobbled together from census blocks may raise constitutional concerns.

In *Hunt v. Cromartie*, the 1999 decision involving North Carolina's congressional redistricting plan, the Supreme Court relied heavily on an expert affidavit that examined racial data and actual election results for the precincts lying just inside and just outside of the challenged district's border. The expert found a high correlation between the racial composition and the partisan performance of these precincts, suggesting a strong tendency for African-Americans to vote for Democratic candidates. He also found that, where race and party diverged, the district, more often than not, included the more heavily Democratic precinct and excluded the more heavily African-American precinct—which tended to confirm the state's argument that the General Assembly had been motivated more by partisan concerns than by race.[36] The Court reached a similar conclusion in *Easley v. Cromartie.* There, however, the Court downplayed evidence that the state had excluded from the district heavily white precincts with high Demo-

33. *Id.* at 970–71 (plurality opinion).
34. Moon v. Meadows, 952 F. Supp. 1141, 1147 & n.6. See also the discussion above of the relationship between using census blocks (rather than census tracts or election precincts) to draw plans and the resultant districts' shapes and demographics.
35. Easley v. Cromartie, 532 U.S. 234, 249–50.
36. Hunt v. Cromartie, 526 U.S. 541, 549–52.

cratic Party registration on the ground that "registration figures do not accurately predict preference at the polls."[37] The Court was also unpersuaded by evidence that the district could have been made less minority-heavy while equally safe for the Democratic Party through a series of land trades, reasoning that "a showing that the legislature might have 'swapped' a handful of precincts out of a total of 154 precincts, involving a population of a few hundred out of a total population of about half a million, cannot significantly strengthen appellees' case."[38]

Although the *Shaw* doctrine greatly restricts the role of race in redistricting, it does *not* require that states ignore race altogether. The Supreme Court has acknowledged that states will always be *aware* of race when they draw district lines,[39] and has made clear that race may be considered in the process—so long as it does not "subordinate" traditional race-neutral principles and political considerations. Indeed, a current majority of the Court has indicated expressly that a state may intentionally create majority-minority districts under some circumstances.[40] Unfortunately, the precise role that race can play in redistricting under *Shaw* is not totally clear at this time, and may change further in the coming years (particularly if the composition of the Supreme Court changes). For now, however, it appears that race can play *some* role in the process, as one factor alongside traditional race-neutral districting principles and political considerations.

B. TRADITIONAL DISTRICTING PRINCIPLES AND POLITICAL CONSIDERATIONS

It is important, in any event, that a state conform to traditional districting principles to a large degree. Though none of these principles is constitutionally required, they are "objective factors that may serve to defeat a claim that a district has been gerrymandered on racial lines."[41] Similarly,

37. Easley v. Cromartie, 532 U.S. 234, 245.
38. *Id.* at 256–57.
39. Shaw v. Reno, 509 U.S. 630, 646 (1993).
40. Bush v. Vera, 517 U.S. 952, 958 (plurality opinion); *id.* at 1008–09 & n.7 (Stevens, J., dissenting); *id.* at 1065 (Souter, J., dissenting). Justices Thomas and Scalia have made clear that they would presume that the intentional creation of majority-minority districts is unconstitutional under any circumstances. *See id.* at 999–1000 (Thomas, J., joined by Scalia, J., concurring in the judgment).
41. Shaw v. Reno, 509 U.S. 630, 647.

evidence that a district was drawn for *political* purposes tends to undercut allegations that its design was motivated primarily by *racial* considerations.

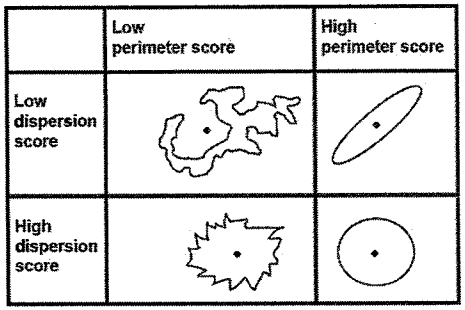
It is not possible to list precisely all "traditional race-neutral districting principles" and valid political considerations since such principles and considerations may vary from state to state. Moreover, the Supreme Court has been hesitant to designate any such list as "comprehensive" given that no one factor is constitutionally required and that redistricting is—within the bounds of federal constitutional and statutory law—a state prerogative. Nevertheless, the existing court opinions pertaining to *Shaw* claims provide some guidance as to the districting principles and political considerations that can assist in defeating a racial gerrymandering charge. Though the list is not exhaustive, there are six such factors in particular: compactness, contiguity, respect for political subdivisions, respect for communities of interest, protection of incumbents, and pursuit of partisan advantage.

1. Compactness[42]

The Supreme Court has repeatedly cited geographical "compactness" as one of the traditional districting principles that can serve to defeat a racial gerrymandering charge.[43] Unfortunately, there is no single measure of compactness that is generally accepted by social scientists as definitive, and the Court has not given a precise definition of the term. Following *Shaw v. Reno*, however, Professors Rick Pildes and Richard Niemi proposed two quantitative measures of compactness for the evaluation of districting plans: a "dispersion" measure, which captures how tightly packed or spread out a district is by calculating the ratio of the district's area to the area of the minimum circle that could circumscribe it; and a "perimeter" measure, which captures the irregularity or jaggedness of the district's border by calculating the ratio of the district's area to the square of the district's perimeter.[44]

42. See also the discussion above of compactness in the context of *Gingles*'s first prong.
43. Bush v. Vera, 517 U.S. 952, 962 (plurality opinion); Shaw v. Hunt, 517 U.S. 899, 905–06 (1996); Miller v. Johnson, 515 U.S. 900, 916 (1995); Shaw v. Reno, 509 U.S. 630, 647.
44. Richard H. Pildes & Richard G. Niemi, *Expressive Harms, "Bizarre Districts," and Voting Rights: Evaluating Election-District Appearances After* Shaw v. Reno, 92 Mich. L. Rev. 483, 554 & n.200, 555 & n.203 (1993).

The Supreme Court has relied on the results of the Pildes-Niemi study to support its conclusions with respect to the irregularity of districts' shapes,[45] but the Court has not endorsed their approach expressly. Indeed, the Court has not made clear whether one should use a quantitative approach at all, or whether an intuitive, "eyeball" approach is preferable. Nor has the Court made clear how important compactness is in the mix of things: In the Georgia case, the Court focused more on the concentration of minority voters in the outer reaches of the Eleventh Congressional District than on the district's shape.[46] Nevertheless, compactness is clearly important: The geometry of North Carolina's Twelfth District was one of the primary reasons the Court gave for its unconstitutionality, even though the state constitution did not require compactness.[47]



Professors Pildes and Niemi proposed two quantitative measures of compactness: the dispersion measure and the perimeter measure. The Supreme Court has relied on the Pildes-Niemi study.

2. Contiguity

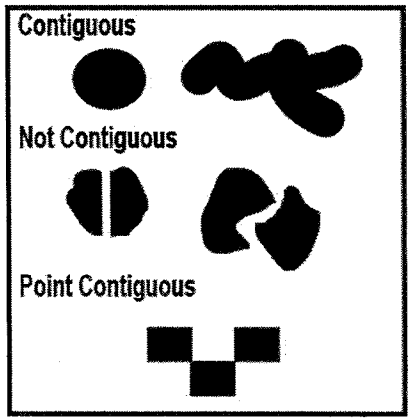
A second traditional race-neutral districting principle that can help defeat a *Shaw* claim is "contiguity."[48] A district may be defined as contiguous if one can reach any part of the district from any other part without crossing the district boundary—in other words, if the district is not divided into two or more discrete pieces. (An intervening body of water, such as in Florida's Senate District 21, does not necessarily undermine a district's contiguity.)[49] Contiguity has been described as a "relatively trivial

45. *See, e.g.*, Bush v. Vera, 517 U.S. 952, 960, 973 (plurality opinion).
46. Miller v. Johnson, 515 U.S. 900, 917.
47. Shaw v. Hunt, 517 U.S. 899, 934–35 (Stevens, J., dissenting).
48. Lawyer v. Dep't of Justice, 521 U.S. 567, 581 n.9; Miller v. Johnson, 515 U.S. 900, 916; Shaw v. Reno, 509 U.S. 630, 647.
49. Lawyer v. Dep't of Justice, 521 U.S. 567, 581 & n.9.

requirement and usually a noncontroversial one,"[50] and indeed there are very few districts that are even arguably noncontiguous. Nevertheless, the fact that North Carolina's Twelfth District was only "point contiguous"—*i.e.*, that in one instance it remained connected at only a single point, like the red squares on a checkerboard—certainly contributed to the Court's conclusion that it was unconstitutional.[51]

3. Respect for Political Subdivisions

A third traditional districting principle cited by the Supreme Court is "respect for political subdivisions."[52] Redistricting plans exhibit "respect" for political subdivisions by creating districts that do not needlessly cross county or municipal boundaries—in other words, by keeping counties, cities, and towns intact, where possible. Lack of such respect can cause "severe disruption of traditional forms of political activity."[53]



A district is defined as contiguous if one can reach any part of the district from any other part of the district without crossing a district boundary.

A lack of respect for political subdivisions was one of the major reasons for the invalidation of the Georgia, North Carolina, Texas, and Virginia plans. Georgia's Eleventh District encompassed portions of three urbanized counties, one of which was split among four congressional districts,[54] while in North Carolina, the Twelfth District split ten counties and six cities.[55] In Virginia, the invalidated Third Dis-

50. Bernard Grofman, *Criteria for Districting: A Social Science Perspective*, 33 UCLA L. Rev. 77, 84 (1985).
51. Shaw v. Reno, 509 U.S. 630, 636.
52. *Id.* at 647; Miller v. Johnson, 515 U.S. 900, 916.
53. Bush v. Vera, 517 U.S. 952, 974 (plurality opinion).
54. Miller v. Johnson, 515 U.S. 900, 908.
55. Shaw v. Reno, 509 U.S. 630, 636.

trict divided 11 of the 17 localities that it touched.[56] And in Texas, the invalidated plan exhibited "utter disregard of city limits."[57]

On the other hand, a lack of respect for political subdivisions will not necessarily lead to the invalidation of a plan, as the Supreme Court made clear in *Lawyer v. Department of Justice*.[58] The legislative district at issue in that case, Florida's Senate District 21, split three counties, yet it nevertheless met with Supreme Court approval. The Court explained that split counties are a "common characteristic[]" of Florida legislative districts, due to "the State's geography and the fact that 40 Senate districts are superimposed on 67 counties."[59] One should not assume, however, that exhibiting respect for political subdivisions will necessarily immunize a districting plan from attack. In *Abrams v. Johnson*,[60] the Supreme Court objected to a proposed Georgia plan even though the districts followed county lines almost perfectly.[61]

4. Respect for Communities of Interest

A fourth traditional districting principle consistently enumerated by the Supreme Court is "respect for . . . communities defined by actual shared interests."[62] Indeed, the Court has made clear that a state may recognize communities that have a particular racial makeup, "provided its action is directed toward some common thread of relevant interests."[63] But this common thread must be "tangible"—a "mere recitation of purported communities of interest" is insufficient.[64] More important, such a common thread must extend beyond race itself. In *Miller v. Johnson*, for example, the Court rejected the argument that Georgia's majority-minority Eleventh District encompassed a community of interest in combining the "black neighborhoods of metropolitan Atlanta and the poor black populace of

56. Moon v. Meadows, 952 F. Supp. 1141, 1147 (E.D. Va. 1997) (three-judge court), *summarily aff'd*, 521 U.S. 1113 (1997).
57. Bush v. Vera, 517 U.S. 952, 974 (plurality opinion).
58. 521 U.S. 567 (1997).
59. *Id.* at 581.
60. 521 U.S. 74 (1997).
61. The proposed plan did, however, split one county in the Atlanta metropolitan area, as well as one non-metropolitan county that had "never before [been] split in apportionment plans." *Id.* at 89.
62. Miller v. Johnson, 515 U.S. 900, 916.
63. *Id.* at 920.
64. *Id.* at 919.

coastal Chatham County."[65] The two regions, the Court declared, were "260 miles apart in distance and worlds apart in culture": The "social, political and economic makeup of the Eleventh District [told] a tale of disparity, not community."[66] In contrast, the Court accepted a community-of-interest justification in *Lawyer v. Department of Justice*, since the predominantly urban, low-income residents of Florida's Senate District 21 "'regard themselves as a community.'"[67] Moreover, "[e]vidence indicated that District 21 [is] the poorest of the nine districts in the Tampa Bay region and among the poorest districts in the State, whose white and black members alike share a similarly depressed economic condition . . . and interests that reflect it."[68]

Where a state seeks to defend a district against a *Shaw* attack on the basis of a community of interest, it is important that the state not only show a community's common thread beyond race, but also show that it was aware of such a community *at the time* the plan was framed. Indeed, the Court rejected the community-of-interest justification offered by Texas in *Bush v. Vera* at least in part because the evidence of commonality had not been "available to the Legislature in any organized fashion before [the districting plan] was created."[69]

5. Protection of Incumbents

The Supreme Court also has recognized incumbency protection—at least in the limited form of avoiding contests between incumbents—as a legitimate state goal.[70] Consequently, if a district's lines are due predominantly to incumbency protection, and not to race, a state may be able to

65. *Id.* at 908.
66. *Id.*
67. Lawyer v. Dep't of Justice, 521 U.S. 567, 581 (citation omitted).
68. *Id.*
69. Bush v. Vera, 517 U.S. 952, 966 (plurality opinion; quotation marks omitted); *see also* Kelley v. Bennett, 96 F. Supp. 2d 1301 (M.D. Ala. 2000) (three-judge court) (highlighting the lack of evidence that the plan's drafter "knew or cared about these communities of interest when he drew the district lines"), *vacated by* 531 U.S. 28 (2008).
70. Bush v. Vera, 517 U.S. 952, 964–65 (plurality opinion); Easley v. Cromartie, 532 U.S. 234, 248.

defeat an otherwise valid *Shaw* claim.[71] As the Court reasoned in *Easley v. Cromartie*, it was permissible for the legislature to reject an alternative districting plan that "would have pitted two incumbents against each other." The legislature "drew its plan to protect incumbents—a legitimate political goal."[72]

6. Pursuit of Partisan Advantage

Analogously, the Supreme Court has stated that districts may take on unusual shapes and disregard traditional districting principles if they do so in an effort to secure partisan advantage. In *Bush v. Vera*, a plurality of the Justices recognized "otherwise constitutional political gerrymandering" as a legitimate goal that states could pursue through a variety of means that might be suspect in other contexts.[73] According to the Court, "[i]f district lines merely correlate with race because they are drawn on the basis of political affiliation, which correlates with race, there is no racial classification to justify."[74] In *Easley v. Cromartie*, similarly, the Court endorsed the inclusion of heavily African-American precincts in the district at issue where the legislature aimed "to secure a safe Democratic seat" and "sought precincts that were reliably Democratic . . . for obvious political reasons."[75]

7. State-Specific Principles and Other Race-Neutral Redistricting Principles

It is not yet possible to enumerate all traditional race-neutral districting principles that might potentially assist in defeating a claim of unconstitutional racial gerrymandering because such principles will vary from state to state. Indeed, some of the most recent Supreme Court cases have emphasized the jurisdiction-specific nature of the inquiry. In *Lawyer v. Department of Justice*, for instance, the Court considered a number of additional districting principles particular to Florida, including

71. *See, e.g.*, Theriot v. Parish of Jefferson, 185 F.3d 477, 485 (5th Cir. 1999) (rejecting a *Shaw* challenge to a majority-black councilperson district, and holding that racial considerations had been "plainly subordinate to the majority of the councilpersons' preoccupation with protecting incumbency and maintaining other political advantages").

72. Easley v. Cromartie, 532 U.S. 234, 248.

73. Bush v. Vera, 517 U.S. 952, 968 (plurality opinion).

74. *Id.*

75. Easley v. Cromartie, 532 U.S. 234, 245, 247.

multicounty districting (to increase the number of legislators who are available to speak for each county) and the desire to avoid out-of-cycle elections.[76] The Court appeared to *de*-emphasize such principles as respect for political subdivisions that were not common to Florida districting. Similarly, in *Abrams v. Johnson*, the Supreme Court approved a court-drawn plan that had considered "Georgia's traditional redistricting principles."[77] These principles were based on maintaining, among other things, district cores, four traditional "corner districts" in the corners of the state, and an urban majority-black district in the Atlanta area.[78]

In sum, race may still be a factor in a state's redistricting process, and at times it must be considered to avoid violating the Voting Rights Act. Commitment to traditional districting principles and responsiveness to political considerations may shield a plan from a constitutional challenge even if race was considered. Under the current state of the law, however, it is not sufficient for a district merely to exhibit *some* respect for traditional districting principles and political concerns—such a district will not be immune from attack if race nonetheless predominated in the process. If a court finds that "[r]ace was the criterion that, in the state's view, could not be compromised," a district may be struck down regardless of its consideration of other factors.[79]

C. OTHER WAYS TO JUSTIFY THE USE OF RACE IN DISTRICTING

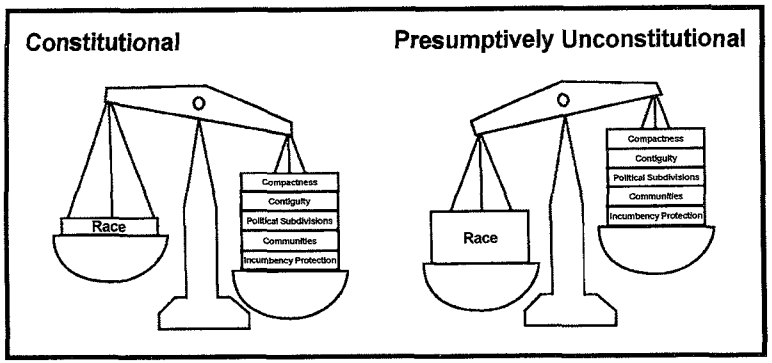
If race predominated over traditional race-neutral districting principles and political factors, the district is *presumptively* unconstitutional. But it may be possible, under certain limited circumstances, to overcome that presumption. Indeed, a majority of the justices on the Supreme Court have indicated that an effort to comply with Section 2 or Section 5 of the

76. Lawyer v. Dep't of Justice, 521 U.S. 567, 581–82 nn.9–10. Because Florida has staggered senate terms and only half the districts choose a state senator in any given election cycle, the mid-decade redistricting could have resulted in special "out-of-cycle" elections in districts that were significantly redrawn.

77. 521 U.S. 74, 84 (1997).

78. *Id.* The Court's inclusion of this last "principle," the maintenance of a majority-black district, implies that a state may purposefully *maintain* a district for race-related reasons without running afoul of *Shaw*.

79. Shaw v. Hunt, 517 U.S. 899, 907.



The Shaw *doctrine restricts the use of race in redistricting. Race may only be considered alongside traditional race-neutral factors.*

Voting Rights Act or an effort to remedy past discrimination might justify an otherwise unconstitutional plan.[80]

With regard to Section 2, the state must have had a "strong basis in evidence" *at the time it drew the district* for concluding that the creation of a majority-minority district was reasonably necessary in order to comply with Section 2. "[G]eneralized assumptions about the prevalence of racial bloc voting" would not qualify as a "strong basis in evidence."[81] Moreover, the district must "substantially address[]" the potential Section 2 liability[82] without "subordinat[ing] traditional districting principles to race substantially more than [is] 'reasonably necessary' to avoid" that liability.[83] A district will be held unconstitutional if it is bizarrely shaped and noncompact, it otherwise neglects traditional districting principles,

80. Shaw v. Reno, 509 U.S. 630, 653–57 (1993); Miller v. Johnson, 515 U.S. 900, 920–21 (1995); Shaw v. Hunt, 517 U.S. 899, 908–16; Bush v. Vera, 517 U.S. at 976–77 (plurality opinion); *id.* at 990–92 (O'Connor, J., concurring); *id.* at 1033 (Stevens, J., dissenting); *id.* at 1065 (Souter, J., dissenting).

81. Bush v. Vera, 517 U.S. at 994 (O'Connor, J., concurring).

82. Shaw v. Hunt, 517 U.S. 899, 915, 918.

83. Bush v. Vera, 517 U.S. 952, 979 (plurality opinion); *see also* King v. Ill. Bd. of Elections, 979 F. Supp. 619, 627 (N.D. Ill. 1997) (three-judge court) (holding that Illinois' majority-Hispanic Fourth Congressional District was narrowly tailored to serve the compelling state interest in complying with Section 2 of the Voting Rights Act because the district's "noncompactness and irregularity" could be explained by the desire to maintain the core of a neighboring majority-black district that separated Chicago's two densely populated Hispanic enclaves), *summarily aff'd,* 522 U.S. 1087 (1998) (summarily affirming the district court's judgment, over the objections of Justices Scalia, Kennedy, and Thomas).

and it deviates substantially from a hypothetical court-drawn Section 2 district *for predominantly racial reasons.*[84]

Similarly, it is not entirely clear when a presumptively unconstitutional district can be saved by the argument that it was drawn to comply with Section 5 of the Act. In *Bush v. Vera,* the state of Texas made that argument in defense of District 18 in Houston, but a five-justice majority rejected it. Under the benchmark plan that was in effect prior to the 1991 redistricting, District 18's population was only 35.1 percent African-American. Under the 1991 plan, that figure rose to 50.9 percent. Because the state had not demonstrated that this increase in black population "was necessary to ensure nonretrogression" under Section 5, the Court struck down District 18.[85] The Court did not explain when, if ever, an increase in a district's minority population would be "necessary to ensure nonretrogression." Nor did the Court even begin to address the thornier questions, such as when and how changes in levels of "crossover" voting would affect a state's ability to use compliance with Section 5 as a defense to a *Shaw* claim.

With regard to past discrimination, the legislature must likewise have a "strong basis in evidence" that remedial action is necessary *before* engaging in it, and must identify "with some specificity" the discrimination to be remedied.[86]

The Court has never expressly upheld a plan on any of these bases, and in general the Court has been extraordinarily reluctant to hold that *any* racial classification is justified. Furthermore, several Justices have indicated that attempted compliance with the Voting Rights Act should *never* be allowed to justify a racial gerrymander. At this time, therefore, a state may find it too risky to use race as the predominant factor in its districting.

84. Bush v. Vera, 517 U.S. 952, 977 (plurality opinion); *id.* at 994 (O'Connor, J., concurring).

85. *Id.* at 983 (plurality opinion).

86. Shaw v. Hunt, 517 U.S. 899, 909–10 (quotation marks omitted); Bush v. Vera, 517 U.S. 952, 982 (plurality opinion).

Index

A

Abrams v. Johnson 7, 27, 76–79
African Am. Voting Rights Legal Defense Fund, Inc. v. Villa 42
American Citizens v. Perry 5
American Community Survey 3
Armour v. Ohio 52
Askew NAACP v. City of Rome 49
Askew v. City of Rome 48

B

bailout provisions
  Voting Rights Act, Section 4(a) 30
Baird v. Consol. City of Indianapolis 56
Barnett v. City of Chicago 40, 60
Bartlett v. Strickland 40–42, 59
Baumgart v. Wendelberger 12
Beer v. United States 21
Black Political Task Force v. Galvin 52–53
Blackmoon v. Charles Mix County 12
Boddie v. City of Cleveland 12
Bone Shirt v. Hazeltine 48, 59
Bonneville County v. Ysursa 12
Brewer v. Ham 39
Brown v. Thompson 10–12
Busbee v. Smith 28
Bush v. Vera 68, 77–81

C

Campos v. City of Houston 40
Campuzano v. Ill. State Bd. of Elections 43
Cano v. Davis 40, 63
census blocks 67–68
Census Bureau 2–3
  apportionment purposes 3
  redistricting purposes 3
Chen v. City of Houston 14, 40
Citizens for a Better Gretna v. City of Gretna 51, 55
City of Carrollton Branch of the NAACP v. Stalling 53
City of Pleasant Grove v. United States 28
Clark v. Calhoun County 54–55
Clarke v. City of Cincinnati 53, 57
Collins v. City of Norfolk 50
communities of interest 76–77
compactness, geographical 43
  definitions of 43
  LULAC v. Perry 39, 43
  measurement of 44
  non-geographic factors, consideration of 44

compactness of district 73–74
dispersion measure of 73
perimeter measure of 73
Pildes-Niemi study 73–74
Shaw v. Reno 73
congressional districts, population equality of 4
county lines, respect for 7
deviation, court acceptance of 6–7
deviations, justifying 5–6
inequality, charges of 6
Karcher v. Daggett 4
legislative policy, application of 5–7
variance, justifications for 5
Cottier v. City of Martin 47

D

Daly v. Hunt 14
Davis v. Bandemer 17–18
Davis v. Chiles 52
De Grandy v. Wetherell 51
Deem v. Manchin 12
deviation
acceptability in congressional redistricting 4
average population 2
court acceptance of 6–7
justifying 5–6
magnitude of 8–10
overall population 1
rejection of 8–10
total population 1
DeWitt v. Wilson 66
districting principles, traditional 72–79
Abrams v. Johnson 79
Bush v. Vera 68, 77–78, 81
communities of interest, respect for 76–77
compactness. *See* compactness of district.
contiguity 74–75
Easley v. Cromartie 78
incumbents, protection of 77–78
Lawyer v. Department of Justice 78
partisan advantage, pursuit of 78
political subdivisions, respect for 75–76
race-neutral redistricting principles 78–79

E

Easley v. Cromartie 63–64, 71, 78
effects prong, Voting Rights Act 25–27
Abrams v. Johnson 27
benchmarks for plan measurement 25
discriminatory effect, determining 25
minority voting strength, reduction of 26
retrogression, analysis of 27
retrogression, defined 25
Equal Protection Clause 9, 14, 19, 63
exogenous elections 54–55

F

federal decennial census 2

G

Garza v. County of Los Angeles 14, 54
Georgia v. Ashcroft 27, 44
gerrymandering 17–19
constitutional limits on 17–19
Davis v. Bandemer 17–18
defined 17
mid-decade redistricting 19
partisan advantage, pursuit of 19, 73
race and ethnicity considerations 19
Vieth v. Jubelirer 18
gerrymandering, racial, constitutional limits on 63–64
Easley v. Cromartie 63–64
Equal Protection Clause 63
Miller v. Johnson test 64
Shaw v. Reno 63–64
Gingles test
compactness, geographical 38
Johnson v. De Grandy 36–37
numerosity 38
proportionality 36–37, 59–60
questions to address 34
racially polarized voting 35, 45, 48, 55–58
requirements of 36
Gomez v. City of Watsonville 48–53
Goosby v. Town Bd. of Town of Hempstead 55
Gorin v. Karpan 11
Graham v. Thornburgh 8
Growe v. Emison 35

H

Hines v. Mayor and Town Council of Ahoskie 56
Hulme v. Madison County 13
Hunt v. Cromartie 71

I

incumbents, protection of 77–78

J

Jamison v. Tupelo 48
Jeffers v. Clinton 43
Jenkins v. Red Clay Consol. Sch. Dist. Bd. of Educ. 51–56
Johnson v. De Grandy 36–39, 59–60
Johnson-Lee v. City of Minneapolis 63

K

Karcher v. Daggett 4, 8–10
Ketchum v. Byrne 42
Kirkpatrick v. Preisler 7

L

Larios v. Cox 13
Lawyer v. Department of Justice 76–78
League of United Latin Am. Citizens 4434 v. Clements 49

League of United Latin American Citizens v. Perry 43
legally significant racially polarized voting 56–61
causation, role of 57
party identification, significance of 58
racial bloc voting 58–61
reasons for, relevance of 57–58
Levy v. Lexington County 47
Lewis v. Alamance County 51–52, 58
LULAC v. Perry 39–43, 59

M

Magnolia Bar Ass'n v. Lee 53
Marylanders for Fair Representation, Inc. v. Schaefer 49
McNeil v. Springfield Park Dist. 39
Meza v. Galvin 40, 54
Miller v. Johnson 22, 64–68
minority political cohesiveness 48–50
defined 48
Gomez v. City of Watsonville 48
inquiries about 48
lay testimony in determining 49
minority groups, number of 49
voting alignment, level of 49
voting patterns, studies of 48
minority-preferred candidate, determining 50–53
candidate identity 50
multi-candidate elections 53
primary elections 53
race, relevancy 51
Ruiz v. City of Santa Maria 51
white candidates as 51–53
Mobile v. Bolden 33
Monroe v. City of Woodville 49
Moon v. Meadows 66
Moore v. Itawamba County 13

N

NAACP v. Fordice 54
National Commission on Voting Rights 24
Negron v. City of Miami Beach 40
New Rochelle Voter Defense Fund v. City of New Rochelle 40
Nipper v. Smith 53, 57
Northwest Austin Municipal Utility Dist. No. One 29
numerosity 38–43
Bartlett v. Strickland 41
Brewer v. Ham 39
citizens of voting age 39–40
denominator 38–40
Johnson v. De Grandy 39
LULAC v. Perry 39
McNeil v. Springfield Park District 39
minority group, size of 41–50
numerator 41–50

numerical majority, necessity of 42
population bases, variety of 38
proper population base, determining 38–40
voting-age population 39–40

P

Page v. Bartels 63
partisan advantage, pursuit of 78
Pildes-Niemi study 74
political subdivisions 75–76
population equality, measures of 1–3
American Community Survey 3
average population deviation 2
congressional districts. *See* congressional districts, population equality of.
federal decennial census 2
overall population deviation 1
total population deviation 1
Prejean v. Foster 63
proportionality 59–61
citizens of voting age 59
De Grandy v. Johnson 59
LULAC v. Perry 59
regional vs. statewide measurement 60
purpose prong, Voting Rights Act 22, 28–29
focus of 28
relevant considerations 28
Reno v. Bossier Parish Sch. Bd. 28
retrogression, consideration of 28
U.S. Department of Justice regulations 28

R

race factor, determining 64–72
census blocks in districting 67
demographics 65–68
district shape 65–68
districting principles, traditional 64–65, 72
districting process documents 69
Easley v. Cromartie 71
Hunt v. Cromartie 71
legislator statements 68–70
Miller v. Johnson 68
preclearance submissions 70
reapportionment data 70–73
Shaw doctrine 66, 72
Shaw v. Reno 65
race-neutral redistricting principles 64, 72, 78–79
racial bloc voting 58–61
racially polarized voting 45–59
evidence for determining 50–56
identifying. *See* racially polarized voting, identifying
minority-preferred candidate, determining 50

anecdotal evidence, use of 48
bivariate ecological regression analysis 45–48
ecological inference 45–48
elections, analysis of 55–56
exogenous elections, consdideration of 54–55
homogeneous precinct analysis 45–48
legally significant racially polarized voting 35, 37, 50, 56–59
minority political cohesiveness 45, 48–49
voting behavior by race, estimate of 46
Rangel v. Morales 54
Reno v. Bossier Parish Sch. Bd. 22, 28
Rodriguez v. Bexar County 46
Rodriguez v. Pataki 13, 52, 63
Romero v. City of Pomona 40
Ruiz v. City of Santa Maria 51

S

S. Christian Leadership Conf. v. Sessions 50, 55
Sanchez v. Bond 49
Sanchez v. Colorado 51
Shaw doctrine
census blocks, use in districting 67
characteristics of 66
race in redistricting, restrictions on 72
Shaw v. Hunt 61
Shaw v. Reno 63–65
Silver v. Diaz 67
Smith v. Clark 8
Smith v. Clinton 54
Solomon v. Liberty County 57
state districts, population equality of 9–13
Chen v. City of Houston 14
Daly v. Hunt 14
flexibility of standards 10
Garza v. County of Los Angeles 14
population measure, determining 14–15
Stephan v. Graves 7

T

ten-percent rule 10–13
Brown v. Thompson 10–12
Hulme v. Madison County 13
justifying deviations above 10–12
justifying deviations below 13–15
Larios v. Cox 13
one-person, one-vote standard 12–13
population deviation, absolute limit on 12
state constitutional guidelines 11
state policy interests 12
total population deviation, maximum 10
Thornburg v. Gingles 34

U

United States v. Blaine County 46
United States v. City of Euclid 47

United States v. Euclid City School Bd. 43
Uno v. City of Holyoke 52
Utah v. Evans 3

V

variance
justifications for 5–6
unconstitutionality of 7
Vera v. Bush 7
Vieth v. Jubelirer 18–19
Vieth v. Pennsylvania 5, 9
Village of Arlington Heights v. Metro. Hous. Dev. Corp. 28
Voting Rights Act, Section 2 33–61
Gingles test 35, 38–45, 56–59
Johnson v. De Grandy 36–37
majority-minority districts, creation of 34
minority vote dilution, prohibition against 33
prohibitions of 32–33
prongs of 35
purpose of 33
relationship to Section 5 31–32
rough proportionality, measure of 37
substantial proportionality, measure of 37
Thornburg v. Gingles 34–37
Voting Rights Act, Section 5 21–32
administrative preclearance 21
amendments to 23
congressional debate over 24
constitutionality of 29–30
coverage formula, concerns about 24
covered jurisdictions, determining 23
effects prong. *See* effects prong, Voting Rights Act
enactment of 22–24
judicial preclearance 21
necessity of 30
preclearance procedures 25
procedural paths 22
purpose of 22
purpose prong. *See* purpose prong, Voting Rights Act
reenactment of 23
relationship to Section 2 31–32
requirements of 21
state sovereign dignity, affront to 30
substantive standards 22
Voting Rights Act. Section 4(a) bailout provisions 30–31

W

Westwego Citizens for a Better Gov't v. City of Westwego 52
Whitfield v. Democratic Party of Ark. 48

Nos. 18-422, 18-726

IN THE
Supreme Court of the United States

ROBERT A. RUCHO, ET AL.,
Appellants,
v.
COMMON CAUSE, ET AL.,
Appellees.

On Appeal from the United States District Court for the Middle District of North Carolina

LINDA H. LAMONE, ET AL.,
Appellants,
v.
O. JOHN BENISEK, ET AL.,
Appellees.

On Appeal from the United States District Court for the District of Maryland

AMICUS BRIEF OF MATHEMATICIANS, LAW PROFESSORS, AND STUDENTS IN SUPPORT OF APPELLEES AND AFFIRMANCE

GUY-URIEL E. CHARLES
HARVARD LAW SCHOOL
1563 Massachusetts Avenue
Cambridge, MA 02138
(617) 998-1742

DEEPAK GUPTA
Counsel of Record
DANIEL WILF-TOWNSEND
GUPTA WESSLER PLLC
1900 L Street, NW, Suite 312
Washington, DC 20036
(202) 888-1741
deepak@guptawessler.com

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Counsel for Amici Curiae

Exhibit
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TABLE OF CONTENTS

Table of authorities iii

Interest of *amici curiae* 1

Summary of argument.....2

Argument.....4

I. Claims of vote dilution on the basis of partisanship are justiciable. 4

A. The Constitution supplies an equality principle that protects each individual from intentional vote dilution by the state. 4

1. The Constitution protects an individual's right to an undiluted vote. 5

2. The government acts unconstitutionally when it intentionally dilutes an individual's vote. 7

B. The equality principle extends to cases in which the government intentionally dilutes votes based on partisanship. 10

II. Claims of vote dilution on the basis of partisanship can be evaluated by a reliable and well-established computational method. 14

A. A reliable and well-established computational method provides a baseline that enables the identification of outliers.....16

B. This method takes into account the legal and political landscape of each state. 19

C. Unconstitutional vote dilution can be identified in specific districts. 21

D. This method is limited in scope. 25

Conclusion 26

Addendum: identity of *amici curiae*

TABLE OF AUTHORITIES

Cases

Avery v. Midland County,
390 U.S. 474 (1968) 6

Baker v. Carr,
369 U.S. 186 (1962) 5, 13

Chapman v. Meier,
420 U.S. 1 (1975) 9

Common Cause v. Rucho,
318 F. Supp. 3d 777 (M.D.N.C. 2018).....15

Elrod v. Burns,
427 U.S. 347 (1976) 13

Evenwel v. Abbott,
136 S. Ct. 1120 (2016) 5, 9

Fortson v. Dorsey,
379 U.S. 433 (1965) 6

Frost & Frost Trucking Co. v. Railroad Commission,
271 U.S. 583 (1926) 10

Gill v. Whitford,
138 S. Ct. 1916 (2018) 5, 17

Gomillion v. Lightfoot,
364 U.S. 339 (1960) 7, 10

Gray v. Sanders,
372 U.S. 368 (1963) .....*passim*

Hadley v. Junior College District,
397 U.S. 50 (1970) 10

Karcher v. Daggett,
462 U.S. 725 (1983) 7

Keyishian v. Board of Regents,
385 U.S. 589 (1967) 13

Kirkpatrick v. Preisler,
394 U.S. 526 (1969) 9

Lane v. Wilson,
307 U.S. 268 (1939) 10

Miller v. Johnson,
515 U.S. 900 (1995) 10

Perry v. Sindermann,
408 U.S. 593 (1972) 13

Reynolds v. Sims,
377 U.S. 533 (1964) .....*passim*

Rogers v. Lodge,
458 U.S. 613 (1982) 11

Rutan v. Republican Party of Illinois,
497 U.S. 62 (1990) 13

Snowden v. Hughes,
321 U.S. 1 (1944) 11

Speiser v. Randall,
357 U.S. 513 (1958) 13

United States v. Classic,
313 U.S. 299 (1941) 7

United States v. Mosley,
238 U.S. 383 (1915) 7

United States v. Saylor,
322 U.S. 385 (1944). 2, 6, 7, 12

Vieth v. Jubelirer,
541 U.S. 267 (2004) 15

Wesberry v. Sanders,
376 U.S. 1 (1964) 6, 8, 14

Whitcomb v. Chavis,
403 U.S. 124 (1971) 11

White v. Regester,
412 U.S. 755 (1973) 11

Other authorities

Persi Diaconis,
The Markov Chain Monte Carlo Revolution,
Bulletin of the American Mathematical Society,
April 2009.....16

Moon Duchin, et al.,
Locating the Representational Baseline: Republicans in Massachusetts, MGGG (Oct. 22, 2019) 26

Peter L. Galison,
Image & Logic: A Material Culture of Microphysics (1997).....17

Karen Kemp,
Nonpartisan Redistricting Panel Reveals Unofficial NC Congressional Voting Map, Duke Sanford School of Public Policy (Aug. 29, 2016).....23

Richard H. Pildes,
Redistricting Reform and the 2018 Elections,
Harvard Law Review Blog (Oct. 26, 2018).....20

INTEREST OF *AMICI CURIAE*[1]

Amici are a group of mathematicians and law professors and a supporting team of students. Moon Duchin and the other *amici* mathematicians are members of a mathematical community that has worked to develop benchmarks for statistical and computational techniques that can be used to evaluate districting plans. Some have critically compared the work of other redistricting analysis teams, and some have developed their own algorithms and analytical techniques. Several *amici* have published in this area in popular forums in addition to their scholarly work.

Bridging the fields of law and mathematics, the *amici* have worked together in this brief to articulate a legal standard for adjudicating partisan-gerrymandering claims and to develop ideas for making the mathematics responsive to the needs of the Court. *Amici* write to inform the Court of the relevance and availability of reliable computational methods for evaluating these claims—methods that are illustrated using data in the North Carolina case now before the Court. A complete list of the *amici* is set forth in an addendum to this brief.

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[1] No counsel for a party authored this brief in whole or in part and no person other than *amici* and their counsel made a monetary contribution to its preparation or submission. The parties' letters consenting to the filing of *amicus* briefs are on file with the Clerk.

SUMMARY OF ARGUMENT

The right to vote is more than just the right to cast a ballot. The Constitution protects an individual's right to an *undiluted* vote—a right to cast a vote that is free from being "impaired, lessened, diminished, diluted, and destroyed." *United States v. Saylor*, 322 U.S. 385, 388 (1944). The government violates the Constitution when it intentionally dilutes an individual's vote, whether on grounds of race, sex, geography, or partisanship.

An equality principle undergirds "one person, one vote": under the Constitution, the government unconstitutionally dilutes the right to vote when it draws district lines in a manner that arbitrarily distinguishes among voters. *See Gray v. Sanders*, 372 U.S. 368, 379 (1963). This equality principle is a judicially manageable standard. A plaintiff can prove a claim of vote dilution by showing that the manner in which the government drew the district lines diminished the equal weight, power, and value of the plaintiff's vote.

Because vote dilution violates basic constitutional rights, it is essential for courts to be able to detect and act on intentional dilution where it exists. But adjudicating the potential abuses of line-drawing for partisan advantage has bedeviled this Court for decades. Drawing on many years of experience in the fields of mathematics and computational science, this brief presents and illustrates a computational method that is designed to efficiently produce representative samples—in this application, by sampling alternative valid districting plans. Courts can then reasonably infer the presence of intentional discrimination by assessing a given district in the context of valid alternative plans. Such a comparison allows courts to see whether a challenged district falls within the wide range of plans that you would expect to

see from a neutral decision-maker, or is instead an outlier.

This brief thus offers a way forward that is based on reliable and well-established tools that have been used in science and industry for decades—in applications ranging from weapons development to weather prediction. The process of generating these large, diverse ensembles of possible districts also meets the demands of our constitutional framework by taking state-specific redistricting criteria and a state's unique political geography into account before flagging certain districts as outliers.

Unconstitutional vote dilution turns on the idea that the state has departed from a baseline of equal treatment. The method we describe here identifies that baseline by quantitatively determining a normal range for a given district's composition, making dilutive "packing and cracking" clearly visible to courts, legislatures, and the public when a district is an extreme outlier from that range. An outlier finding means that the design of the district is not explained by state-specific rules or political geography, but is far better explained by partisan motives.

In one of the two cases before the Court, the State of North Carolina expressed an explicit intent to produce a partisan outcome by sorting voters into districts on the basis of partisanship, thereby admitting to singling out voters to downgrade the value of their votes. Even without an explicit statement of intent, the methods described here demonstrate impermissible intent through extreme effects. The effects of unequal treatment of individual voters in multiple districts are so stark—and are so clearly shown not to be explained by

the rules and geography—that the only reasonable inference is one of intentional discrimination.

ARGUMENT

I. Claims of vote dilution on the basis of partisanship are justiciable.

The Constitution prohibits the state from intentionally infringing on an individual's right to vote, whether through denial, "debasement[,] or dilution." *Reynolds v. Sims*, 377 U.S. 533, 555 (1964). Vote dilution can take many forms—for example, stuffing a ballot box or intentionally mis-tabulating the votes. In the districting context it means that, to secure an outcome that it prefers, the state has drawn district lines in a way that intentionally discriminates among voters or treats voters differently. As a consequence of this intentional treatment, the state has minimized the weight, value, or power of certain votes. Vote dilution thus turns on the idea that the state has departed from a baseline of equal treatment and, by doing so, has intentionally diminished the weight, power, and value of an individual's vote. This Court has held for decades that the state violates the constitutional guarantee to an undiluted vote when it intentionally prefers some voters over others, whether based on race, sex, or geography. Now, this Court has the opportunity to affirm that the state likewise violates that constitutional guarantee when it prefers some voters based on their political affiliation or their political beliefs.

A. The Constitution supplies an equality principle that protects each individual from intentional vote dilution by the state.

The vote has long been regarded as among the most fundamental rights, and indeed as preservative of all other rights. *See, e.g.*, *Reynolds*, 377 U.S. at 562. This

Court has found "the right of suffrage can be denied by a debasement or dilution of the weight of a citizen's vote just as effectively as by wholly prohibiting the free exercise of the franchise." *Id.* at 555. The right is personal to the individual. *See*, *e.g.*, *Gill v. Whitford*, 138 S. Ct. 1916, 1920 (2018) ("The right to vote is 'individual and personal in nature.'") (quoting *Reynolds*, 377 U.S. at 561).

While the "One Person, One Vote" principle can be conceptualized as a collective harm to principles of equal representation as a whole, *see Evenwel v. Abbott*, 136 S. Ct. 1120, 1131 (2016), the constitutional right to have an undiluted vote described by this Court can best be understood as an individual right that arises from an individual conception of injury. The state unconstitutionally diminishes this individual right when it draws districts to intentionally minimize or cancel out the votes of some voters, just as if it had stuffed the ballot box or intentionally miscounted votes to achieve its preferred outcome. *See id.* at 557–58. This constitutional violation occurs whether the state singles out specific voters based on race, geography, or political affiliation.

1. The Constitution protects an individual's right to an undiluted vote.

Every voter has an individual right to an undiluted vote. This Court has long recognized that "the right of suffrage can be denied by a debasement or dilution of the weight of a citizen's vote just as effectively as by wholly prohibiting the free exercise of the franchise." *Reynolds*, 377 U.S. at 555. A citizen's constitutional "right to vote free of arbitrary impairment by state action" encompasses a right to an election free "from dilution by a false tally" or "by a stuffing of the ballot box." *Baker v. Carr*, 369 U.S. 186, 208 (1962). Thus, the right to vote is not

merely the right to cast a ballot; it is the right to cast a ballot that is "honestly counted." *United States v. Saylor*, 322 U.S. 385, 388 (1944). The Constitution protects each voter's individual "right to have their expressions of choice given full value and effect by not having their votes impaired, lessened, diminished, diluted and destroyed." *Id.* at 386.

It is similarly well established that a state's drawing of its voting districts can dilute votes, thereby infringing on the individual right to vote. For example, in *Wesberry v. Sanders*, this Court struck down the State of Georgia's congressional apportionment plan for impermissibly diluting votes. 376 U.S. 1, 4 (1964). This Court expressly framed the constitutional violation in individual terms, explaining that when the state intentionally discriminates against some voters in the construction of voting districts, it "debas[es] the weight of the [plaintiffs'] votes." *Id.* This debasement "abridge[s] the right to vote for members of Congress guaranteed . . . by the United States Constitution." *Id.*; *see also Avery v. Midland Cty.*, 390 U.S. 474, 478 (1968) ("Every qualified resident, *Reynolds* determined, has the right to a ballot for election of state legislators of equal weight to the vote of every other resident, and that right is infringed when legislators are elected from districts of substantially unequal population."); *Fortson v. Dorsey*, 379 U.S. 433, 439 (1965) ("It might well be that . . . a multi-member constituency apportionment scheme, under the circumstances of a particular case, would operate to minimize or cancel out the voting strength of racial or political elements of the voting population.").

The fact that vote dilution in apportionment cases requires a comparison with the voting power of other voters does not change the individualized character of

the right recognized in this Court's early cases. As this Court articulated, "[s]imply stated, an individual's right to vote for state legislators is unconstitutionally impaired when its weight is in substantial fashion diluted when compared with votes of citizens living in other parts of the state." *Reynolds*, 377 U.S. at 568; *cf. id.* at 580 ("Citizens, not history or economic interests, cast votes. . . . Again, people, not land or trees or pastures, vote."). This Court's prior precedents are clear: the Constitution protects an individual voter from having their vote debased or diluted.

2. The government acts unconstitutionally when it intentionally dilutes an individual's vote.

The Constitution forbids the government and its officials from intentionally interfering with or impairing an individual's right to vote. *See United States v. Classic*, 313 U.S. 299 (1941); *see also Karcher v. Daggett*, 462 U.S. 725, 753 (1983) (Stevens, J., concurring) ("The path the Court has sometimes used to enter this political thicket is marked by the label 'intent.'"). This Court has upheld this prohibition on intentional interference in a variety of contexts, finding that a state unconstitutionally dilutes or impairs an individual's vote when it artificially inflates vote counts by stuffing ballot boxes, *see Classic*, 313 U.S. at 314 (citing *United States v. Mosley*, 238 U.S. 383 (1915)), arbitrarily refuses to count ballots from certain precincts, *see Reynolds*, 377 U.S. at 555 (citing *Saylor*, 322 U.S. at 386), redistricts with the purpose of disenfranchising a distinct segment of minority voters, *see Gomillion v. Lightfoot*, 364 U.S. 339, 347 (1960), restricts access to the primary when the primary is an instrumental mechanism of choice, *see Classic*, 313 U.S. at 314 (1941), and diminishes the strength of urban votes in

malapportioned systems, *see Reynolds*, 377 U.S. at 568. In each of these contexts, this Court reaffirmed that unconstitutional harm is done when the state manifests an intent to impair the participation of otherwise eligible voters.

The state cannot create a preferred class of voters. *See Gray*, 372 U.S. at 379–80 ("The concept of 'we the people' under the Constitution visualizes no preferred class of voters but equality among those who meet the basic qualifications."). A fundamental equality principle, grounded in the Equal Protection Clause, requires that "all who participate in the election are to have an equal vote—whatever their race, whatever their sex, whatever their occupation, whatever their income, and wherever their home may be in that geographical unit." *Id.* at 379.

The state impairs the participation of otherwise eligible voters when it creates a preferred class of voters. Thus, in *Gray*, this Court explained that a system in which a voter's ballot has more weight than a similarly situated voter in a neighboring county unconstitutionally discriminates between eligible voters. *Id.* at 381. The equality principle applies with the same force and with the same logic in the apportionment context and in all contexts in which the state delineates voting districts. For example, in *Wesberry*, the Court found that Georgia "grossly discriminate[d]" against the plaintiffs because its apportionment statute "contract[ed] the value of some votes and expand[ed] that of others." 376 U.S. at 7; *see also id.* at 17–18 ("Our Constitution leaves no room for classification of people in a way that unnecessarily abridges [the] right" to vote). Put simply, this Court has articulated and enforced a principle of equality among voters as a standard: all eligible voters have an equal right for their ballots to be cast, counted, and duly

registered free from state impairment, manipulation, and diminishment. And, as this Court has stated, the equality principle protects both the right of the voter to equal treatment and the right of the voter to equal representation. *Evenwel*, 126 S. Ct. at 1130.

Reynolds embraced this equality principle. There, this Court considered the constitutionality of the apportionment of the Alabama Legislature. *See Reynolds*, 377 U.S. at 545–46. This Court acknowledged that, together, *Gray* and *Wesberry* stand for the proposition that "in statewide and in congressional elections, one person's vote must be counted equally with those of all other voters in a State." *Id.* at 560. With this doctrinal foundation, the relevant question in *Reynolds* was "whether there are any constitutionally cognizable principles which would justify departures from the basic standard of equality among voters in the apportionment of seats in the legislature." *Id.* at 561. In other words, the fundamental equality principle *presumptively controlled*; the only question was whether there was a reason *not* to apply the fundamental equality principle to the issues presented in *Reynolds*. This Court found no such reason and affirmed the district court's order for the Alabama Legislature to be reapportioned. *See id.* at 587.

Since *Reynolds*, this Court has continually found attempted justifications to be insufficient to sustain population deviations that discriminate against similarly situated eligible voters based on their geographies—even though these claims do not implicate any suspect classifications. *See, e.g.*, *Chapman v. Meier*, 420 U.S. 1, 24 (1975); *Kirkpatrick v. Preisler*, 394 U.S. 526, 530–31 (1969). This Court has also affirmed that states cannot discriminate against voters under the guise of exercising "power wholly within the domain of state interest" in

their role facilitating elections. *Gomillion*, 364 U.S. at 347. Indeed, "[i]t is inconceivable that guarantees embedded in the Constitution of the United States may thus be manipulated out of existence." *Id.* at 345 (quoting *Frost & Frost Trucking Co. v. R.R. Comm'n*, 271 U.S. 583, 594 (1926)).

Because "the Constitution forbids 'sophisticated as well as simpleminded modes of discrimination,'" this Court looks beyond the statutory language and stated legislative purpose for evidence of unconstitutional intent to diminish the weight of certain individuals' votes. *Reynolds*, 377 U.S. at 562–64 (quoting *Lane v. Wilson*, 307 U.S. 268, 275 (1939)). Specifically, the real-world effects of state decisions can be used to discern unconstitutional intent. In *Gomillion*, this Court found an analysis of the effects of redistricting plan made a demonstration, "tantamount for all practical purposes to a mathematical demonstration, that the legislation is solely concerned with segregating white and colored voters by fencing Negro citizens out of town so as to deprive them of their pre-existing municipal vote." 364 U.S. at 341; *see also Miller v. Johnson*, 515 U.S. 900, 916 (1995) (explaining that intent can be shown "either through circumstantial evidence of a district's shape and demographics or more direct evidence going to legislative purpose").

B. The equality principle extends to cases in which the government intentionally dilutes votes based on partisanship.

As this Court has repeated, "in situations involving elections, the States are required to insure that each person's vote count as much, insofar as it is practicable, as any other person's." *Hadley v. Junior Coll. Dist.*, 397 U.S. 50, 54 (1970). Insuring that each person's vote

counts equally means that the state cannot dilute the power of votes by making distinctions—such as those based upon sex, geography, or race—among voters. This standard, the equality principle, applies to cases in which the government draws voting districts that intentionally discriminate against voters because of their political affiliation just as it applies to intentional discrimination against voters based on race, sex, or geography. When this Court is confronted with districts that show clear intent to dilute the power of voters based on political belief or party affiliation—as it is in this case—it must conclude that these cases are justiciable, consistent with this Court's prior precedents.

Vote dilution based on voters' political beliefs is structurally no different than vote dilution on other bases, such as race or geography, that this Court has found justiciable. As this Court explained in *Baker*, "if 'discrimination is sufficiently shown, the right to relief under the equal protection clause is not diminished by the fact that the discrimination relates to political rights.'" 369 U.S. at 209–10 (quoting *Snowden v. Hughes*, 321 U.S. 1, 11 (1944)). *See also Rogers v. Lodge*, 458 U.S. 613 (1982) (reaffirming the justiciability of race-based vote dilution claims and deciding one such claim on the merits); *White v. Regester*, 412 U.S. 755, 766–67 (1973) (same); *Whitcomb v. Chavis*, 403 U.S. 124, 143 (1971) (same). This Court has stated that dilution based on sex would not be "allowable." *Gray*, 372 U.S. at 379. And this Court has repeatedly found justiciable claims of vote dilution based on discrimination by geography, in which urban voters were systematically assigned to larger districts, amounting to a lesser weight being afforded to their votes. *See, e.g.*, *id.*; *Reynolds*, 377 U.S. at 562–64. In *Gray*, this Court explained that the justiciability of geography-based vote dilution claims follows logically from the

justiciability of race- and sex-based vote dilution claims. When "none could successfully contend" that race- and sex-based vote dilution "was allowable," "[h]ow then can one person be given twice or 10 times the voting power of another person in a statewide election merely because he lives in a rural area or because he lives in the smallest rural county?" *Gray*, 372 U.S. at 379.

The same reasoning applies in cases alleging vote dilution on the basis of partisanship. There is no principled basis on which the merits of claims alleging party-based dilution can be distinguished from those of claims alleging intentional dilution based on race, sex, and geography. The justiciability of party-based dilution claims flows ineluctably from geography-based and race-based dilution claims. If the state impermissibly impairs the right to a vote when it dilutes the votes of those who reside in the city, *id.* at 379, draws racial gerrymanders, *see id.*, stuffs ballot boxes, *Saylor*, 322 U.S. at 389, or discriminates based on sex, *Gray*, 372 U.S. at 379, then it is difficult to see why it would not also be an impermissible impairment for the state to discriminate based on political affiliation.

Just as it would violate the Constitution if the state decided to give double votes to urban voters or to White voters, but only single votes to suburban voters or to Black voters, it would also violate the Constitution if the state gave double votes to some voters and only single votes to others on the basis of partisanship. And just as it would violate the Constitution for the state to dilute the votes cast by individuals because they reside in the city or because they are Black, it also violates the Constitution when the state dilutes votes because the voters are associated with Republicans or with Democrats. In all these intentional vote dilution cases, this Court must

conduct the *Reynolds* inquiry, and determine whether there is any constitutionally valid justification for treating voters differently, and thus violating "the basic standard of equality among voters." *Reynolds*, 377 U.S. at 561.

Here, this Court should affirm that there is no such constitutionally valid justification from departing from presumptive voter equality. *Baker* protected the "right to a vote free of arbitrary impairment by state action." 369 U.S. at 208. No person may be given greater voting power merely because of her race, her sex, or where she lives. Surely, then, she may not be given greater voting power because she is a Democrat. This is especially so given that the First Amendment protects individuals from state discrimination on the basis of their political beliefs.

For example, the government may not determine access to government employment or benefits on partisan grounds, except in certain cases in which party affiliation is relevant to the office. *See Rutan v. Republican Party of Ill.*, 497 U.S. 62, 74–75 (1990); *Elrod v. Burns*, 427 U.S. 347, 359–60 (1976) (opinion of Brennan, J.). Similarly, membership in a particular political organization cannot be the basis for termination from the civil service. *See Keyishian v. Board of Regents*, 385 U.S. 589, 607–08 (1967). By denying a benefit to certain persons because of their partisan affiliation or their political beliefs, their "exercise of those freedoms would in effect be penalized and inhibited. This would allow the government to 'produce a result which (it) could not command directly.'" *Perry v. Sindermann*, 408 U.S. 593, 597 (1972) (quoting *Speiser v. Randall*, 357 U.S. 513, 526 (1958)). So too here: by disfavoring individuals based on their political affiliation, the state not only treats them

unequally in the exercise of the franchise, but it also penalizes and inhibits their First Amendment freedoms—a result it could not command directly.

* * *

In short, there is no constitutional principle that can explain why intentional, selective treatment based on individuals' partisanship should be adjudicated differently from intentional dilution on other grounds—race, sex, or geography. This Court has explained that "[t]he concept of 'we the people' under the Constitution visualizes no preferred class of voters but equality among those who meet the basic qualifications." *Gray*, 372 U.S. at 380. Moreover, there *is* a constitutional principle, embodied in the First Amendment, for why partisan association and beliefs should be protected. As *Wesberry* put it, "the right to vote is too important in our free society to be stripped of judicial protection." 376 U.S. at 7. *Reynolds* reaffirmed that, "[e]specially since the right to exercise the franchise in a free and unimpaired manner is preservative of other basic civic and political rights, any alleged infringement of the right of citizens to vote must be carefully and meticulously scrutinized." 377 U.S. at 562. The equality standard is judicially manageable, as reflected by this Court's prior precedents. Thus, this Court can, and should, conclude that these cases of intentional vote dilution on the basis of partisanship are justiciable, and that individuals deserve protection from this form of vote dilution just as for other forms already held to be unconstitutional.

II. Claims of vote dilution on the basis of partisanship can be evaluated by a reliable and well-established computational method.

In this section, we describe a powerful method to evaluate the districts in contested plans, setting a high

bar to distinguish extreme outliers from those within the range of reasonable outcomes for that state. Unconstitutional vote dilution can be proved by showing that the manner in which the government drew the lines departed from a baseline of equal treatment by diminishing the weight, power, and value of an individual's vote. The district court in the North Carolina case framed matters similarly, observing that "there needs to be a baseline from which to measure to what degree a districting plan drawn on the basis of partisan favoritism deviates from the universe of 'fair and effective' plans." *Common Cause v. Rucho*, 318 F. Supp. 3d 777, 876 n.33 (M.D.N.C. 2018) (citing *Vieth v. Jubelirer*, 541 U.S. 267, 307 (2004) (Kennedy, J., concurring)). Thus, a key to adjudicating cases of partisan gerrymandering is the determination of this baseline: we must have a reliable method to distinguish a normal, neutral, or non-gerrymandered district from an intentionally abusive, gerrymandered, dilutive district. After all, a great many legally valid congressional districting plans exist for North Carolina—not simulations, but true alternative plans—and they come in enormous variety. We must therefore create a benchmark understanding of neutral districting plans in a state-specific setting. Once we have such a benchmark, we can compare it to the challenged districting plan to determine whether, in light of the evidence, an intent to discriminate is the best explanation for a district's design.

The North Carolina case provides a demonstration of how such a model can work in practice. Here, there is no doubt about the intent behind the districting plan. David Lewis, the Republican official who led the redistricting process, admitted that his caucus had selected a map designed to produce a 10-3 split "because I do not believe it's possible to draw a map with 11 Republicans and two

Democrats." Compl. at 13, *Common Cause v. Rucho*, No. 1:16-CV-1016 (M.D.N.C. 2017), 2017 WL 3981300. Representative Lewis elaborated: "I think electing Republicans is better than electing Democrats, so I drew this map to help foster what I think is better for the country." *Id.* Months later, the map produced precisely the expected 10–3 outcome.

The method outlined below demonstrates how, even without such a helpfully clear statement of intent, such discrimination could be reasonably inferred. A simple forensic analysis reveals that six of the thirteen districts are extreme outliers in their partisan composition, both in the North Carolina Congressional Plan enacted in 2012 and in its 2016 replacement that has been held unconstitutional by the district court in the current case (the "2012 Plan" and "2016 Plan," respectively).

A. A reliable and well-established computational method provides a baseline that enables the identification of outliers.

For many decades, scientists, mathematicians, technologists, and government officials have used a technique known as *Markov chain Monte Carlo* ("MCMC") for prediction, modeling, and analysis of large data sets. MCMC gets its name from combining a class of algorithms known as Monte Carlo methods with a probabilistic process called a Markov chain. It has a sixty-year track record of success in studying configurations of complex systems, and has been famously applied in settings from weapons development to weather prediction to finance to number theory to quantum mechanics. *See generally* Persi Diaconis, *The Markov Chain Monte Carlo Revolution*, Bulletin of the American Mathematical Society, April 2009, at 179; Peter L. Galison, *Image & Logic: A Material Culture of Micro-*

physics (1997). For its use in redistricting, see Br. for Eric Lander, as Amici Curiae Supporting Appellees, *Gill v. Whitford*, 138 S. Ct. 1916 (2018) (No. 16-1161).

MCMC permits us to carry out a comparative analysis of districting plans by generating a large and diverse sample of districting plans—tens of thousands, millions, or billions can be efficiently generated on a standard laptop. The search can be restricted to plans that comply with a given state's districting laws, and hold constant the state's geography and voting patterns. These collections, or "ensembles," of plans provide a baseline understanding of the range of possible legally valid plans, which enables us to compare any given plan with that range and flag extreme outliers. We can refer to this assessment technique as "the method of ensembles."

Scientific consensus in the mathematics and statistics community increasingly endorses this approach to the problem of discriminatory redistricting. Many technical teams are now using this method independently of each other to understand redistricting in the United States. These teams each set up their own algorithms, running chains of map generation until they achieve high confidence that the ensemble is mathematically representative of the full universe of possibilities and provides robust, reliable results.

In the North Carolina case, plaintiff's expert Jonathan Mattingly adopted this approach and created an ensemble of 24,518 maps using a popular MCMC variant known as simulated annealing. *See districtingDataRepository*, Gitlab Community Edition, https://bit.ly/2HrB9mj. Other groups have similarly created redistricting ensembles using their own MCMC approaches. *See mggg*, Github, https://bit.ly/2TEHXTS; *redist*, Github, https://bit.ly/2EI1p8M; https://bit.ly/2XKe1F9.

Significantly, even though MCMC approaches vary, the results in the current case can be replicated. For instance, *amici* were able to compare Mattingly's ensemble to one that we prepared independently with an entirely different MCMC technique called tree-based recombination ("ReCom"), producing remarkably consonant results. To make the box-and-whisker plots shown below in Figure 1, the resulting maps were laid over Senate 2016 voting patterns to benchmark the expected partisan composition for each district in North Carolina—a similar plot could be made with respect to any other electoral data. The boxes show the middle 50 percent of plans, and the whiskers bracket the first to 99th percentile. Crucially, the two ensembles flag exactly the same districts as extreme outliers in both the 2012 Plan and 2016 Plan. This outlier finding will be illustrated for Districts #10 and #11 below (see Fig 2 and 3).

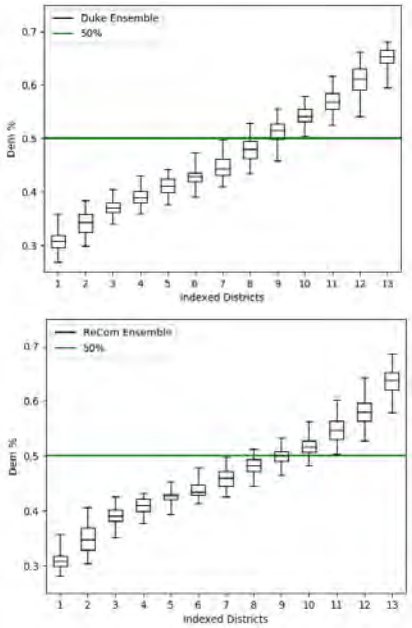

Figure 1.

These identical outlier findings, despite different MCMC designs and ensemble sizes, demonstrate the robustness of the approach. They also demonstrate that the method of ensembles is reliable and replicable, bolstering the plausibility of using outlier analysis as a legal tool.

B. This method takes into account the legal and political landscape of each state.

Individual states can and do set their own districting rules and criteria. This presents us with an explicit *ex ante* framework in each state, containing both federal rules, like equal population and the Voting Rights Act, and state-specific rules—Arizona's priority for competitive districts, Iowa's requirement that counties be preserved whole, Colorado's guidance to minimize the total perimeter of the districts, and so on.

In addition to laws governing districting, each state also has idiosyncratic physical and human geography: The Black population is concentrated in the Delta region of Mississippi; Democratic votes are concentrated in cities in Pennsylvania but in rural areas in Alaska; Iowa is a nearly-perfect grid of nearly-square counties; and so on.

The political geography, in particular, matters enormously for the determination of district behavior. For instance, if every household in a state casts three Republican votes and two Democratic votes, then as long as district lines do not split a house, every single district—no matter how its lines are placed—must necessarily reflect this 3–2 Republican tilt. This forces 100 percent of the representation to be Republican, irrespective of districting choices, which should clearly not support a finding of unconstitutional vote dilution. On the other hand, if the same 40 percent share of Demo-

cratic votes fell into several enclaves, then substantial Democratic representation would be normal and expected, and a 100 percent Republican outcome should be flagged as an outlier.

With MCMC, it is easily demonstrable that legal and political geography work together to create measurably different baselines in some states than in others. In other words, the outcomes of the districting process will and should vary a great deal from state to state, even without any discriminatory intent.

It is worth emphasizing that the technique we describe here is a *method*—not a new score of partisan skew. The method of ensembles does not produce a number or score. Instead, it generates a neutral baseline that can be used to interpret scores for a challenged district plan. The examples in the figures shown here demonstrate the method with respect to vote share, but the method applies equally to other measures or metrics of partisan skew. Thus, ensemble analysis can be flexibly applied to any one or several measures of partisanship that are specified in state rules or doctrinal criteria. A state can certainly name preferred scores of partisan fairness, as some are starting to do—Utah's new law cites partisan symmetry measures, while Missouri's uses efficiency gap. *See generally* Richard H. Pildes, *Redistricting Reform and the 2018 Elections*, Harvard Law Review Blog (Oct. 26, 2018), https://bit.ly/2TC1tAq. These methods then generate legally valid plans to benchmark state-specific reasonable values for each metric, rather than relying on universal *a priori* presumptions about ideals and thresholds. Ensembles only provide benchmarks and baselines once metrics have been selected.

C. Unconstitutional vote dilution can be identified in specific districts.

By identifying some districts as extreme outliers, the method of ensembles makes dilutive "packing and cracking" clearly visible to courts, legislatures, and the public. Packing and cracking are familiar concepts in the history of redistricting. Packed districts have elevated vote levels for a disfavored group, far beyond 50 percent and far from the baseline of the sample. Cracked districts have depressed vote share for the disfavored group, usually well under 50 percent even though the bulk of the ensemble is over that level. Because of asymmetrical geographical patterns, it may well be that very high or very low vote share in a district is completely expected without any discriminatory intent, so neither packing nor cracking is a manageable or usable concept without a method of distinguishing outliers from expected outcomes.

Exploring further the partisan composition data displayed above, we can sort the districts in order of their Democratic share and obtain a clear finding of extreme packing and cracking. The figure below uses the cracked 13th District from the 2016 Plan and the packed 4th District from that plan to illustrate how extreme outliers are made manifest by comparison with an ensemble. (These districts appear as #10 and #11, respectively, when sorted by Democratic vote share as in Figure 1.)

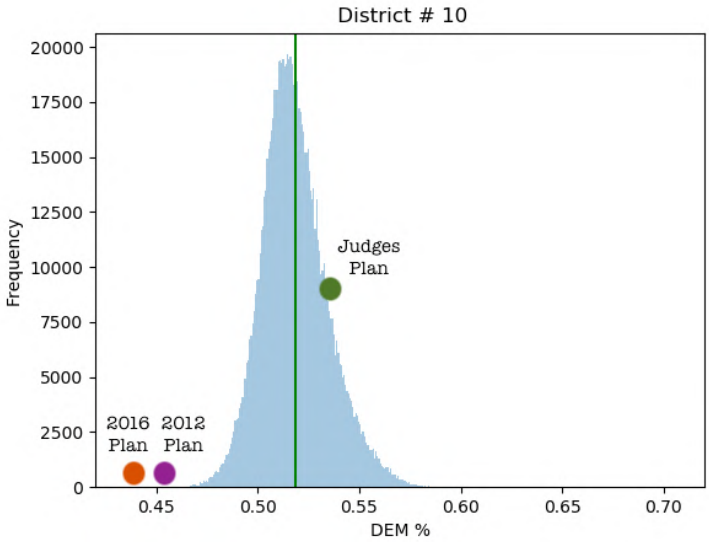

Figure 2

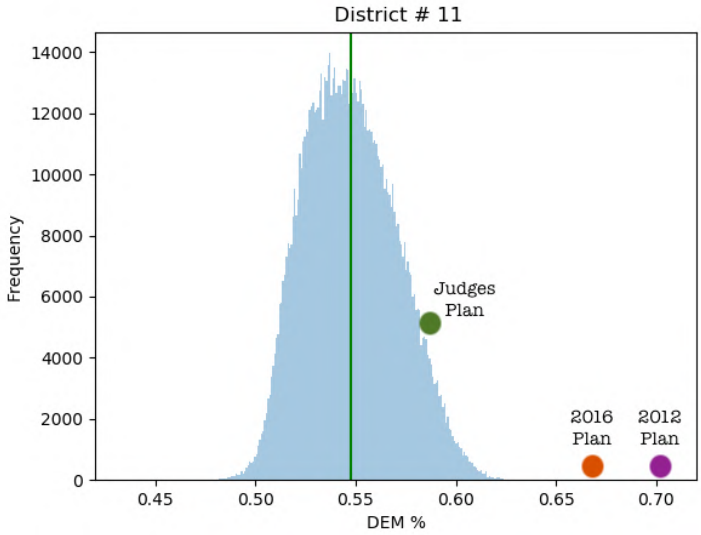

Figure 3

The extreme outlier status of these districts in both the 2012 Plan and the 2016 Plan is clearly visible here,

further thrown into relief by comparison with the corresponding districts in a plan made by a bipartisan panel of retired judges ("Judges' Plan"). Karen Kemp, *Nonpartisan Redistricting Panel Reveals Unofficial NC Congressional Voting Map*, Duke Sanford School of Public Policy (Aug. 29, 2016), https://bit.ly/2HjYyG8. Intentional minimization of the weight of votes for those districts' inhabitants is the clear inference from such extreme outlying effects.

The same effects may be observed if the comparison ensemble is sorted geographically rather than by party share, which we have done by designating a central Charlotte precinct and its district in the 2016 plan. Partisan composition in that district can then be compared to corresponding districts in the ensemble, averaged over their respective precincts. The figure below shows that the 2016 Plan clearly packs Charlotte voters. The 2012 Plan is not depicted in the figure because its packing is so pronounced that it is out of range of the plot. As with the other findings described in this section, Charlotte's outlier status is a matter of complete agreement between the Mattingly and the ReCom ensembles.

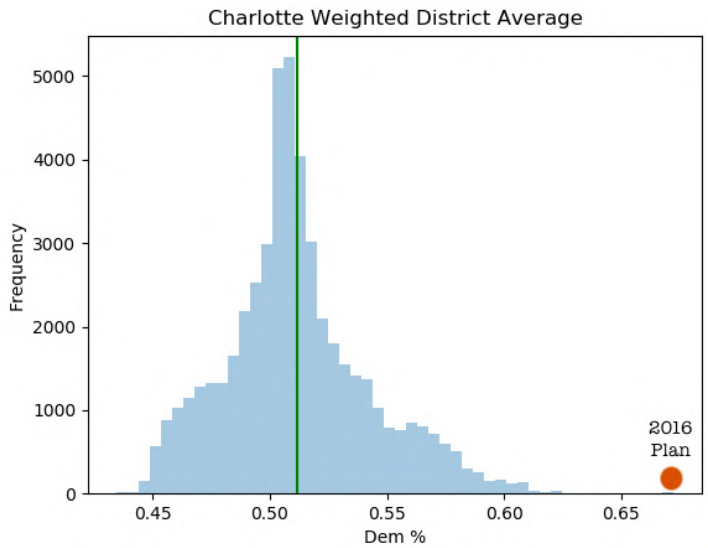

Figure 4

In sum, individual voters are harmed by living in districts that are intentionally designed to instrumentalize rather than to fully register their votes. When district design serves to effectively preordain an outcome far from the neutral baseline, it does not properly weight the votes in those districts.

Consider a scenario in which the North Carolina legislature decides to design the districts *after* a vote has been conducted, with knowledge of how votes were cast in each precinct. Having decided to concede three districts to Democrats, it can then sort the heavily Democratic precincts into those designated districts, clearly serving to diminish the weight, power, and value of those votes. The debasement of vote weight is as clear as in ballot-stuffing scenarios. The difficulty is to distinguish intentional manipulation by the state from the natural patterns of higher and lower concentration present in the vote distribution itself.

A plan composed of districts that fall far from the baseline constructed by the state's rules and geography, and in a pattern that benefits the controlling party, is not rationally explained by the rules and geography. Absent plausible justification by permissible principles, the reasonable inference is one of intentional discrimination.

D. This method is limited in scope.

A method that flags extreme outliers does not infringe on states' ability to set the rules and add districting criteria, nor on their latitude to select a plan that broadly comports with those criteria. We emphasize that the use of the method of ensembles for districting is proposed as an assessment technique, not proposed for optimization or map selection. This will never amount to usurping the state's authority to select a plan, because billions of substantially different plans remain viable, under any conception of outlier. This method does not choose a winner from among the abundance of options. This balances between state prerogatives and constitutional principles.

Importantly, even some districts or plans that look gerrymandered on their face will not be flagged as outliers by this method. For instance, Massachusetts had ten House seats in the 2000–2010 census cycle, and in that period, a Republican share of 30-37% was typical in statewide races. However, not a single Republican was elected to Congress in the five races in that cycle. This may seem to provide a cause of action for a potential claim. What an ensemble analysis clearly shows, however, is that for most elections in that cycle, no valid districting plan *whatsoever* will have even a single Republican-favoring district. Moon Duchin et al., *Locating the Representational Baseline: Republicans in Massachusetts*, MGGG (Oct. 22, 2019), https://bit.ly/

2SPW2cL. Not only a majority of possible plans, but indeed *every single* possible plan, produces a completely Democratic delegation. This is because Massachusetts at the time behaved much like the hypothetical state in which every household has the same voting preference: the statewide share of Republican votes is nearly replicated in every town and even precinct around the state. Thus the method of ensembles contradicts the *prima facie* suggestion of a gerrymander. This example also demonstrates that the method of ensembles does not covertly enforce a proportionality standard, but instead defers to the consequences of the state's rules and political geography.

CONCLUSION

The right to vote is personal and individual. That right is violated when a state singles out voters—in this case, because of their political beliefs—and acts with an intention to dilute their votes. The districting process by its very nature draws lines, thereby treating some voters differently from others. Thus, the process of distinguishing between this permissible line drawing and intentional, unconstitutional vote dilution is not always straightforward. The methods described here, however, demonstrate that these distinctions can be reliably made and thus that these claims can be justiciable. By flagging some districts as extreme outliers, these methods can make clearly visible to courts, legislatures, and the public when there is no rational justification for the drawing of a district and the only reasonable inference is one of intentional discrimination.

Respectfully submitted,

DEEPAK GUPTA
Counsel of Record
DANIEL WILF-TOWNSEND
GUPTA WESSLER PLLC
1900 L Street, NW, Suite 312
Washington, DC 20036
(202) 888-1741
deepak@guptawessler.com

GUY-URIEL E. CHARLES
HARVARD LAW SCHOOL
1563 Massachusetts Avenue
Cambridge, MA 02138
(617) 998-1742

March 8, 2019 *Counsel for Amici Curiae*

ADDENDUM: IDENTITY OF *AMICI CURIAE*

Moon Duchin is an Associate Professor of Mathematics at Tufts University and a Senior Fellow in the Tisch College of Civic Life.

Jeanne Clelland is a Professor of Mathematics at the University of Colorado Boulder.

Daryl DeFord is a postdoctoral associate in the Geometric Data Processing Group at the Massachusetts Institute of Technology.

Jordan Ellenberg is the John D. MacArthur Professor of Mathematics at the University of Wisconsin-Madison.

Tyler Jarvis is a Professor of Mathematics at Brigham Young University.

Nestor Guillen is an Assistant Professor of Mathematics at the University of Massachusetts at Amherst.

Dmitriy Morozov is a Staff Scientist in the Computational Research Division at the Lawrence Berkeley National Laboratory.

Elchanan Mossel is a Professor of Mathematics and core faculty of the Institute for Data, Systems and Society at the Massachusetts Institute of Technology.

Dana Randall is the ADVANCE Professor of Computing and the Co-Executive Director of the Institute for Data Engineering and Science at the Georgia Institute of Technology.

Justin Solomon is an Assistant Professor of Electrical Engineering & Computer Science at the Massachusetts Institute of Technology and leads the Geometric Data Processing Group.

Ari Stern is an Associate Professor of Mathematics and Statistics at Washington University in St. Louis.

Law Professors

Guy-Uriel Charles is the Edward and Ellen Schwarzman Professor of Law at Duke Law School, the Bennett Boskey Visiting Professor of Law at Harvard Law School, and the co-director of the Duke Law Center on Law, Race and Politics.

Luis Fuentes-Rohwer is a Professor of Law and Harry T. Ice Faculty Fellow at Maurer School of Law, Indiana University Bloomington.

Students

Anna Dorman, Dana Paikowsky, and Robin Tholin (all of Harvard Law School).