IN THE
UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA

KHADIDAH STONE, et al., Plaintiffs, v. **WES ALLEN, et al.**, Defendants,	Case No. 2:21-cv-1531-AMM

EXPERT REPORT OF SEAN P. TRENDE, Ph.D.

DEFENDANT'S EXHIBIT
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1 Expert Qualifications

1.1 Career

I serve as Senior Elections Analyst for Real Clear Politics. I joined Real Clear Politics in January of 2009 after practicing law for eight years. I assumed a fulltime position with Real Clear Politics in March of 2010. Real Clear Politics is a company of approximately 50 employees, with its main offices in Washington D.C. It produces one of the most heavily trafficked political websites in the world, which serves as a one-stop shop for political analysis from all sides of the political spectrum and is recognized as a pioneer in the field of poll aggregation. Real Clear Politics produces original content, including both data analysis and traditional reporting.

My main responsibilities with Real Clear Politics consist of tracking, analyzing, and writing about elections. I collaborate in rating the competitiveness of Presidential, Senate, House, and gubernatorial races. As a part of carrying out these responsibilities, I have studied and written extensively about demographic trends in the country, exit poll data at the state and federal level, public opinion polling, and voter turnout and voting behavior. In particular, understanding the way that districts are drawn and how geography and demographics interact is crucial to predicting United States House of Representatives races, so much of my time is dedicated to that task.

I am currently a Visiting Scholar at the American Enterprise Institute, where my publications focus on the demographic and coalitional aspects of American Politics.

I am also a Lecturer at The Ohio State University, where I teach courses in survey methods, voter participation and turnout, and introductory American Politics.

1.2 Publications and Speaking Engagements

I am the author of the 2012 book The Lost Majority: Why the Future of Government is up For Grabs and Who Will Take It. In this book, I explore realignment theory. It argues that realignments are a poor concept that should be abandoned. As part of this analysis, I conducted a thorough analysis of demographic and political trends beginning in the 1920s and continuing through modern times, noting the fluidity and fragility of the coalitions built by the major political parties and their candidates.

I also co-authored the 2014 Almanac of American Politics. The Almanac is considered the foundational text for understanding congressional districts and the representatives of those districts, as well as the dynamics in play behind the elections. My focus was researching the history of and writing descriptions for many of the 2012 districts, including tracing the history of how and why they were drawn the way that they were drawn. Because the 2014 Almanac covers the 2012 elections, analyzing how redistricting was done was crucial to my work. I have also authored a chapter in Larry Sabato's post-election compendium after every election dating back to 2012.

I have spoken on these subjects before audiences from across the political spectrum, including at the Heritage Foundation, the American Enterprise Institute, the CATO Institute, the Bipartisan Policy Center, and the Brookings Institution. In 2012, I was invited to Brussels to speak about American elections to the European External Action Service, which is the European Union's diplomatic corps. I was selected by the United States Embassy in Sweden to discuss the 2016 elections to a series of audiences there and was selected by the United States Embassy in Spain to fulfill a similar mission in 2018. I was invited to present by the United States Embassy in Italy, but was unable to do so because of my teaching schedule.

1.3 Education

I received my Ph.D. in political science at The Ohio State University in 2023. I passed comprehensive examinations in both methods and American Politics. The first chapter of my dissertation involves voting patterns on the Supreme Court from 1900 to 1945; the second chapter involves the application of integrated nested LaPlace approximations to enable the incorporation of spatial statistical analysis in the study of United States elections. The third chapter of the dissertation involves the use of communities of interest in redistricting simulations. In pursuit of this degree, I also earned a Master's Degree in Applied Statistics. My coursework for my Ph.D. and M.A.S. included, among other things, classes on G.I.S. systems, spatial statistics, issues in contemporary redistricting, machine learning, non-parametric hypothesis tests and probability theory. I also earned a B.A. from Yale University in history and political science in 1995, a Juris Doctor from Duke University in 2001, and a Master's Degree in political science from Duke University in 2001.

In the winter of 2018, I taught American Politics and the Mass Media at Ohio Wesleyan University. I taught Introduction to American Politics at The Ohio State University for three semesters from Fall of 2018 to Fall of 2019, and again in Fall of 2021. In the Springs of 2020, 2021, 2022 and 2023, I taught Political Participation and Voting Behavior at The Ohio State University. This course spent several weeks covering all facets of redistricting: how maps are drawn, debates over what constitutes a fair map, measures of redistricting quality, and similar topics. I also taught survey methodology in Fall of 2022 and Spring of 2024.

1.4 Prior Engagements as an Expert

A full copy of all cases in which I have testified or been deposed is included on my c.v, attached as Exhibit 1. In 2021, I served as one of two special masters appointed by the Supreme Court of Virginia to redraw the districts that will elect the Commonwealth's representatives to the House of Delegates, state Senate, and U.S. Congress in the following decade. The Supreme Court of Virginia accepted those maps, which were praised by observers from across the political spectrum. *E.g.*, "New Voting Maps, and a New Day, for Virginia," *The Washington Post* (Jan. 2, 2022), *available at* `https://www.washingtonpost.com/opinions/2022/01/02/virginia-redistricting-voting-mapsgerrymandee`; Henry Olsen, "Maryland Shows How to do Redistricting Wrong. Virginia Shows How to Do it Right," *The Washington Post* (Dec. 9, 2021), *available at* `https://www.washingtonpost.com/opinions/2021/12/09/maryland-virginia-redistricting/`; Richard

Pildes, "Has VA Created a New Model for a Reasonably Non-Partisan Redistricting Process," *Election Law Blog* (Dec. 9, 2021), available at `https://electionlawblog.org/?p=126216`.

In 2019, I was appointed as the court's expert by the Supreme Court of Belize. In that case I was asked to identify international standards of democracy as they relate to malapportionment claims, to determine whether Belize's electoral divisions (similar to our congressional districts) conformed with those standards, and to draw alternative maps that would remedy any existing malapportionment.

I served as a Voting Rights Act expert to counsel for the Arizona Independent Redistricting Commission in 2021 and 2022.

2 Scope of Engagement

I was engaged by the Alabama Office of the Attorney General in the above-captioned matter. In particular, I was asked to examine Districts 7 and 25 from the Illustrative Plan submitted by Mr. Anthony E. Fairfax. I was asked to examine his use of Citizen Voting Age Population ("CVAP"), the distribution of residents within the districts, and the level of Black Voting Age Population at which the Black candidate of choice would likely perform in the Illustrative District.

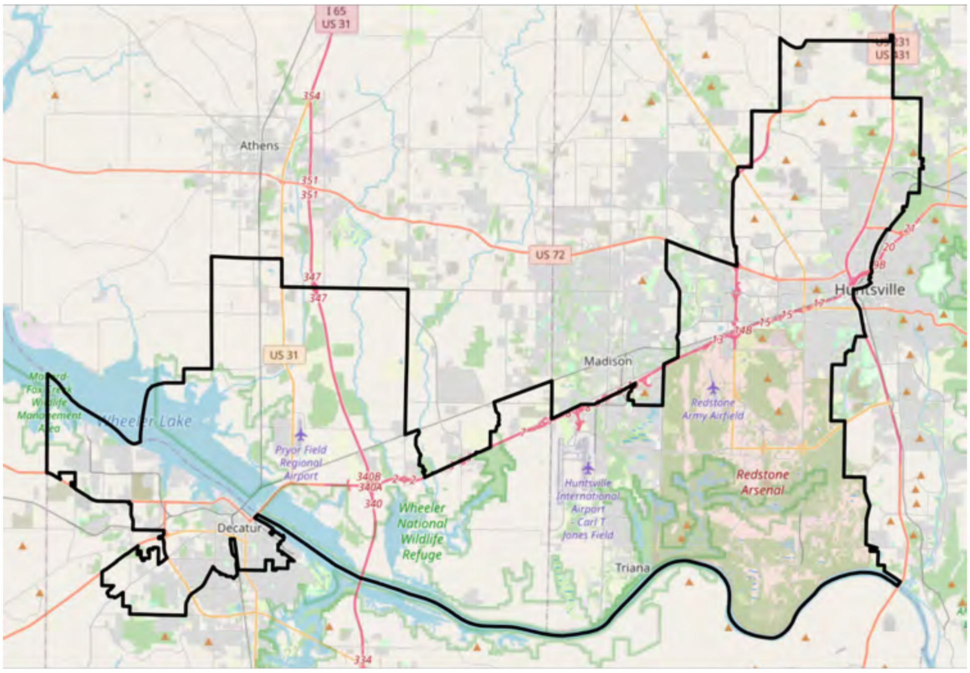
3 Analysis of Illustrative District 7

First, I was asked to evaluate Mr. Fairfax's Illustrative District 7. This district begins in western Huntsville, then skirts around south of Madison, through the Redstone Arsenal, Huntsville Airfield, and Wheeler National Wildlife Refuge to link up with a second population cluster in Decatur. The district has a population of 137,221. Of those, 48,260 (35.2%) are White, 66,602 (48.5%) are Black,[1] and 17,010 (12.4%) are Hispanic. Of those 137,221 residents, 108,202 are 18 or older ("Voting Age Population" or "VAP").

[1] This utilizes the "any part Black" defintion of "Black"

50,658 (46.8%) of those residents are Black, 42,176 are White (39%), and 10,877 (10.1%) are Hispanic.

Figure 1: Fairfax Illustrative District 7



Both the Black share of the total population and the BVAP fall short of the 50% threshold typically required under the Voting Rights Act for Prong 1 of the Gingles analysis.

Mr. Fairfax, however, opts to rely upon the Citizen Voting Age Population, or CVAP. Unlike Voting Age Population and total population, which are taken from the decennial census, the Citizen Voting Age Population is derived from the American Community Survey, or ACS. Using the 2021 CVAP data, he estimates the Black share of the Citizen Voting Age Population —defined here as Black or Black/White–for the district to be 50.16%. There are, however, many issues associated with the ACS estimates of which this Court should be aware before it accepts this approach. The better interpretation is that we lack sufficient information to conclude one way or the other whether the district is majority Black CVAP (or "BCVAP").

3.1 Limitations of CVAP Data

3.1.1 Background

In my experience, CVAP is typically used when there are large Hispanic populations, where non-citizenship rates are often high and where a district with a 50% Hispanic voting age population may actually have a quite small Hispanic citizen population.

The ultimate question of whether the CVAP data are sufficiently reliable to draw conclusions about whether an Illustrative District might satisfy Gingles Prong 1 for Black residents is, to my mind, a legal question for lawyers to fight about and judges to decide. I will therefore not give an ultimate opinion on whether CVAP is an appropriate metric; legal considerations do not always overlap with social science considerations. There are, however, some serious limitations that accompany the CVAP data about which the Court should be aware when rendering its decision that render it impossible in this situation to determine whether Illustrative District 7 is, in fact, majority BCVAP.

As mentioned above, CVAP data are obtained through the American Community Survey. The American Community Survey is an ongoing project conducted by the U.S Census Bureau, which surveys millions of people every year to produce a large sample survey that examines various demographic, economic, and social aspects of American life. These data are published in yearly estimates, although the Bureau also produces 3-year estimates (for the 2022 ACS, these would include data from 2020, 2021 and 2022) and 5-year estimates (for the 2022 ACS, these would include data from 2018, 2019, 2020, 2021 and 2022) for certain variables.

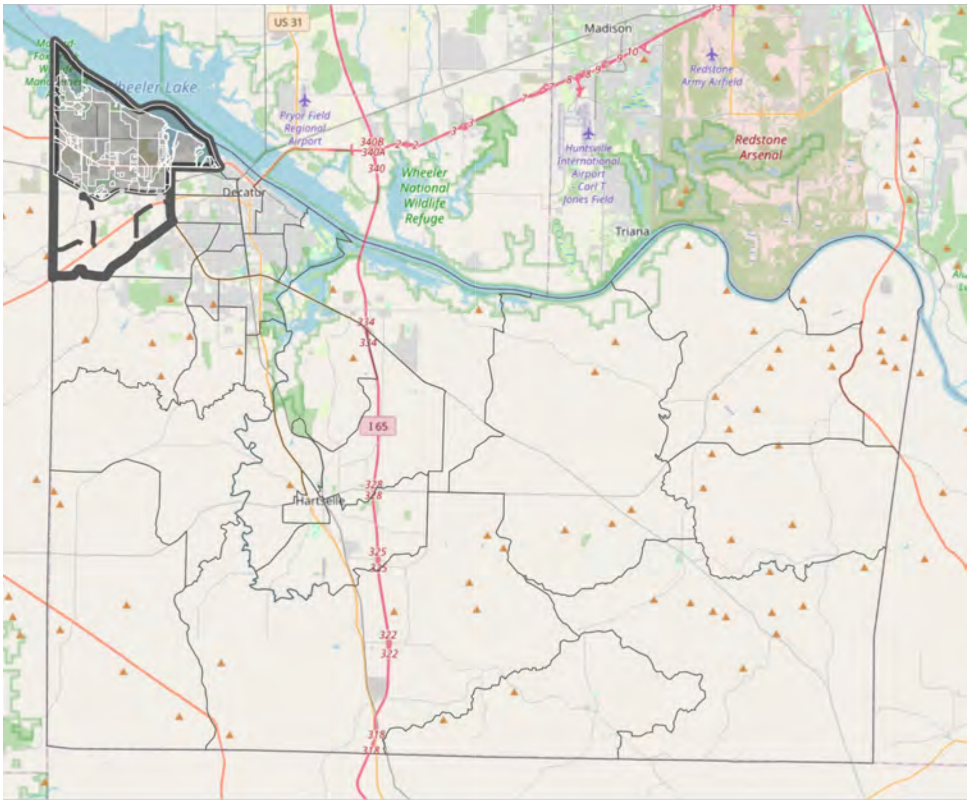
This report focuses on a special supplement to the ACS that the Census Bureau prepares annually, known as the "Citizen Voting Age by Race and Ethnicity (CVAP) special tabulation." See `https://www.census.gov/programs-surveys/decennial-c` ensus/about/voting-rights/cvap.html. This special tabulation gives data, broken down by race and ethnicity, of the number of people in various locations who identify as U.S. Citizens. In part because the decennial census does not ask residents whether they are citizens or not, this type of data is only made available at granular levels through this special tabulation. The drawback is that, unlike the decennial census, which is treated as an actual enumeration, this is a survey, and comes complete with all of the uncertainty associated with other surveys. This data is available at the statewide level in the 1-year census estimates, but is not published consistently below the county level for Alabama.

3.1.2 The Organization of Census Data

Census data are reported at multiple levels of data collection. The smallest unit is the census block, which have an average population of 27 in Alabama. Blocks are clustered into block groups (average Alabama population: 1,280), which are then clustered into census tracts (average Alabama population: 3,496). Tracts are contained within counties.

To get a better sense of scale, consider the following map of Morgan County, Alabama. Morgan County is divided into 31 census tracts. Some of these are quite rural and large, while others are smaller. Tract 005101 is located in the upper left corner of the county, and is highlighted on the map with a heavier border for further analysis. It is divided into four block groups (there are a total of 88 in Morgan County), which are denoted by dashed lines. Finally, one of those groups is divided into 170 blocks; these are shaded in dark and denoted by white lines. Overall, there are 4,806 blocks in Morgan County, and 344 blocks in Census Tract 005101.

Figure 2: Example of the Organization of Census Data in Morgan County, Alabama



One group that is missing, perhaps notably, is precincts. While the census does produce tabulations of Voting Districts, or VTDs (which are frequently, though not always, coterminous with precincts), those are usually built up from census blocks. VTD/Precinct lines often are not drawn with respect for other census groupings. Thus, while individual blocks are typically housed entirely within one precinct, block groups and tracts are frequently split.

3.1.3 CVAP data typically has substantial error margins.

Because census data are treated as a full enumeration, they come without error margins. If a block group is reported as having 500 residents, it has 500 residents. There is no randomness involved. This allows for granular analysis down to the level of very small subsamples, such as census blocks.

The ACS data, however, is based upon samples. We conduct samples because it is too time consuming, costly, or impractical to survey the entire group of people about whom we are interested (called the population). Instead, we attempt to randomly contact a subset of people, called the sample, and use what we learn about the sample to draw inferences about the composition of the population. Thus, the sample found within the ACS is an attempt to enable us to draw inferences about the broader US population given the difficulties involved with contacting every American with a lengthy survey every year.

This also means, however, that like all surveys (such as polls), there is inherent uncertainty in the ACS process. This uncertainty can take many forms: perhaps the census is unable to contact certain groups at the same rate as other groups, or perhaps certain groups will be less likely to respond to the ACS. Those types of bias/error are real, but they are difficult to quantify.

For our purposes here, the type of uncertainty in which we are most interested is called sampling error. Sampling error is a mathematical reality that even the most careful analyst cannot eliminate entirely. For example (to use an example I frequently employ in class to demonstrate the concept to my students), suppose we wanted to know the composition of a large bag of Skittles. In my experience, Skittle colors are distributed more-or-less evenly across bags. If you close your eyes, reach into a bag full of Skittles and grab 7 candies, you're very unlikely to pull out 7 yellow-colored Skittles. At the same time, though, you're also unlikely to pull out 7 candies that perfectly reflect the actual composition of the entire bag. It doesn't matter how good you are at sampling; if you're truly reaching in the bag and pulling out Skittles randomly, there's a very good chance what you pull out won't look exactly like the entire contents of the bag.

The ACS operates on the same principles. A subsample of the population is selected, and they are interviewed. It's unlikely to be completely wrong (though that can happen). But it also is unlikely to be completely correct. As the Census Bureau explained:

"All estimates produced from sample surveys have uncertainty associated with them as a result of being based on a sample of the population rather than the full population. This uncertainty—called sampling error—means that estimates derived from the ACS will likely differ from the values that would have been obtained if the entire population had been included in the survey, as well as from values that would have been obtained had a different set of sample units been selected for the survey." See ACS General Handbook at 44, available at `https://www.census.gov/content/dam/Census/library/publications/2018/acs/acs_general_handbook_2018_ch07.pdf`.

Statistics, which can be thought of as the mathematical study of uncertainty, allows us to quantify our uncertainty and express it through error margins. Error margins for the ACS work in much the same way that they work for polls. When you see a poll of President Biden's job approval that places it at, say, 45%, we don't actually know whether or not that's the same job approval that we would find had we interviewed every American. Thus, polls are accompanied by error margins, which are typically reported at a 95% degree of confidence. If the error margin for the aforementioned poll were +/- 4%, that would tell us that 95 out of every 100 polls conducted will have the "true" population value within 4 points in either direction of the reported estimate. How do we know whether our poll is one of the five that does not have the true population value within its error margins? We don't, and we can't. That's the uncertainty inherent in sampling. Likewise, we don't know whether the actual value is higher or lower than our estimate, and we don't know where in our error margin it is likely to be. We just know that our polls will typically contain the true value somewhere within four points.

Error margins are calculated with respect to the number of units within the sample, the overall variance of the sample, and the desired degree of confidence. At the national or state level, these error margins are typically manageable. To use an example contained within the document linked just above, the ACS reports that for the state of Colorado, there are 657,324 households with one or more people under the age of 18. This comes with a 90% confidence interval (the census employs 90% rather than the more traditional

95%, although the latter can easily be calculated based upon the former) of +/- 8,777 residents, or +/- 0.4%.

But the statewide ACS sample for Colorado is quite large. In 2022, the ACS interviewed 1,980,550 people nationally, of whom 32,952 resided in Colorado. It interviewed 32,482 residents of Alabama. However, because error margins are, in part, a function of the number of units that you sample, the accuracy of a poll will decline quickly as you examine smaller and smaller census groups. Alabama has 3,438 block groups, which means each group averages 9.45 respondents. This can result in very large error margins for that unit of analysis, even when aggregated across multiple years.

To see why this can be important, there are 119 block groups that are contained in whole or in part within the boundaries of Mr. Fairfax's Illustrative District 7. Below I have taken the ten block groups with the smallest error margins, their overall CVAP estimate, and the 90% and 95% error margins (I derive the latter) expressed both in terms of residents and percentages. As you can see, even the most precise estimates come with substantial error margins.

Figure 3: Error Margins, ACS CVAP Tabulation 2022, Illustrative District 7

Block Group	CVAP Estimate	90% M.o.E.	95% M.o.E.	90% M.o.E. as %	95% M.o.E. as %
0014011	1,980	212	253	10.7%	12.8%
0112032	2,215	253	301	11.4%	13.6%
0002032	3,020	354	422	11.7%	14.0%
0013021	1,930	288	343	14.9%	17.8%
0004001	1,325	204	243	15.4%	18.3%
0106311	1,885	306	365	16.2%	19.3%
0008001	1,010	165	197	16.3%	19.5%
0112012	3,085	552	658	17.9%	21.3%
0022001	1,050	199	237	19.0%	22.6%
0111002	610	116	138	19.0%	22.7%

(a) 10 Block Groups with smallest error margins for overall CVAP

When we look at the block groups with the largest error margins, we see that the uncertainty can almost eclipse the total population.

Figure 4: Error Margins, ACS CVAP Tabulation 2022, Illustrative District 7

Block Group	CVAP Estimate	90% M.o.E.	95% M.o.E.	90% M.o.E. as %	95% M.o.E. as %
0023003	1,170	860	1,025	73.5%	87.6%
0024001	375	250	298	66.7%	79.4%
0002031	775	481	573	62.1%	73.9%
0025013	390	215	256	55.1%	65.7%
0013011	1,175	632	753	53.8%	64.1%
0013013	505	267	318	52.9%	63.0%
0021003	530	274	326	51.7%	61.6%
0005012	725	372	443	51.3%	61.1%
0001005	390	198	236	50.8%	60.5%
0106253	625	312	372	49.9%	59.5%

(a) 10 Block Groups with largest error margins for overall CVAP

That is just the uncertainty for the denominator in a percentage CVAP estimate. The numerator – the number of Black citizens in a district – is based upon an even smaller subsample of Alabamians. Even the best case scenario comes with an error margin of +/- 22.2% of the population at 90% confidence.

Figure 5: Error Margins, ACS BCVAP Tabulation 2022, Illustrative District 7

Block Group	CVAP Estimate	90% M.o.E.	95% M.o.E.	90% M.o.E. as %	95% M.o.E. as %
0002032	1,930	360	429	18.7%	22.2%
0013021	1,440	289	345	20.1%	23.9%
0005011	554	128	153	23.1%	27.5%
0007021	950	223	266	23.5%	28.0%
0112032	1,150	272	325	23.7%	28.2%
0005031	355	93	111	26.2%	31.3%
0004033	1,005	265	316	26.4%	31.5%
0004031	1,534	405	483	26.4%	31.5%
0211021	520	143	170	27.4%	32.7%
0003013	1,265	358	427	28.3%	33.8%

(a) 10 Block Groups with smallest error margins for overall BCVAP

The worst case estimates include error margins that eclipse the BCVAP estimates for the block group. Using 90% confidence intervals, 15 of the 119 block groups have confidence intervals that include zero; at 95% confidence, 19 of the blocks groups have confidence intervals that include zero.

Figure 6: Error Margins, ACS BCVAP Tabulation 2022, Illustrative District 7

Block Group	CVAP Estimate	90% M.o.E.	95% M.o.E.	90% M.o.E. as %	95% M.o.E. as %
0111001	0	18	22	Inf%	Inf%
0002002	0	18	22	Inf%	Inf%
0023003	15	35	41	230.3%	274.4%
0004002	20	37	44	186.7%	222.4%
0010002	10	18	22	183.8%	219.1%
0107051	60	86	102	143.3%	170.8%
0051011	45	62	74	138.6%	165.1%
0001005	80	111	132	138.5%	165.0%
0004004	65	85	101	130.8%	155.8%
0007002	100	118	140	117.7%	140.3%

(a) 10 Block Groups with largest error margins for overall BCVAP

The Census Bureau instructs that "if a population estimate is near zero, the calculated value of the lower confidence bound may be less than zero. However, a negative number of people does not make sense, so the lower confidence bound should be reported as zero instead." *ACS General Handbook 2018*, at 45, *available at* `https://www.census.gov/content/dam/Census/library/publications/2018/acs/acs_general_handbook_2018_ch07.pdf`. This is certainly sensible. The point is simply that these CVAP estimates are consistent with there being no Black citizens in these block groups as well as with there being substantial numbers of Black citizens.

It is difficult to provide precise estimates for the Illustrative District as a whole since, as described below, census block groups are split. This leads to further uncertainty about the point estimates as described below. However, we can look at all of the census block groups included, in whole or in part, in Illustrative District 7, before splitting them. The total CVAP of these block groups, using 2022 data, is 129,045, with a 90% error margin of +/- 3,893 and a 95% error margin of +/-4,638. The total Black CVAP of these block groups, using 2022 data, is 55,935 with a 90% error margin of 2,923 and a

95% error margin of 3,483. Overall, the 2018-2022 estimate for the BCVAP of these block groups is 43.3%, with a 90% error margin of +/-2.6% and with a 95% error margin of +/- 3.1%. This suggests that a lot is riding on how the BCVAPs of the split precincts are calculate. It also suggests that, even though we cannot calculate precise error margins for the BCVAPs of the complete districts, we should be skeptical of BCVAPs hovering within a couple of points of 50%.

3.1.4 The ACS data include data taken from multiple years.

The ACS CVAP data are only made consistently available below the county level in Alabama in the 5-year data. Thus, it may be legally significant that the 2020 ACS CVAP data are not the data for 2020 in the same way that the 2020 decennial census data are the data for the year 2020. Instead, the ACS 2020 CVAP data include data collected for the 2016, 2017, 2018, 2019 and 2020 ACS. Put differently, the 2020 ACS data include data from almost a full decade ago at this point. Likewise, the most recent census release, the 2022 ACS data, actually includes data from 2018, 2019, 2020, 2021 and 2022. The 2021 ACS data, which Mr. Fairfax utilizes for his report, contains data from 2017, 2018, 2019, 2020 and 2021. In other words, most of the data are taken from before the decennial census was conducted.

3.1.5 The ACS CVAP data produces bizarre outcomes

Because the ACS are drawn from a different sample than the decennial census, there is a potential to produce outcomes that we know to be impossible. This occurs frequently, in fact. For example, using the 2020 CVAP data, we find ten block groups that are included, in whole or in part, in Illustrative District 7 where the reported total CVAP is higher than the total population in the block group as determined by the census. Using the 2021 data, there are 12 such block groups. Using the 2022 data, there are nine such block groups. In other words, in roughly 10 percent of the building blocks of Mr. Fairfax's districts, we know the data upon which he relies is not just wrong, but is spectacularly wrong.

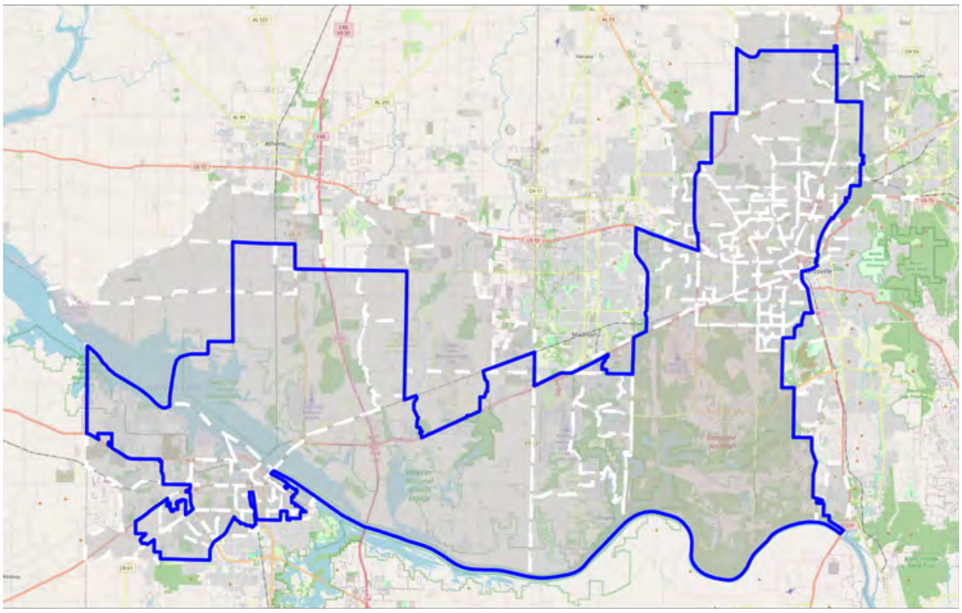
If we compare the reported CVAP to just the voting age population in the blocks groups contained in whole or in part in Illustrative District 7, it is even worse: there are 33 block groups using the 2020 data where the reported CVAP exceeds the census VAP, 44 such block groups using the 2021 data, and 50 block groups using the 2022 data. This can't readily be ascribed to population growth following the decennial census either, since most of the data come from before the decennial census (as described above in section 3). These aren't just small misses either; in roughly a third of the data upon which Mr. Fairfax's estimate is built, the building blocks reveal not just uncertain estimates, but impossible estimates.

If we look just at the Black population, there are six block groups in 2020 and five in 2021 that report more Black citizens of voting age than there are total residents. In almost half the block groups (56 in 2020, 58 in 2021 and 56 in 2022), the CVAP reports more Black citizens of voting age than there are citizens of voting age. Overall, in 2020 the CVAP reports 53,634 Black citizens in the Block Groups contained in whole or in part in Illustrative District 7, compared to a Voting Age Population of 55,939. In 2021, the ACS reports 54,614 Black citizens. In 2022, the ACS reports 55,935 Black citizens. In other words, the most recent CVAP estimates (half of which are before 2020, half of which are after 2020) reports just four fewer Black citizens of voting age than there are Black residents of voting age. Note too that the Black CVAP estimates are never lower than 95.8% of the Black Voting Age population.

3.1.6 Estimating the Black CVAP for District 7 requires piling inference on top of inference

Throughout this report I've referred to block groups contained "in whole or in part" within Illustrative District 7. That is because, as discussed in part 1, precincts in Alabama do not necessarily conform to block groups lines. That is certainly the case here. The following map depicts the boundaries of Illustrative District 7, as well as the block groups from which it draws the census blocks upon which it is built. The block groups are shaded grey, while the boundaries of the block groups are denoted with dashed lines. The boundaries of the district are denoted by a solid blue line.

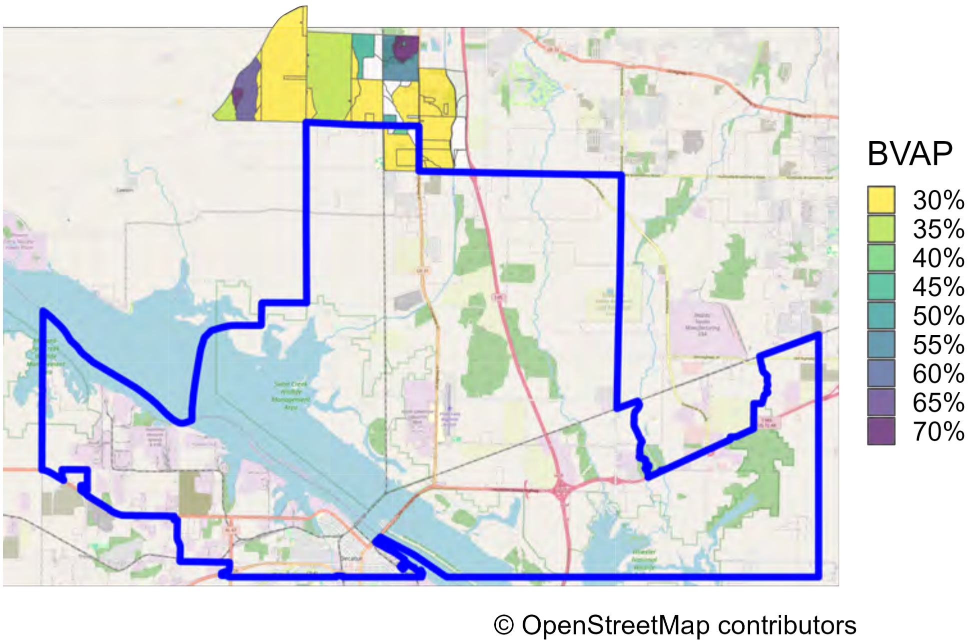
Figure 7: Block Groups contained in Illustrative District 7, with Illustrative District 7 overlaid



As you can see, there are block groups that are entirely contained within the district. But there are block groups that are split. For these, yet another issue presents itself: the researcher must also estimate the racial makeup of the portion of the block group that is contained within the district. This can be consequential. The estimated BCVAPs of the groups wholly within the district are 51.7%, 50.5%, and 50.3%, in 2020, 2021 and 2022, respectively. The corresponding BCVAPs for the block groups not wholly contained within the district are 33.8%, 32.3% and 31.2%. If the portions of the split block groups that are contained within the district are heavily Black, the district would remain majority Black CVAP. But if they are not, it would drop the BCVAP of the district below 50%.

To illustrate the problem further, consider one such block group, located south of downtown Athens:

Figure 8: Block Group 1 in Census Tract 211.02, Limestone County, AL, with census blocks shaded by BVAP



Here, the district boundary is illustrated with a solid line that traverses the district. The relevant block group is depicted in full, and the census blocks within the block group are shaded by their BVAP as defined by the decennial census (white blocks have no population).

As you can see, the district splits this block group, with some census blocks contained within the district and some contained outside of the district. Overall, the ACS estimates 615 Black citizens in the group in 2020, 430 in 2021, and 520 in 2022. The task is to figure out how many of these Black citizens to allocate to the district, and how many to keep outside of the district. We also must figure out a way to allocate the roughly

1,400 citizens within the block group.

There's no obviously correct way to do this. After all, citizenship is not equally distributed within racial groups, and the Black residents of voting age that are living outside the district may have lower citizenship rates than those within. Alternatively, Hispanic residents outside of the district could have lower citizenship rates than Hispanic residents who live within the district, affecting the total number of residents we should allocate to the district. Any estimation is going to have to rely upon an untestable assumption regarding the distribution of citizens within the block group.

Making matters even worse, as described above, we don't *really* know how many Black citizens of voting age there are within the block group to allocate in the first place, nor do we know *really* how many total citizens of voting age there are. Many block groups in this district have obviously incorrect point estimates for the number of Black citizens of voting age, and some have obviously incorrect point estimates for the number of total citizens of voting age. Thus, in many cases we're piling an estimation technique that we can't really validate on top of a point estimate that is of dubious value.

Finally, we can at least estimate an error margin for the issues raised in the preceding section. There is, however, to my knowledge no way to estimate an error margin for districts created using the technique above.

Regardless, there have been attempts to do this. One way that has been suggested is to look at the overall citizenship rate for a given block group, and then to apply that rate to the voting age population of the blocks. In other words, if 90% of the residents of the block groups are of voting age, then it is assumed that 90 of the residents of every block in the block group are of voting age. We can then allocate the citizens estimated to reside within blocks to the district in which they reside. This, however, forces us to assume that citizenship is spread evenly across the block group, without any real justification for doing so.

Making matters worse, as noted above, some block groups report higher numbers of citizens than the census reports of residents of voting age population. If we try to estimate the citizenship rate for the block group there, we will find a citizenship rate of in excess of 100% applied to the block groups. This leaves us a choice of using an obviously wrong citizenship rate, or artificially capping the citizenship rate at 100%, decreasing the number of citizens below what is reported by the ACS.

If we take this approach, we find a BCVAP of 50.1% using 2016-2020 CVAP data, 49.7% using 2017-2021 CVAP data and 48.8% using 2018-2022 CVAP data. If we cap the CVAP percent and BCVAP percent at 100%, the percentages drop further: we find a BCVAP of 49.2% using the 2020 data, 48.0% using the 2021 data, and 47.8% using the 2022 data. Of course, this comes with an unknown and unknowable error margin based on the truncated sample.

Another method that has been employed is to instead mimic the disaggregation/aggregation approach used for estimating political outcomes in split precincts. This can be done manually, or it can be done using the "split_precinct_analysis" command in the eiExpand package in R. Of course, political outcomes in a full precinct are a known quantity, unlike the block-group-wide estimates employed here, so that approach is not subject to the doubled uncertainty found here. The approach is as follows: Take the census blocks within the split unit (using political data, a precinct; for our purposes here, a block group), and divide them between blocks that fall within the district and blocks that fall outside of the district. Examine the percentage of the relevant voting age population contained in the blocks within the district, and then apply that percentage to the CVAP of the block group. In other words, you would assume that the percentage of citizens of voting age in the block group that is also contained within the district is the same as the percentage of the voting age population in the block group that is also contained within the district.

If we apply this metric assuming that both the BCVAP and total CVAP are apportioned similarly to the VAP within the district, we get BCVAPs of 50.4% using the 2020 data, 49.2% using the 2021 data and 48.3% using the 2022 data. If we weight the BCVAP and CVAP separately, the results are 50.9%, 49.7% and 48.7% using the 2020, 2021 and 2022 data, respectively. Using the package, we find estimates of 50.4%, 48.2% and 48.3%. Weighting BVAP and CVAP separately, the results are the same as when we do it manually. [2].

3.1.7 2020 Specific Concerns

Finally, the 2020 1-year estimates are particularly unreliable, as the census has noted. *See* `https://www.census.gov/newsroom/blogs/random-samplings/2021/10/pandemic-impact-on-2020-acs-1-year-data.html`. It did not believe that data met its quality expectations.

3.1.8 Felons

Finally, Mr. Fairfax claims that use of CVAP is justified because "when a meaningful number of noncitizens are present, CVAP, which only includes citizens, becomes a more appropriate racial population group to determine the majority of eligible voters (because noncitizens are not eligible to vote and when there is a significant amount, they should be removed from the analyzed population group). Thus, CVAP represents a more accurate population group that only includes citizens above the age of 18 years." Fairfax Report at 41. First, as demonstrated above, the high degree of uncertainty regarding the CVAP rates here calls into serious question whether this is a more accurate population depiction. Indeed, it isn't clear that there are *any* Black non-Citizens in District 7.

More importantly, if Mr. Fairfax is truly interested in reporting the eligible population, he should take Dr. Burch's report or other data into account. Specifically, Dr. Burch reports that in Alabama, 8.6% of the voting eligible population is barred from voting because of a felony conviction. But for eligible Black voters, that number is higher: 14.7%. If we apply those ratios to the CVAPs that Mr. Fairfax provides for District 7, the district would have a Black eligible population of just 46.8%.

[2]The only reason to check both ways is that the eipackage discards block groups with less than 2% of the population contained within the district

3.1.9 Conclusion

Whether Illustrative District 7 is truly majority BCVAP depends heavily on the assumptions one employs, the data one uses, and the estimation technique utilized. Apparently the Maptitude redistricting software estimates that, using 2021 CVAP data, the district is barely majority Black CVAP. Other commonly employed estimation techniques, however, suggest that it falls short.

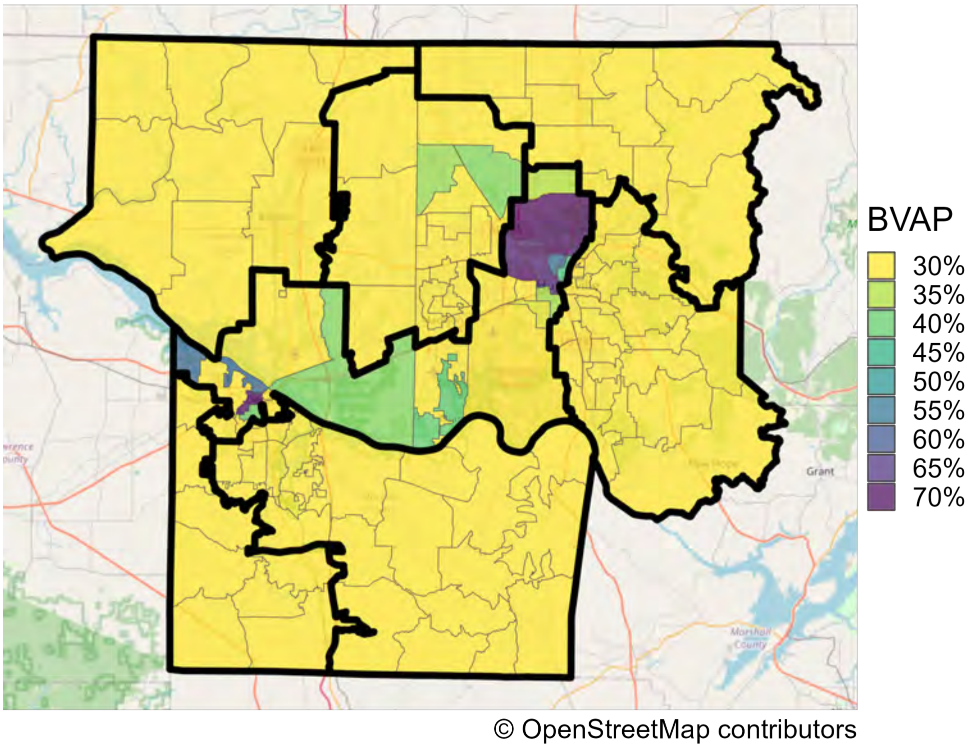
Moreover, there has been a steady trend in the district, using a variety of techniques, that lower the BCVAP. Using the 2022 CVAP estimates – which include data balanced across the decennial census – results in an estimate below 50% BCVAP. It is likely that had Mr. Fairfax using the 2022 CVAP estimates in Maptitude for Redistricting, it would show a BCVAP below 50% as well.

Finally, and perhaps most importantly, even that estimate comes with a substantial error margin. We can't know exactly what that error margin is, but the closest approximations we can draw would place it at around 3%. In other words, with a bare majority BCVAP in the district, the error margin would contain 50% and values below. Typically, in my profession, when the error margin includes a value, we cannot exclude an argument that the correct point estimate is the actual value. In other words, we can't say – using any of the estimates here – with a reasonable degree of scientific certainty that the BCVAP in this district is, in fact, in excess of 50%.

3.2 Population Compactness

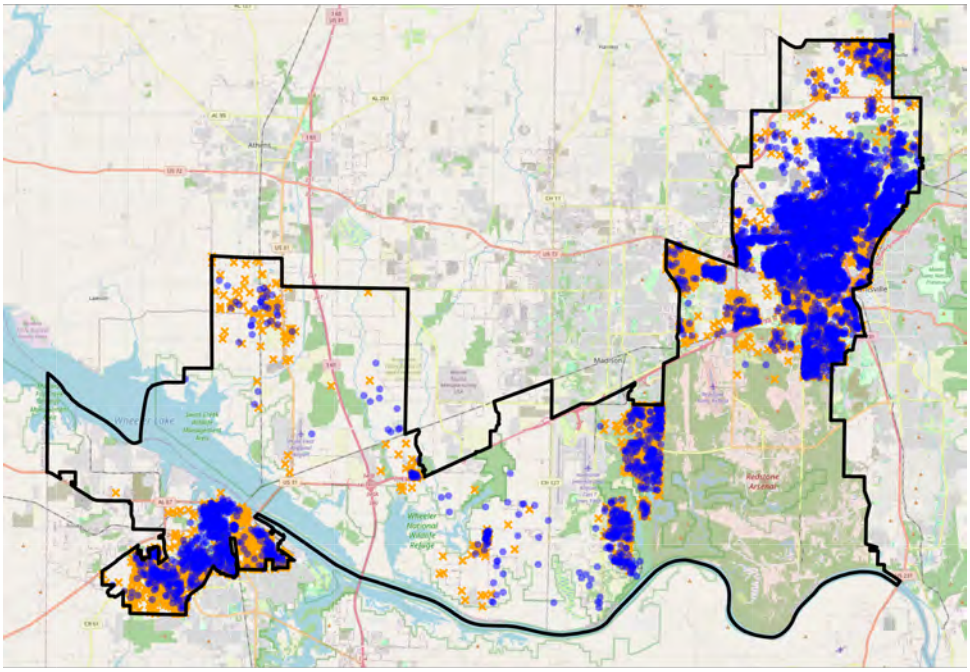
Finally, I was asked to examine the compactness of the population in the district. The following map depicts the VTDs in the three counties Illustrative District 7 traverses, with the Illustrative District boundaries overlaid. The district connects two discrete Black groups in Decatur and Huntsville to achieve its majority Black status. I also note that the district appears to pay particular attention to the black composition of the precincts he joins. Every precinct in the three counties with a BVAP in excess of 38% is included within the district, and all but five with BVAPs in excess of 25% are included within the district.

Figure 9: Precincts in Limestone, Madison and Morgan Counties, Shaded by BCVAP



We can further see the disconnected nature of the population of the district by examining dot density maps. These should be read in conjunction with the choropleth maps above, as they both provide different types of information. On the following map, ten white residents of voting age are depicted by an orange "x" while ten Black residents of voting age are depicted by a blue dot. As you can see, the district picks up a substantial, compact Black population in Huntsville. It then bypasses the populated (heavily White) portions of Madison to cut across the unpopulated Redstone Arsenal, before picking up another cluster of Black residents to the west of the arsenal. It then cuts across additional lightly populated areas around the Wheeler National Wildlife Refuge, before turning southward and picking up additional Black residents in Decatur. In other words, the district is a collection of three compact clusters of Black residents, separated by a corridor containing empty or mostly White areas of the counties.

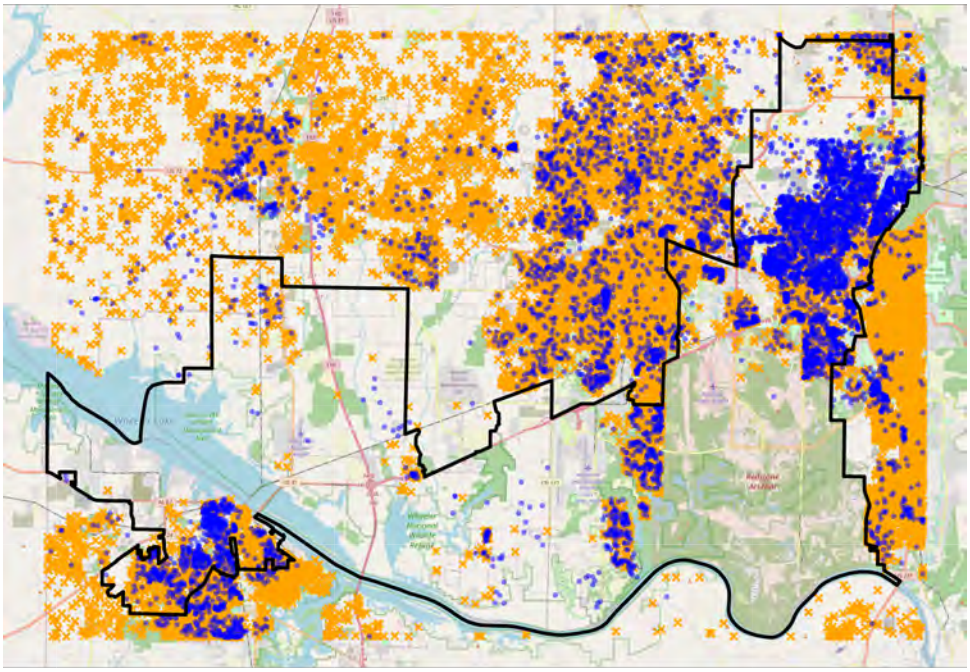
Figure 10: Dot Density Map of Black and White populations, Illustrative District 7



(a) 1 blue dot represents 10 Black citizens, 1 orange x represents 10 White citizens.

As you can see, the district carefully winds through underpopulated areas to avoid the more heavily populated areas with lower BVAPs adjacted to the district, in order to connect Decatur with the heavily Black portion of Huntsville.

Figure 11: Dot Density Map of Black and White populations, Illustrative District 7 and surrounding areas



(a) 1 blue dot represents 10 Black citizens, 1 orange x represents 10 White citizens.

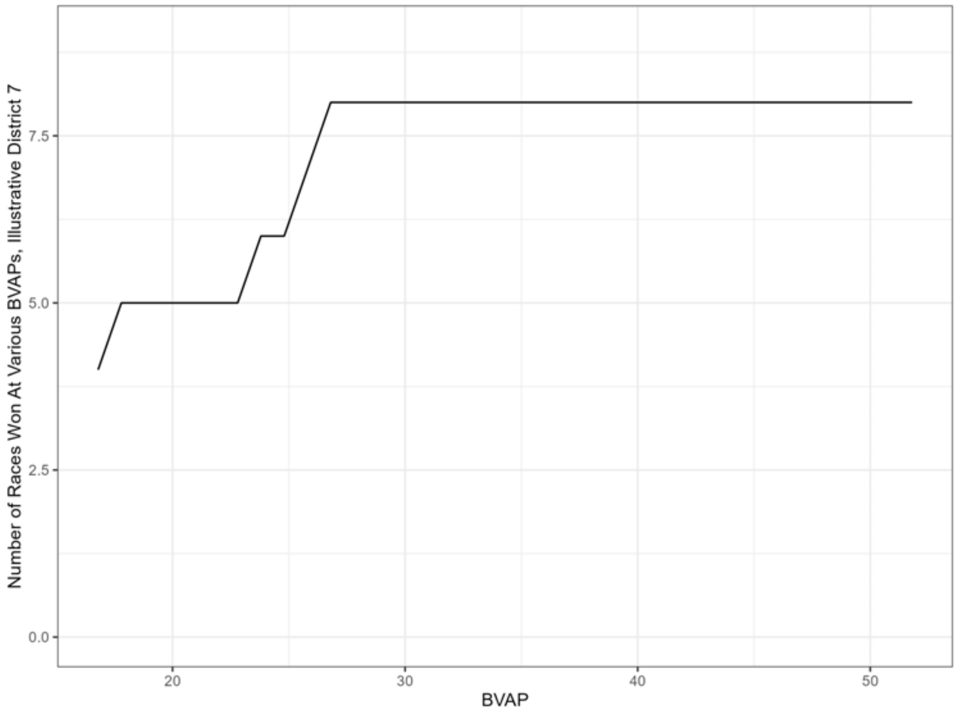
3.3 Effectiveness Analysis

Finally, I was asked to continue Dr. Liu's effectiveness analysis by calculating the BVAP that would be needed for the district to perform. I did not have access to the 2014 election data, so this is conducted only for the statewide races Dr. Liu identifies in 2018 and 2022. Because Dr.Liu identifies a substantial amount of crossover voting, I would expect the district to perform at very low BVAPs.

Indeed, given the turnout differentials, this is what we see. I first performed the EI analysis that Dr. Liu performed for each race. I then took the results for turnout and vote share, and increased or decreased the White VAP by 1%, sequentailly, and changed the BVAP by the same amount in the opposite direction.

As you can see, even at very low BVAPs, we would expect the Black candidate of choice to perform. Even in the 25% BVAP range, the Black candidate of choice would win regularly. This is because the Democratic candidate earns almost unanimous support from Black voters, and typically wins about 1/3 of the support from White voters.

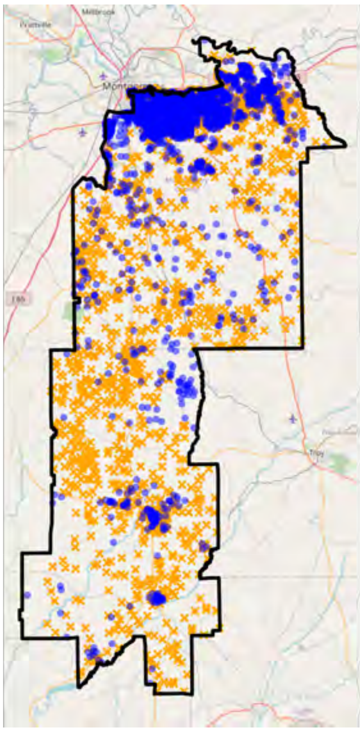
Figure 12: Number of Races won at different BVAPs, Illustrative District 7



4 Analysis of Illustrative District 25

There appears to be little dispute that Illustrative District 25 is majority BVAP. This renders much of the above moot. I have, however, been asked to create a dot density plot for the district. It is shown below.

Figure 13: Dot Density Map of Black and White populations, Illustrative District 25



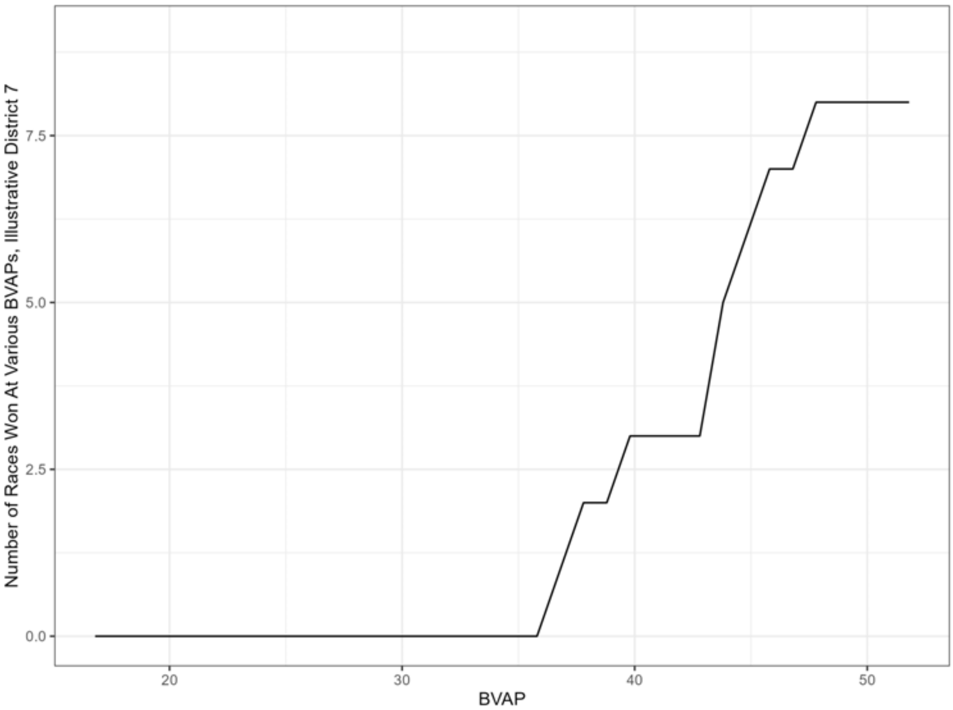
(a) 1 blue dot represents 10 Black citizens, 1 orange x represents 10 White citizens.

As you can see, there is a heavily concentrated Black population in Montgomery. But to achieve 50% +1 status, the district has to pick up isolated Black populations throughout the countryside.

4.1 Effectiveness Analysis

I also recalcuated the effectiveness analysis for District 25. Here, crossover voting is not as commonplace. Nevertheless, the district will still perform at less than 50% BVAP.

Figure 14: Number of Races won at different BVAPs, Illustrative District 25



5 Conclusion

We lack a scientific basis for claiming that Illustrative District 7 does, in fact, have a majority Black Citizen Voting Age Population. In addition, both it and District 25 (but particularly District 7) are composed of disparate groupings of Black residents. Finally, both districts would perform at well under 50% BVAP.

I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct to the best of my knowledge and belief. Executed on 29 March, 2024 in Delaware, Ohio.

Sean Trende

Sean P. Trende

6 Exhibit 1

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EDUCATION

Ph.D., The Ohio State University, Political Science, 2023. Dissertation titled *Application of Spatial Analysis to Contemporary Problems in Political Science*, September 2023.

M.A.S. (Master of Applied Statistics), The Ohio State University, 2019.

J.D., Duke University School of Law, *cum laude*, 2001; Duke Law Journal, Research Editor.

M.A., Duke University, *cum laude*, Political Science, 2001. Thesis titled *The Making of an Ideological Court: Application of Non-parametric Scaling Techniques to Explain Supreme Court Voting Patterns from 1900-1941*, June 2001.

B.A., Yale University, with distinction, History and Political Science, 1995.

PROFESSIONAL EXPERIENCE

Law Clerk, Hon. Deanell R. Tacha, U.S. Court of Appeals for the Tenth Circuit, 2001-02.

Associate, Kirkland & Ellis, LLP, Washington, DC, 2002-05.

Associate, Hunton & Williams, LLP, Richmond, Virginia, 2005-09.

Associate, David, Kamp & Frank, P.C., Newport News, Virginia, 2009-10.

Senior Elections Analyst, RealClearPolitics, 2010-present.

Columnist, Center for Politics Crystal Ball, 2014-17.

Visiting Scholar, American Enterprise Institute, 2018-present.

BOOKS AND BOOK CHAPTERS

Larry J. Sabato, ed., *The Red Ripple*, Ch. 15 (2023).

Larry J. Sabato, ed., *A Return to Normalcy?: The 2020 Election that (Almost) Broke America* Ch. 13 (2021).

Larry J. Sabato, ed., *The Blue Wave*, Ch. 14 (2019).

Larry J. Sabato, ed., *Trumped: The 2016 Election that Broke all the Rules* (2017).

Larry J. Sabato, ed., *The Surge:2014's Big GOP Win and What It Means for the Next Presidential Election*, Ch. 12 (2015).

Larry J. Sabato, ed., *Barack Obama and the New America*, Ch. 12 (2013).

Barone, Kraushaar, McCutcheon & Trende, *The Almanac of American Politics* 2014 (2013).

The Lost Majority: Why the Future of Government is up for Grabs – And Who Will Take It (2012).

PREVIOUS EXPERT TESTIMONY AND/OR DEPOSITIONS

Dickson v. Rucho, No. 11-CVS-16896 (N.C. Super. Ct., Wake County) (racial gerrymandering).

Covington v. North Carolina, No. 1:15-CV-00399 (M.D.N.C.) (racial gerrymandering).

NAACP v. McCrory, No. 1:13CV658 (M.D.N.C.) (early voting).

NAACP v. Husted, No. 2:14-cv-404 (S.D. Ohio) (early voting).

Ohio Democratic Party v. Husted, Case 15-cv-01802 (S.D. Ohio) (early voting).

Lee v. Virginia Bd. of Elections, No. 3:15-cv-357 (E.D. Va.) (early voting).

Feldman v. Arizona, No. CV-16-1065-PHX-DLR (D. Ariz.) (absentee voting).

A. Philip Randolph Institute v. Smith, No. 1:18-cv-00357-TSB (S.D. Ohio) (political gerrymandering).

Whitford v. Nichol, No. 15-cv-421-bbc (W.D. Wisc.) (political gerrymandering).

Common Cause v. Rucho, No. 1:16-CV-1026-WO-JEP (M.D.N.C.) (political gerrymandering).

Mecinas v. Hobbs, No. CV-19-05547-PHX-DJH (D. Ariz.) (ballot order effect).

Fair Fight Action v. Raffensperger, No. 1:18-cv-05391-SCJ (N.D. Ga.) (statistical analysis).

Pascua Yaqui Tribe v. Rodriguez, No. 4:20-CV-00432-TUC-JAS (D. Ariz.) (early voting).

Ohio Organizing Collaborative, et al v. Ohio Redistricting Commission, et al, No. 2021-1210 (Ohio) (political gerrymandering).

NCLCV v. Hall, No. 21-CVS-15426 (N.C. Sup. Ct.) (political gerrymandering).

Szeliga v. Lamone, Case No. C-02-CV-21-001816 (Md. Cir. Ct.) (political gerrymandering).

Montana Democratic Party v. Jacobsen, DV-56-2021-451 (Mont. Dist. Ct.) (early voting; ballot collection).

Carter v. Chapman, No. 464 M.D. 2021 (Pa.) (map drawing; amicus).

NAACP v. McMaster, No. 3:21-cv-03302 (D.S.C.) (racial gerrymandering).

Graham v. Adams, No. 22-CI-00047 (Ky. Cir. Ct.) (political gerrymandering).

Harkenrider v. Hochul, No. E2022-0116CV (N.Y. Sup. Ct.) (political gerrymandering).

LULAC v. Abbott, Case No. 3:21-cv-00259 (W.D. Tex.) (racial/political gerrymandering/VRA).

Moore et al., v. Lee, et al., (Tenn. 20th Dist.) (state constitutional compliance).

Agee et al. v. Benson, et al., (W.D. Mich.) (racial gerrymandering/VRA).

Faatz, et al. v. Ashcroft, et al., (Cir. Ct. Mo.) (state constitutional compliance).

Coca, et al. v. City of Dodge City, et al., Case No. 6:22-cv-01274-EFM-RES (D. Kan.) (VRA).

Milligan v. Allen, Case No. 2:21-cv-01530-AMM (N.D. Ala.) (VRA).

Nairne v. Ardoin, NO. 22-178-SDD-SDJ (M.D. La.) (VRA).

Robinson v. Ardoin, NO. 22-211-SDD-SDJ (M.D. La.) (VRA).

Republican Party v. Oliver, No. D-506-CV-2022-00041 (N.M. Cir. Ct. (Lea County)) (political gerrymandering).

Palmer v. Hobbs, Case No. 3:22-CV-5035-RSL (W.D. Wash) (VRA; remedial phase only).

Clarke v. Evers, No. 2023AP001399-OA (Wisc.) (Political gerrymandering; remedial phase only).

COURT APPOINTMENTS

Appointed as Voting Rights Act expert by Arizona Independent Redistricting Commission (2020)

Appointed Special Master by the Supreme Court of Virginia to redraw maps for the Virginia House of Delegates, the Senate of Virginia, and for Virginia's delegation to the United States Congress for the 2022 election cycle.

Appointed redistricting expert by the Supreme Court of Belize in Smith v. Perrera, No. 55 of 2019 (one-person-one-vote).

INTERNATIONAL PRESENTATIONS AND EXPERIENCE

Panel Discussion, European External Action Service, Brussels, Belgium, Likely Outcomes of 2012 American Elections.

Selected by U.S. Embassies in Sweden, Spain, and Italy to discuss 2016 and 2018 elections to think tanks and universities in area (declined Italy due to teaching responsibilities).

Selected by EEAS to discuss 2018 elections in private session with European Ambassadors.

TEACHING

American Democracy and Mass Media, Ohio Wesleyan University, Spring 2018.

Introduction to American Politics, The Ohio State University, Autumns 2018, 2019, 2020, Spring 2018.

Political Participation and Voting Behavior, Springs 2020, 2021, 2022, 2023.

Survey Methodology, Fall 2022, Spring 2024.

PUBLICATIONS

James G. Gimpel, Andrew Reeves, & Sean Trende, "Reconsidering Bellwether Locations in U.S. Presidential Elections," Pres. Stud. Q. (2022) (forthcoming, available online at http://doi.org/10.1111/psq.12793).

REAL CLEAR POLITICS COLUMNS

Full archives available at `http://www.realclearpolitics.com/authors/sean_trende/`