REPORT of THOMAS A. DARLING, Ph.D. 
in 
Romo v. Detzner 
(Case No. 2012-CA-000412, Fla. 2d Cir. Ct.)

submitted by 
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I was retained as an expert consultant by Legislative Defendants’ counsel in this matter to review the “Report on Computer Simulations of Florida Congressional Districting Plans” by Jowei Chen and Jonathan Rodden (February 15, 2013); to generate Congressional districting plans using computer-intensive methods and to analyze those plans; and, to conduct such other analyses as Legislative Defendants’ counsel might request.

I am employed as an Associate Professor in the School of Public and International Affairs at the University of Baltimore in Baltimore, Maryland. Until recently I also served as the Special Assistant to the Dean of the University of Baltimore’s College of Public Affairs (prior to June 30, 2010, the Dean of the Yale Gordon College of Liberal Arts). Also until recently I served as Director, Government and Technology, at the Schaefer Center for Public Policy at the University of Baltimore. I have been with the University of Baltimore since 1996. Prior to that I was employed as a Research Associate at the New York State Forum for Information Resources Management, and as an Adjunct Research Associate with the Center for Policy Research at the Rockefeller College of Public Affairs and Policy, University at Albany.

I have extensive professional and academic experience using computer databases for the quantitative analysis of moderately large information files. I teach graduate level courses in statistics, analytical techniques, information technology, database design, management science, geographic information systems, and public management in the School of Public and International Affairs’ Doctorate of Public Administration and Masters of Public Administration programs.
In the mid- to late-1990s, I authored, with colleagues Carmen Cirincione and Timothy O’Rourke a number of conference and working papers related to using computer intensive methods to assess “race as predominant factor” claims, including a 2000 article published in Political Geography. Following the 2000 census, at the request of a Maryland State Senator, I proposed a districting plan for the Maryland State Senate, which was considered by that body. In 2002, I served as an expert consultant in a Voting Rights Act, vote dilution, case (Clarence Mitchell, IV v. Paris Glendenning, in U.S. District Court). The case was mooted before trial by an opinion from the Maryland Court of Appeals revising the originally adopted plan.

Over the last several years, I have served as an expert consultant and witness for plaintiff’s in class action lawsuits related to access to Medicaid services and the provision of such services to Medicaid children. In these cases I typically analyze large datasets provided by the State related to Medicaid services received by children over several years. These cases include: Memisovski, et al. v. Garner, et al. (Civil Action No. 92 C 1982 in the United States District Court for the Northern District of Illinois, Eastern Division), my testimony and report in that matter were found both credible and useful by the Court; G.D., et al., v. Riley (Case No. 2:05cv980, U.S. District Court, Southern District of Ohio, Eastern Division), the relevant portion of the case was settled after my report was issued; Florida Pediatric Society, et al. v. Benson, (Case No. 05-23037-CIV-Jordan/McAliley in the United States District Court for the Southern District of Florida), my direct testimony and report in that case were accepted in evidence by the Court (a decision is pending); and, T.H., et al. v. Elizabeth Dudek, et al. (Case No. 12-60460-CIV-Rosenbaum, in the United States District Court for the Southern District of Florida, Fort Lauderdale Division), which is still in the class certification stage.

Materials considered in the preparation of this report are referenced throughout the document and/or in Appendix A. My resume is currently being updated and will be provided within the coming week. I have been engaged by Legislative Defendants’ counsel to serve as a consultant and, if requested, an expert witness in this matter at the rate of $300/hour plus expenses for my time generally and $600/hour plus expenses for time spent testifying.

The report consists of five sections. The first provides a summary of my primary findings and results; the second reproduces the language found in Article III, Section 20 of Florida’s Constitution related to the standards for establishing Congressional district boundaries; the third section provides a detailed description of the algorithm I use to generate districting plans and the methodology used to analyze those plans; the fourth section provides the results of the analyses conducted in this matter; and, the final section discusses some additional concerns regarding the Chen and Rodden report.
Primary Findings and Results

For the reasons set forth below, based on my review of the analyses contained in Chen and Rodden’s report and the additional analyses performed in this report, I find no substantial or persuasive evidence, much less compelling or strong evidence, that the Congressional districting plan adopted by the Legislature (CD2012) was created with the intent to favor Republicans. The districts in the CD2012 plan could have arisen from the reasonable application of criteria set forth in Article III, Section 20 of Florida’s Constitution – equal population; contiguity; adherence to Federal law and State requirements (as I understand them) protecting the opportunity of racial or language minorities to participate in the political process; compactness; and, utilizing existing political and geographic boundaries.

The analyses contained in the Chen and Rodden report and in this report do not address – and methodologically cannot address – the second order question of whether the Article III, Section 20 criteria were chosen and applied in the way they were when CD2012 was created in order to “favor or disfavor a political party.”

Summary of Chen and Rodden’s Expert Report Conclusions

Based on the analyses contained in their expert report, Chen and Rodden conclude that CD2012 “was not driven by the Legislature’s need to draw majority-minority districts or protect the integrity of counties. Thus we are left with the conclusion that the Legislature’s plan was drawn with explicit intent to favor the Republican Party” (p. 18).

The principal basis for their conclusion was their main analysis that compared the number of CD2012 districts in which the Republicans’ 2008 Presidential candidate (McCain) received more than 50% of the combined votes for Republican and Democratic (Obama) 2008 Presidential candidates (this occurred in 17 of the CD2012 districts) and the percentage of simulated plans in which more than r districts had the 2008 Republican candidate earning more than 50% of the vote.

Chen and Rodden’s main analysis kept intact the three African-American majority-minority districts created under CD2012; they used their districting simulation algorithm to generate 1,000 plans with each plan consisting of 24 congressional districts. According to Chen and Rodden (pp. 8-9), their districting simulation algorithm generates congressional districting plans with districts that are contiguous and compact, and with total district populations within ±5% of the ideal. They next “aggregate the precinct-level votes for Barack Obama and John McCain in the 2008 presidential election to the level of simulated Congressional districts and calculate the number of seats with a majority in favor of John McCain.” (p. 9)

Using their 2008 presidential vote aggregation method, a total of 17 of the 27 districts in the CD2012 plan had a greater than 50% vote share for John McCain. In the Chen and Rodden main analysis consisting of 1,000 simulated plans (p. 21), only 0.8% of their computer-generated plans contain 17 districts with a greater than 50% vote share for John McCain.
Table 1. Percentage of Chen and Rodden “main analysis” computer-generated plans where exactly $r$ districts have a greater than 50% Republican vote share.

Based primarily on these main results, Chen and Rodden conclude “that the Legislature’s plan was drawn with explicit intent to favor the Republican Party” (p. 18).

**Chen and Rodden’s Conclusions Cannot Be Reached From the Analyses They Conduct**

In their Report, Chen and Rodden attempt to use their analyses to test whether the Legislature drew the enacted plan (CD2012) with an intent to favor the Republican Party. There are three critical flaws in the analysis and test performed by Chen and Rodden that do not allow them to answer the question they seek to test.

- They misinterpret the results of their hypothesis test.
- Their analysis is based on the voting pattern from a single election (the 2008 Presidential election) which limits the generalizability of any conclusions they reach to that one election.
- They cannot apply a statistical hypothesis test or confidence interval standard to their sample of computer-generated plans.

**Chen and Rodden Misinterpret the Results of Their Hypothesis Test**

Chen and Rodden (pp. 9-10) state that their

> *analysis concludes with 95 percent certainty that a non-partisan redistricting process produces a districting plan that contains between 12 and 16 districts in which McCain voters outnumber Obama voters. The plan submitted by the Florida Legislature, which contains 17 such districts, falls outside of this 95 percent confidence interval. Hence, we conclude that the enacted districting plan would be an extreme statistical outlier under a partisan-neutral redistricting process. In other words, if the Legislature had drawn the congressional districting plan without partisan intent, the enacted plan would have been statistically very unlikely to have emerged.* (Emphasis supplied.)

The question (hypothesis) that the Chen and Rodden simulation analysis addresses (tests) is quite different than the one stated above. A more rigorous phrasing of the question (hypothesis) they test would be --

Using voting patterns from the 2008 presidential election, what is the likelihood that 17 districts would have a 50% or higher Republican vote share if the map makers only applied equal population, contiguity, and compactness considerations when drawing the 24 districts remaining after holding constant the three majority-minority districts (the 5th, 20th, and 24th districts) contained in the CD 2012 plan?
When the question (hypothesis) is correctly phrased, the limits to the conclusions that can be drawn from the Chen and Rodden main results are clear:

1) If a difference is found between the enacted plan and the simulation results, it suggests that the map makers applied criteria other than just equal population, contiguity and compactness when creating the plan, but it does not give an indication what those other criteria might have been; and,

2) The results of the analysis are limited to the voting patterns from a single election (the 2008 Presidential election), and cannot be generalized to all elections that may be held under the plan.

While their main simulation results appear to strongly suggest that the Legislature applied criteria other than just equal population, contiguity and compactness when creating the enacted plan (holding fixed the three African-American majority-minority districts), those results do not allow any conclusion or inference to be drawn regarding what the other criteria were that the Legislature applied. Chen and Rodden’s conclusion that their “analysis provides strong evidence that districts were drawn with intent to favor the Republican Party” (p. 3) cannot be reached given the methodology used in their analysis – the question of what those other criteria are that underlies their conclusion is not addressed, much less answered, given their approach.¹

Examples of other criteria that might have been used include, but are not limited to:

- The creation of Congressional districts (in addition to CD2012’s 5th, 20th, and 24th) that would meet requirements under the Voting Rights Act or would otherwise avoid “denying or abridging the equal opportunity of racial or language minorities to participate in the political process or to diminish their ability to elect representatives of their choice”; and,

- The use of additional criteria in the map drawing process, in particular the utilization of existing political and geographic boundaries.

Legislative Defendants’ counsel advises that in addition to the three African-American majority-minority districts, the Legislature sought to create a combined African-American and Hispanic majority district in the vicinity of Hillsborough County and also sought to create three Hispanic districts that would be capable of electing Hispanic candidates. Given these additional stated intentions, it is not surprising that Chen and Rodden’s test shows that the Legislature applied criteria in addition to equal population, contiguity, and compactness, when, in fact, they did apply other criteria. Chen and Rodden themselves acknowledge that seemingly “partisan bias in the transformation of votes to seats can emerge without intent to favor or harm a political party as an outgrowth of efforts to create majority-minority districts” (p. 4, emphasis supplied).

It also should be noted that Chen and Rodden’s districting algorithm does not take political boundaries into consideration. A human map-drawer’s attention to county or municipal

¹ As demonstrated by Altman and McDonald, even if the “distribution [of a test statistic] is sufficient to reject the null hypothesis that the districts were not manipulated, [it is] not sufficient to calculate the likelihood of any particular motivation yielding that plan” (p. 9). The Limitations of Quantitative Methods for Analyzing Gerrymanders: Indicia, Algorithms, Statistics, and Revealed Preference. Accessed March 26, 2013; available at http://ssrn.com/abstract=998728.
boundaries, in conjunction with compactness, could lead to different results than Chen and Rodden’s algorithm, which ignores county and municipal boundaries altogether. Later in this report I will discuss how Chen and Rodden’s simulation that held fixed the whole counties in the CD2012 plan does not address this concern regarding county and municipal boundaries.

**Chen and Rodden Overgeneralize the Results of Their Analysis**

Chen and Rodden also err in seeking to generalize results based on the 2008 Presidential voting pattern to all Congressional elections. First, members of the House of Representatives are elected every two years; it is widely accepted that voter participation during Presidential election years is substantially different from participation during “mid-term,” statewide elections. Second, voter participation and candidate preferences are not solely shaped by party enrollment and past voting patterns, but may depend, at least to some extent, on characteristics of the particular candidates and their platforms, as well as overall perceptions of the state of the nation, the economy, and the world at the time of the election. It is inappropriate, therefore, for Chen and Rodden to argue that results based on the voting pattern derived from a single, unique election are applicable to all other voting patterns from elections that might occur under the plan.

**Chen and Rodden Cannot Apply a Statistical Hypothesis Test Or Confidence Interval Standard to Their Generated Sample of Plans**

Chen and Rodden’s use of a hypothesis test and confidence intervals is inappropriate absent proof that their sample of plans is known in fact to be an unbiased random sample drawn from the population of all possible “partisan neutral” plans. Chen and Rodden offer no evidence that their 1,000 plan sample is randomly drawn from the set of all possible “partisan neutral” plans, and it is doubtful that they could develop such a proof. Given the number of building blocks used to generate their plans, the total number of feasible plans is enormous (uncountably large, but not infinite), which makes it extremely unlikely that such a proof could be offered.

Chen and Rodden further muddy the random sampling question by failing to clearly define what they mean by “partisan neutral” (p. 10) or “reasonably compact” (p. 7) plans. And, because their algorithm pays no attention to political or geographic boundaries it is unlikely that it draws a (uniform) random sample from the entire set of plans “that could be expected from the nonpartisan districting process called for in the Florida Constitution” (p. 2).

Given the absence of proof regarding the representativeness of the sample, and the lack of a clear definition of the feasible plan space actually sampled, it is statistically inappropriate to assign specific, probability-based confidence intervals or draw strong conclusions from their results. The relatively small size of their sample (1,000 plans) and the excessive relaxation of the equal population constraint (“within 5% of the ideal district population,” p. 8) adds to these concerns.

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2 Altman and McDonald, *op. cit.*, pp. 22-24., demonstrate that drawing a truly random sample in redistricting is an NP-complete problem, and, thus, likely to be computationally intractable.
The Voting Pattern Produced by the 2008 Presidential Election is An Outlier

At the request of Legislative Defendants' counsel, I applied an algorithm of my own design to examine the results from using the 2008 Presidential voting pattern and nine additional statewide election voting patterns from 2006 and 2010.

When the Darling algorithm (described in detail below) is used to create 5,000, 24 district plans (leaving CD2012's 5th, 20th, and 24th districts intact) using the 2008 Presidential voting patterns, the Darling simulation algorithm leads to results that are similar to - if not a bit more conservative than - the Chen and Rodden algorithm results. The Darling results suffer from the same methodological constraints as the Chen and Rodden results.

<table>
<thead>
<tr>
<th>2008 Presidential Voting Pattern</th>
<th>% of Simulated Plans With r or More Districts</th>
<th>&gt;50% Rep. Vote Share</th>
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<tr>
<td></td>
<td>r = 10</td>
<td>11</td>
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<tr>
<td>Chen &amp; Rodden (%)</td>
<td>100.0%</td>
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<td>Darling (%)</td>
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<td>Darling (#)</td>
<td>5,000</td>
<td>4,998</td>
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Table 2. Comparison of the percentage of Chen and Rodden “main analysis” computer-generated plans where r or more districts have a greater than 50% Republican vote share with Darling replication.

The voting pattern from the 2008 Presidential election represents a single instance of all the possible voting patterns that might occur. Each election involves different candidates with varying levels of acceptance by voters registered in the mainstream parties and “independent” voters. Voters’ perceptions of the state of the economy, the nation, and the world will be different during different election cycles. The candidate a voter chooses to vote for, indeed the choice to vote at all, reflects these and other characteristics of any given electoral contest.

The results from the analysis of 2008 Presidential voting patterns applied to simulated districting plans (or to the actual CD2012 plan) cannot be generalized beyond that election. To better evaluate the performance of the CD2012 plan, Legislative Defendants’ counsel asked that I examine the results from applying the methodology to voting patterns from nine other recent elections for statewide office in Florida (as in Chen and Rodden’s main results, CD2012’s 5th, 20th, and 24th districts were held intact).

When the results from using nine other statewide election voting patterns are compared to the results from using the 2008 Presidential voting pattern, the 2008 Presidential results are shown to be an anomaly. In three cases, CD2012 had one more district with a >50% Republican share than the rth ranked district in the simulated plans; in two of the three cases, more than 47% of the simulated plans had the same number (or more) >50% Republican share districts as the CD2012 results; in the third case, more than 17% did so. In another three cases, when the voting pattern of the election was applied to the CD2012 plan the result was the same number of districts with a >50% Republican share as in the computer-generated plans. In the remaining three cases, CD2012 produced fewer districts with a >50% Republican share than the rth ranked district in the
simulated plans; in two of the three cases the other election results produced one fewer district, in the third, two fewer districts.

These results demonstrate the misperception that can be creating from examining the voting pattern from a single, unique election – a “sample of one.” Just as the simulation algorithms generate multiple plans for analysis, it also is methodologically requisite to explore results under multiple voting patterns. It is difficult to argue that results based on the voting pattern from the 2008 Presidential election can be generalized much beyond a contest between Barack Obama and John McCain that occurred in fall 2008. I do not claim that the 10 elections analyzed in this report provide a representative sample from the set of feasible voting patterns, they do provide, however, a better picture of the behavior of the CD2012 plan under a much wider variety of plausible voting patterns.

Legislative Defendants’ counsel asked that I perform two additional sets of analyses – one set based on 5,000 plans that left intact CD2012’s Gulf coast majority African-American and Hispanic two-minority district (the 14th district), as well as CD2012’s three majority African-American districts, and another based on a set of 5,000 plans that left intact CD2012’s three Hispanic majority districts (the 25th, 26th, and 27th districts), as well as CD2012’s three majority African-American districts.

When these two additional sets of simulated plans were analyzed using the 2008 Presidential voting patterns, both sets of simulations found at least 15 districts with a >50 Republican share more than half the time (one more than in Chen and Rodden’s main result). When CD2012’s 14th district was held intact, the simulations produced 17 or more districts 9.4% of the time; when CD2012’s 25th, 26th, and 27th districts were held intact, the simulations produced 17 or more districts 3.2% of the time.

When these two additional sets of simulated plans were analyzed using the nine other statewide voting patterns, the results again were in sharp contrast to the results from the 2008 Presidential voting pattern.

- When CD2012’s 14th district was held intact, in five of the elections, CD2012 had one more district with a >50% Republican share than the rth ranked district in the simulated plans; in three elections the result was the same number of districts with a >50% Republican share; and in two elections CD2012 produced one less districts with a >50% Republican share than the rth ranked district in the simulated plans.
- When CD2012’s 25th, 26th, and 27th districts were held intact, in one of the elections, CD2012 had one more district with a >50% Republican share than the rth ranked district in the simulated plans; in three elections the result was the same number of districts with a >50% Republican share; and in five elections CD2012 produced fewer districts with a >50% Republican share than the rth ranked district in the simulated plans.

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3 In their 2009 working paper, Tobler’s Law, Urbanization, and Electoral Bias: Why Compact, Contiguous Districts are Bad for the Democrats, Chen and Rodden explicitly recognize this potential critique, noting that “no matter which statewide elections we choose, examination of hypothetical districts in such races does not capture the dynamics of campaign strategies, advertising, candidate recruitment, and other factors that might be unique to legislative races that take place in geographic districts” (pp. 24-25).
The preceding simulations account for at least some of the Legislature’s stated intentions when creating CD2012 that were not addressed in Chen and Rodden’s analyses. Even ignoring the methodological limitations of the approach and analyses, looking across all three sets of analyses, each examining ten statewide voting patterns, there is no persuasive, much less substantial, evidence that when creating CD2012 the Legislature attended to criteria other than those set forth in Article III, Section 20 of Florida’s Constitution, as I understand them.
Florida’s Constitutional Standards for Establishing Congressional District Boundaries

Article III, Section 20 of Florida’s Constitution provides⁴:

In establishing congressional district boundaries:

(a) No apportionment plan or individual district shall be drawn with the intent to favor or disfavor a political party or an incumbent; and districts shall not be drawn with the intent or result of denying or abridging the equal opportunity of racial or language minorities to participate in the political process or to diminish their ability to elect representatives of their choice; and districts shall consist of contiguous territory.

(b) Unless compliance with the standards in this subsection conflicts with the standards in subsection 1(a) or with federal law, districts shall be as nearly equal in population as is practicable; districts shall be compact; and districts shall, where feasible, utilize existing political and geographical boundaries.

(c) The order in which the standards within subsections 1(a) and (b) of this section are set forth shall not be read to establish any priority of one standard over the other within that subsection.

History.—Proposed by Initiative Petition filed with the Secretary of State September 28, 2007; adopted 2010.

Note.—The subsections of section 20, as it appeared in Amendment No. 6, proposed by Initiative Petition filed with the Secretary of State September 28, 2007, and adopted in 2010, were designated (1)-(3); the editors redesignated them as (a)-(c) to conform to the format of the State Constitution.

Description of Darling Algorithm and Methodology

The Darling algorithm is designed to behave more like a human map-maker than the Chen and Rodden algorithm; it constructs districts serially – one at a time – using 2010 census voting tabulation districts (VTDs or voting districts) as building blocks. Legislative Defendants’ counsel advised that most districting map-makers in Florida draw their first district in the western-most part of Florida’s panhandle; thus, the algorithm begins with Florida’s western-most census voting district. (The implications of using the same starting point are discussed at the conclusion of this section.)

The algorithm then adds a census voting district from among the census voting districts that are contiguous to the first voting district (applying a “line” contiguity standard). The algorithm continues to add unassigned census voting districts from the perimeter of the emerging Congressional district one at a time according to the priorities set forth in the next paragraph. As each census voting district is added to the emerging Congressional district, unassigned voting districts contiguous to it are added to the perimeter list (duplicates and the just added voting district are eliminated), until the size of the emerging district exceeds the desired district population. The last census voting district added (the one that caused the emerging Congressional district to exceed the desired population) is included in the Congressional district if the absolute deviation between the district’s population and the desired population is less when it is included then when it is not. A newly-created Congressional district is thrown out if its population deviates more than ±½ percent from the desired population value.

A voting district from the perimeter list is added to the emerging Congressional district based on the following precedence levels. If more than one voting district meets the criteria at a given precedence level, the voting district to be added is selected at random from those that meet the criteria.

- **Level 1**: the voting district is from a county and a municipality\(^5\) that is currently included in the emerging Congressional district and is contained within the bounding rectangle of the emerging Congressional district.
- **Level 2**: the voting district is from a county that is currently included in the emerging Congressional district and is contained within the bounding rectangle of the emerging Congressional district.
- **Level 3**: the voting district is from a municipality that is currently included in the emerging Congressional district.
- **Level 4**: the voting district is from a county that is currently included in the emerging Congressional district.
- **Level 5**: the voting district is contained within the bounding rectangle of the emerging Congressional district.
- **Level 6**: any voting district contained on the emerging Congressional district’s perimeter list.

\(^5\) A list of the Florida municipalities considered by the algorithm and their associated census voting districts was provided by Legislative Defendants’ counsel. See Appendix B.
The algorithm employs “look ahead” heuristics to create plans efficiently. For example, the algorithm can recognize when a particular unassigned voting district must be included in the emerging Congressional district in order for a complete plan to result, and adds that voting district to the emerging Congressional district. The algorithm also employs heuristics to help it recognize when it has randomly backed itself into a corner – when the most recently built district makes creating a complete plan impossible. When this occurs, the algorithm discards the most recently built Congressional district and starts constructing the Congressional district anew. If the algorithm fails on 250 consecutive attempts to create a Congressional district, it resets and begins construction of an entirely new plan from scratch.

When the algorithm successfully completes a Congressional district it sets the base census voting district for the next Congressional district by randomly selecting an unassigned voting district from the emerging plan’s perimeter list.

Additional Technical Notes

1) It is my understanding that CD2012 districts were constructed from whole 2010 census blocks, but may have split 2010 census voting tabulation districts (VTDs). To account for the possibility of split VTDs, I relied on a file of census block assignments to CD2012 districts provided by Legislative Defendants’ counsel. When generating each set of plans that left selected CD2012 districts intact, I first excluded census blocks associated with the intact districts and then created “updated” census VTDs by aggregated the remaining census blocks [and the total population (POP100) from those census blocks] that were originally part of that census VTD. For each set of plans, I used ArcGIS 10.0 to determine line contiguity (touch lists) among the updated VTDs.

2) Legislative Defendants’ counsel provided a file of voting results by block for the various 2006, 2008, and 2010 elections analyzed below. It is my understanding these data were the same as material made available to map makers in the My District Builder application. For each set of computer-generated districting plans I first aggregated the election results from the provided block files to the updated VTD building blocks. I used the aggregated VTD voting information applicable to each set of generated plans to calculate the Republican vote share for each district in each generated plan.

3) The algorithm’s attention to county boundaries while building a Congressional district acts to reduce the number of split counties – once an emerging Congressional district enters a county it will continue adding voting districts from that county as long as it can. However, the selection of a random starting point for the next Congressional district tempers the attention paid to county integrity; a county that was not completely assigned when a Congressional district meets its population target will not necessarily be selected as the starting point for the next Congressional district. This choice produces a more lax county integrity requirement than would otherwise have been the case, and allows for more split counties than would occur under the forced-construction alternative.

4) In terms of attention to compactness, the algorithm takes a rather simple approach; it attempts to draw Congressional districts that look like rectangles. While the algorithm applies its compactness criterion on a district-by-district basis, it does not necessarily obtain
an optimal level on a plan-wide basis. The map drawing process can “back itself” into creating a Congressional district that is not as “regularly shaped” as the others because the remaining unassigned voting districts simply fit together in a non-rectangular form.

The algorithm uses a rectangle rather than a circle, the most compact geographic figure and the most commonly used referent for compactness measures, or even a square. Both the circle and the square would require Congressional districts to be more symmetric than does the minimum bounding rectangle. As a result of this choice, the algorithm has an increased chance of drawing an elongated district. This characteristic of the algorithm tempers a strict, overarching concern with compactness with a concern for political (county and municipal) boundaries.

**Violations of the Contiguity Constraint Resulting From Bisected Census Voting Districts**

As described above, the Darling algorithm builds Congressional districts from census voting districts created by aggregating census blocks from the same voting district, after excluding census blocks from that voting district that were a part of CD2012 districts that were “held intact” in a given set of simulations. During the final checks on my analyses I discovered that in two cases a “finger” from CD2012’s 5th district bisected an aggregated census voting district (VTDs 120310075 and 120310010) as shown in Figure 1 (see the voting districts with the black outline). Given the geographic proximity of the two parts of these voting districts, most often all the voting districts going around the “finger” and connecting the two disjoint parts will be included in the same Congressional district, but it is possible that a constructed Congressional district could use voting district 120310010 or 120310075 to “leap across” the finger without including a path between the two disjoint parts of the voting district – this would result in a non-contiguous Congressional district. To the best of my knowledge, these are the only two instances where this potential problem arises.
**Figure 1.** Region surrounding two census voting districts bisected by CD2012’s 5th district.

To test the frequency with which this potential break in contiguity actually occurred, for each of the 5,000 generated plans where CD2012 districts 5, 20, and 24 were held intact, I counted the number of instances:

1) Where the Congressional district assigned to VTD 120310010 differed from the Congressional district assigned to VTDs 120310002, 120310005, or 120310004. The population in these four aggregated VTDs totals 7,689, or 1.1% of the average Congressional district population.

2) Where the Congressional district assigned to VTD 120310075 differed from the Congressional district assigned to VTDs 120310069, 120310184, 120310079, 120310078, 120310082, 120310084, or 120310072. The population in these eight aggregated VTDs totals 15,681, or 2.3% of the average Congressional district population.

Based on these tests, the two parts of bisected VTD 120310010 were not connected in 56 (1.1%) of the 5,000 plans; the two parts of bisected VTD 120310075 were not connected in 364 (7.3%) of the 5,000 plans.

Given the infrequent occurrence of the problem, the small percentage of the two affected Congressional districts population involved in the anomaly, and the likely similarity of the geographically proximate populations to one another, it is doubtful that these two sources of violations of contiguity affect the overall analysis results. As time permits, I intend to replace the non-contiguous plans with plans that preserve contiguity and re-analyze all three sets of generated plans. I reserve the right to update my report in the (unlikely) event that the reported results are noticeably different.

*A Note on the Implications of Starting All Plans With the Western-most Census Voting District*

During preliminary discussions with Legislative Defendants’ counsel regarding the contours of the algorithm that would be used, they noted that most Florida map-drawers started in the panhandle. I agreed that was the best approach – because it better captured the map drawing process used in Florida – but I had the reservation discussed in the next paragraph. As I became more acquainted with the situation in this case – where most of the interest lies outside the panhandle – I became completely comfortable with the initial decision.

The Initial Reservation: Because the algorithm constrains which perimeter voting districts can be added at each turn, fewer different Congressional districts are created during the early stages of the map drawing process than those that are created later in the map-drawing process. For example, based on a very quick estimate, it turns out that always starting at the western-most VTD, the original set of plans (that held the 5th, 20th, and 24th district intact) only generated two versions of the 1st simulated Congressional district and approximately 137 versions of the 2nd simulated Congressional district. However, by the time the algorithm drew the 3rd Congressional district it had a larger pool of starting points and was no longer as geographically constrained by the narrow panhandle – the algorithm generated more than 4,500 versions of the 3rd Congressional district.
Simulation Results Using Darling Algorithm

Using the Darling algorithm discussed above, Legislative Defendants' counsel asked that I replicate Chen and Rodden's main analysis and extend that analysis to other statewide elections. They also asked that I analyze the effects of keeping intact additional CD2012 districts that the Legislature created to protect the opportunity of minorities to participate in the political process.

Comparing Chen and Rodden Simulation Results With Darling Simulation Results For the 2008 Presidential Voting Patterns Leaving CD2012 Districts 5, 20, and 24 Intact

The application of the voting patterns from the 2008 Presidential elections resulted in 17 districts with a greater than 50% share of Republican votes out of all the votes cast for the Republican and Democratic candidates.

When the Darling algorithm is used to create 24 district plans (leaving CD2012's 5th, 20th, and 24th districts intact) using the 2008 Presidential voting patterns, the Darling simulation algorithm leads to results that are similar to — if not a bit more conservative than — the Chen and Rodden algorithm results.

<table>
<thead>
<tr>
<th>2008 Presidential Voting Pattern</th>
<th>% of Simulated Plans With r or More Districts</th>
<th>&gt;50% Rep. Vote Share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r = 10</td>
<td>11</td>
</tr>
<tr>
<td>Chen &amp; Rodden (%)</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Darling (%)</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Darling (#)</td>
<td>5,000</td>
<td>4,998</td>
</tr>
</tbody>
</table>

Table 3. Comparison of the percentage of Chen and Rodden “main analysis” computer-generated plans where r or more districts have a greater than 50% Republican vote share with Darling replication.

Exploring Voting Patterns From Other Statewide Elections Using Darling Simulation Results Leaving CD2012 Districts 5, 20, and 24 Intact

The voting pattern from the 2008 Presidential election represents a single instance of all the possible voting patterns that might occur. Each election involves different candidates with varying levels of acceptance by voters registered in the mainstream parties and “independent” voters. Voters’ perceptions of the state of the economy, the nation, and the world will be different during different election cycles. The candidate a voter chooses to vote for, indeed the choice to vote at all, reflects these and other characteristics of any given electoral contest.

The results from the analysis of 2008 Presidential voting patterns applied to simulated districting plans (or to the actual CD2012 plan) cannot be generalized beyond that election. To better evaluate the performance of the CD2012 plan, Legislative Defendants’ counsel asked that I examine the results from applying the methodology to voting patterns from nine other recent elections for statewide office in Florida. The nine additional elections examined occurred during
2006 and 2010, state-level election years. There were no other statewide elections during the 2008 Presidential cycle.

The statewide offices analyzed were Governor, Senator, Attorney General, Chief Financial Officer, and Commissioner of Agriculture. (The 2010 Senate election was excluded from these analyses because a substantial percentage of votes were cast for an “independent” candidate that precludes the use of the “Republican share of Democratic plus Republican votes” metric on which these analyses rely.)

Overall, the results from analyzing the voting patterns in these nine elections stand in stark contrast to the results using the 2008 Presidential pattern. Recall, when the 2008 Presidential voting pattern was applied to the CD2012 plan, it resulted in 17 districts with a greater than 50% Republican share of the total Democratic plus Republican vote. Only 0.6% of the simulated plans had 17 or more districts with a >50% Republican share — 70.7% of the simulated plans had 14 or more districts with a >50% Republican share; 31.6% of the simulated plans had 15 or more districts with a >50% Republican share; and, 7.9% of the simulated plans had 16 or more districts with a >50% Republican share.

<table>
<thead>
<tr>
<th>Florida &quot;less 3&quot; (CD2012 districts 5, 20, and 24 left intact)</th>
<th>% of Simulated Plans With r Districts or More &gt;50% Rep. Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voting Pattern</td>
<td>r Sim CD 2012</td>
</tr>
<tr>
<td>2008 Presidential*</td>
<td>14 17</td>
</tr>
<tr>
<td>2010 Gubernatorial*</td>
<td>16 17</td>
</tr>
<tr>
<td>2006 Gubernatorial*</td>
<td>19 20</td>
</tr>
<tr>
<td>2006 Senate*</td>
<td>3 2</td>
</tr>
<tr>
<td>2010 Attorney Gen.*</td>
<td>21 21</td>
</tr>
<tr>
<td>2010 CFO*</td>
<td>22 20</td>
</tr>
<tr>
<td>2010 Comm of Ag.*</td>
<td>22 21</td>
</tr>
<tr>
<td>2006 Attorney Gen.*</td>
<td>18 18</td>
</tr>
<tr>
<td>2006 CFO*</td>
<td>9 10</td>
</tr>
<tr>
<td>2006 Comm of Ag.*</td>
<td>20 20</td>
</tr>
</tbody>
</table>

*Excluded CD2012 districts 5, 20, and 24 had >50% Dem. share.

Table 4. Results from Darling algorithm replication of Chen and Rodden main analysis, with extension to additional statewide elections.

When the results from using other statewide election voting patterns are compared to the results from using the 2008 Presidential voting pattern, the 2008 Presidential results are shown to be an anomaly. Among the nine additional election voting patterns analyzed:
• In three cases, when the voting pattern of the election was applied to the CD2012 plan the result was one more district with a >50% Republican share than the \( r^{th} \) ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share. In two cases, more than 47% of the simulated plans had the same number (or more) >50% Republican share districts as the CD2012 results; in the third case, more than 17% did so.

• In another three cases, when the voting pattern of the election was applied to the CD2012 plan the result was the same number of districts with a >50% Republican share than the \( r^{th} \) ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share.

• In another three cases, when the voting pattern of the election was applied to the CD2012 plan the result was fewer districts with a >50% Republican share than the \( r^{th} \) ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share. In two cases, the CD2012 results was one less district, in the other case, it was two less districts.

The results in Table 4 reflect the diversity of possibilities that follows from applying voting patterns from different elections – each with different candidates and voter perceptions about those candidates.

When the voting pattern from the 2006 Senate election is applied to the CD2012 plan, there are only two districts that receive a >50% Republican share. When the same voting pattern is applied to the simulated plans, 80% of the plans have three or more districts that receive a >50% Republican share. In terms of the distribution of Republican and Democratic districts, this contrasts sharply with the voting pattern in the 2010 Attorney General election where, when the voting pattern is applied to the CD2012 plan, 21 districts have a >50% Republican share. The same result occurs when analyzing the simulations – 61.4% of the simulated plans have 21 or more districts with a >50% Republican share.

These results demonstrate the misperception that can be creating from examining the voting pattern from a single, unique election – a “sample of one.” Just as the simulation algorithms generate multiple plans for analysis, it also is methodologically requisite to explore results under multiple voting patterns.\(^6\) It is difficult to argue that results based on the voting pattern from the 2008 Presidential election can be generalized much beyond a contest between Barack Obama and John McCain that occurred in fall 2008. I do not claim that the 10 elections analyzed in this report provide a representative sample from the set of feasible voting patterns, they do provide, however, a better picture of the behavior of the CD2012 plan under a much wider variety of plausible voting patterns.

\(^6\) In their 2009 working paper, Tobler’s Law, Urbanization, and Electoral Bias: Why Compact, Contiguous Districts are Bad for the Democrats, Chen and Rodden explicitly recognize this potential critique, noting that “no matter which statewide elections we choose, examination of hypothetical districts in such races does not capture the dynamics of campaign strategies, advertising, candidate recruitment, and other factors that might be unique to legislative races that take place in geographic districts” (pp. 24-25).
Exploring Voting Patterns Leaving CD2012 Districts 5, 14, 20, and 24 Intact

Following their “main” analysis, which left intact the three majority African-American voting districts in the CD2012 – the 5th, 20th, and 24th – Chen and Rodden proceed through various analysis holding only one or two of those districts intact at a time. I am puzzled by their rationale for doing this, when on page 6 of their report, Chen and Rodden explicitly state –

Our intention is to produce a distribution of plans that is consistent with the dictates of the Florida Constitution. This requires not only that we draw districts that are contiguous, compact, and within the proper population bounds, but also that we abide by the Florida Constitution’s prohibitions against diminishing the opportunities of racial minorities to elect the representatives of their choice. The Florida Legislature interpreted this as requiring them to draw three districts with African-American majorities, which they ostensibly achieved by drawing districts 5, 20, and 24.

Further, based (i) on my understanding that in addition to the three African-American majority-minority districts, when drawing the CD2012 plan Legislature sought to create a majority African-American and Hispanic two-minority district in the vicinity of Hillsborough County and also sought to create three majority Hispanic districts that would be capable of electing Hispanic candidates, and (ii) for the methodological reasons discussed above, these additional analyses – reducing the number of CD2012 districts held intact – can provide no additional support for Chen and Rodden’s conclusions.

Legislative Defendants’ counsel asked that I proceed in the opposite direction, by analyzing plans that hold intact CD2012’s 14th district, the majority African-American and Hispanic two-minority district created on the Gulf coast, in addition to the three African-American majority-minority CD2012 districts held intact by Chen and Rodden in their main analyses. The analyses, based on 5,000 new plans generated by the Darling algorithm with district populations held within ±½% of the ideal, examined the ten statewide elections in 2006, 2008, and 2010. The results from these analyses are similar to the results reported when holding only the 5th, 20th, and 24th CD2012 districts intact.

Holding the 14th district intact reduces the discrepancy between the enacted CD2012 plan and the simulations found in Chen and Rodden’s main analysis and my replication of that analysis. When the voting pattern from the 2008 Presidential election is applied to the CD2012 plan, it results in 17 districts with a greater than 50% Republican share of the total Democratic plus Republican vote. In the analyses of the new computer-generated plans with CD2012’s 14th district also held intact, 78.0% of the simulated plans had 15 or more districts with a >50% Republican share; 39.6% of the simulated plans had 16 or more districts with a >50% Republican share; and, 9.4% of the simulated plans had 17 or more districts with a >50% Republican share.

The results from using the other nine statewide election voting patterns are similar to those when only the three African-American majority-minority districts are held intact. Among the nine additional election voting patterns analyzed:

- In four cases, when the voting pattern of the election was applied to the CD2012 plan the result was one more district with a >50% Republican share than the rth ranked district in
the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share.

- In another three cases, when the voting pattern of the election was applied to the CD2012 plan the result was the same number of districts with a >50% Republican share than the \( r \)th ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share.

- In two cases, when the voting pattern of the election was applied to the CD2012 plan the result was one less district with a >50% Republican share than the \( r \)th ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share.

<table>
<thead>
<tr>
<th>Voting Pattern</th>
<th>( r ) Sim</th>
<th>( r ) CD 2012</th>
<th>% of Simulated Plans With ( r ) Districts or More &gt;50% Rep. Share</th>
<th>( r-3 )</th>
<th>( r-2 )</th>
<th>( r-1 )</th>
<th>( r ) Sim</th>
<th>( r+1 )</th>
<th>( r+2 )</th>
<th>( r+3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008 Presidential*</td>
<td>15</td>
<td>17</td>
<td>100.0% 99.9% 97.7% 78.0% 39.6% 9.4% 0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 Gubernatorial*</td>
<td>16</td>
<td>17</td>
<td>100.0% 100.0% 99.8% 77.0% 15.2% 1.1% 0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 Gubernatorial*</td>
<td>19</td>
<td>20</td>
<td>100.0% 100.0% 100.0% 92.5% 31.2% 0.0% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 Senate*</td>
<td>3</td>
<td>2</td>
<td>n/a 100.0% 100.0% 76.9% 12.5% 0.4% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 Attorney Gen.*</td>
<td>20</td>
<td>21</td>
<td>100.0% 100.0% 99.3% 61.4% 9.8% 0.0% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 CFO*</td>
<td>21</td>
<td>20</td>
<td>100.0% 100.0% 98.9% 84.7% 17.5% 0.0% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 Comm of Ag.*</td>
<td>21</td>
<td>21</td>
<td>100.0% 100.0% 99.2% 82.9% 23.5% 0.2% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 Attorney Gen.*</td>
<td>18</td>
<td>18</td>
<td>100.0% 100.0% 99.3% 52.4% 5.4% 0.0% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 CFO*</td>
<td>10</td>
<td>10</td>
<td>100.0% 99.7% 95.7% 79.5% 44.7% 11.7% 0.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 Comm of Ag.*</td>
<td>19</td>
<td>20</td>
<td>100.0% 100.0% 100.0% 96.0% 44.0% 1.1% 0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: For each voting pattern row, the "\( r \) Sim" column shows the percentage of simulated plans in which the "\( r \) Sim" ranked district (in the first column) had a >50% Rep. share. Yellow cells indicate the "\( r \) CD2012" district with >50% Rep. share relative to the "\( r \) Sim" ranked district; the number in the cell reflects the percentage of simulated plans with that many districts or more with >50% Rep. share. Light blue cells indicate voting pattern rows in which the relative number of districts from CD2012 and the simulated plans were the same.

*Excluded CD2012 districts 5, 14, 20, and 24 had >50% Dem. share.

Table 5. Results from Darling algorithm analyzing election voting patterns when CD2012’s districts 5, 14, 20, and 24 are held intact.

Exploring Voting Patterns Leaving CD2012 Districts 5, 20, 24, 25, 26, and 27 Intact

Legislative Defendants’ counsel asked that I also analyze plans that hold intact the three CD2012 majority Hispanic districts that would be capable of electing Hispanic candidates, in addition to the three African-American majority-minority CD2012 districts held intact by Chen and Rodden in their main analyses. The analyses, based on 5,000 new plans generated by the Darling algorithm with district populations held within ±½% of the ideal, examined the ten statewide elections in 2006, 2008, and 2010. The results from these analyses are similar to the results reported when holding only the 5th, 20th, and 24th CD2012 districts intact.
Holding the three Hispanic majority districts intact reduces the discrepancy between the enacted CD2012 plan and the simulations found in Chen and Rodden’s main analysis and my replication of that analysis. When the voting pattern from the 2008 Presidential election is applied to the CD2012 plan, it results in 17 districts with a greater than 50% Republican share of the total Democratic plus Republican vote. In the analyses of the new computer-generated plans with CD2012’s three majority Hispanic districts also held intact, 56.7% of the simulated plans had 15 or more districts with a >50% Republican share; 17.4% of the simulated plans had 16 or more districts with a >50% Republican share; and, 3.2% of the simulated plans had 17 or more districts with a >50% Republican share.

| Florida "less 6" (CD2012 districts 5, 20, 24, 25, 26, and 27 left intact) |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Voting Pattern    | Sim r   | CD 2012 r   | % of Simulated Plans With r Districts or More >50% Rep. Share |
|                   |        |            | r - 3 | r - 2 | r - 1 | r Sim | r + 1 | r + 2 | r + 3 |
| 2008 Presidential*| 12      | 14          | 100.0% | 99.7% | 88.5% | 56.7% | 17.4% | 3.2%  | 0.3%  |
| 2010 Gubernatorial*| 14      | 14          | 100.0% | 100.0%| 99.3% | 72.0% | 19.3% | 0.8%  | 0.0%  |
| 2006 Gubernatorial*| 18      | 17          | 100.0% | 100.0%| 100.0%| 50.1% | 0.0%  | 0.0%  | 0.0%  |
| 2006 Senate**      | 2       | 2           | n/a   | n/a   | 100.0%| 99.9% | 6.7%  | 0.0%  | 0.0%  |
| 2010 Attorney Gen.*| 18      | 18          | 100.0% | 100.0%| 100.0%| 99.0% | 0.0%  | 0.0%  | 0.0%  |
| 2010 CFO*          | 19      | 17          | 100.0% | 100.0%| 100.0%| 100.0%| 0.0%  | 0.0%  | 0.0%  |
| 2010 Comm of Ag*   | 19      | 18          | 100.0% | 100.0%| 100.0%| 100.0%| 1.4%  | 0.0%  | 0.0%  |
| 2006 Attorney Gen.*| 16      | 15          | 100.0% | 100.0%| 99.9% | 85.4% | 16.8% | 0.0%  | 0.0%  |
| 2006 CFO**         | 8       | 9           | 100.0% | 99.6% | 95.0% | 75.9% | 32.1% | 4.0%  | 0.2%  |

** Key: For each voting pattern row, the "r Sim" column shows the percentage of simulated plans in which the "r Sim" ranked district (in the first column) had a >50% Rep. share. Yellow cells indicate the "r CD2012" district with >50% Rep. share relative to the "r Sim" ranked district; the number in the cell reflects the percentage of simulated plans with that many districts or more with >50% Rep. share. Light blue cells indicate voting pattern rows in which the relative number of districts from CD2012 and the simulated plans were the same.

* Excluded CD2012 districts 25, 26, and 27 had a >50% Rep. share; excluded districts 5, 20, and 24 had a >50% Dem. share.

** Excluded CD2012 district 25 had a >50% Rep. share; excluded districts 5, 20, 24, 26, and 27 had a >50% Dem. share.

Table 6. Results from Darling algorithm analyzing election voting patterns when CD2012’s districts 5, 20, 24, 25, 26, and 27 are held intact.

The results from using other nine statewide election voting patterns are similar to those when only the three African-American majority-minority districts are held intact. Among the nine additional election voting patterns analyzed:

- In only one case, when the voting pattern of the election was applied to the CD2012 plan the result was one more district with a >50% Republican share than the rth ranked district in the simulated plans where at least half of the plans had r districts with a >50% Republican share.
• In another three cases, when the voting pattern of the election was applied to the CD2012 plan the result was *the same* number of districts with a >50% Republican share than the \( r^{th} \) ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share.

• In five cases, when the voting pattern of the election was applied to the CD2012 plan the result was *fewer* districts with a >50% Republican share than the \( r^{th} \) ranked district in the simulated plans where at least half of the plans had \( r \) districts with a >50% Republican share. In four cases, the CD2012 results have *one less* district, in the other case, it has *two less* districts.
Additional Comments Regarding Chen and Rodden’s Report

Voting Age Population Demographics in the Three African-American-Majority CD2012 Congressional Districts (the 5th, 20th, and 24th districts)

On page 6 of their report, Chen and Rodden state, “The African-American populations of districts 5 and 24 appear to fall slightly under 50% of the citizen, voting-age population.” On page 12, they state, “…Districts 5 and 20 may not in fact have African-American majorities among voting-age citizen population (sic).”

Appendix C provides a table of voting age population demographics for the Congressional districts in CD2012. The table is based on material provided to me by Legislative Defendants’ counsel; reportedly it is the same as material made available to map makers in the My District Builder application. According to the information in Appendix C –

- CD2012’s 5th Congressional district is 50.1% African-American (49.0% Black, Not Hispanic; 1.1% Black and Hispanic).
- CD2012’s 20th Congressional district is 50.1% African-American (48.9% Black, Not Hispanic; 1.2% Black and Hispanic).
- CD2012’s 24th Congressional district is 54.9% African-American (51.7% Black, Not Hispanic; 3.2% Black and Hispanic).

Prevalence of Majority Hispanic Districts

Chen and Rodden analyze the 1,000 simulated districting plans from their main simulation in terms of the “Hispanic population among each of the 27 districts within each of the 1,000 simulated plans”, and plot “these district-level Hispanic vote shares in Figure 12” (p. 14). Based on this analysis, Chen and Rodden conclude –

Figure 12 shows that the simulated plans are not notably distinct from the Legislature’s plan on the dimension of producing majority Hispanic districts. Without any intentional effort, the simulation algorithm almost always systematically produces exactly three majority-Hispanic districts, as does the Legislature’s plan. Hence, these results lay to rest any potential concern that our simulation algorithm fails to produce as many majority-Hispanic districts as the Legislature's plan does. (p. 14)

A closer look at Figure 12 belies Chen and Rodden’s interpretation. While it appears that their simulations “almost always” produce three districts with a greater than 50% Hispanic vote share (which I interpret to mean the Hispanic percent of the district’s voting age population), it also appears that their third most Hispanic district rarely, if ever, achieves the same level as the red X that shows the level in the adopted CD2012 plan.

Legislative Defendants’ counsel advises that the proportion of the voting age population that is Hispanic in CD2012’s 25th, 26th and 27th (68.9%, 67.4%, 72.8%, respectively, see Appendix C), or a comparable proportion, is necessary to create a district that would be capable of electing Hispanic candidates. In the set of Darling generated plans discussed above that held CD2012 5th,
14th, 20th, and 24th districts intact, only 1,440 of the 5,000 plans (28.8%) included three majority Hispanic districts with at least a 60% share of the voting age population, and only 202 of the 5,000 plans (4.0%) included three majority Hispanic districts with at least a 66.67% share of the voting age population.

Assuming the proportions in the plans produced in Chen and Rodden’s main analysis are similar – and, based on the Figure 12 (p. 31) that would appear likely – and the concerns relayed to me by Legislative Defendants’ counsel are correct, very few of Chen and Rodden’s 1,000 simulated plans contain three majority Hispanic districts capable of electing a Hispanic candidate. Even if the standard is set at 60%, if less than 30% of Chen and Rodden’s simulated plans meet the criteria, the distribution of results they rely on to form their conclusions cannot be said to account for a Legislative criterion that would create three districts that could elect Hispanic candidates.

Preservation of Intact CD2012 Districts

Chen and Rodden’s algorithm pays no attention to municipal or geographic boundaries when constructing its plans; it cannot given its underlying construction. To the extent a plan is produced with districts that appear to pay attention to county or city borders it is due entirely to chance, a situation that will very rarely occur. In other words, the area of the feasible space from which their algorithm selects plans is not constrained in regard to municipal or geographic boundaries. This leads to a concern about the relative frequency of certain plan characteristics in Chen and Rodden’s simulations vis-à-vis a plan created by map drawers who paid attention, where feasible, to county and municipal boundaries as well as compactness.

Chen and Rodden attempt to address this concern in a series of simulations that force the counties that are “whole” in CD2012 to remain whole in five alternative sets of plans they generate. Given the lack of flexibility in their algorithm, that was the only way they could address the county boundary Constitutional criterion. I have not had the opportunity to explore these simulations in detail, but am concerned about how the use of a few unusually large, and fixed, building blocks affects the population size of their districts, as well as the generalizability of the sets of sample plans generated under this condition.
Appendix A
List of Materials Referenced

In addition to the sources directly cited in the body of the report, the following materials were consulted during the preparation of this report:


In addition, I occasionally referenced various internet sites regarding the Delphi/Pascal programming language, Microsoft Access 2010, and ArcGIS 10.0 functions.
Appendix B
List of Cities and Municipalities Accounted For By Darling’s Algorithm

Alachua  Briny Breezes
Alford  Bristol
Altamonte Springs  Bronson
Altha  Brooker
Anna Maria  Brooksville
Apalachicola  Bunnell
Apopka  Bushnell
Arcadia  Callahan
Archer  Callaway
Astatula  Cape Canaveral
Atlantic Beach  Cape Coral
Atlantic Beach  Carrabelle
Auburndale  Caryville
Aventura  Casselberry
Avon Park  Cedar Key
Bal Harbour  Center Hill
Bartow  Century
Basscom  Chattahoochee
Bell  Chiefland
Belle Glade  Chipley
Belle Isle  Cinco Bayou
Belleair  Clearwater
Belleair Shore  Clermont
Belleair Beach  Clewiston
Beverly Beach  Cloud Lake
Biscayne Park  Cocoa
Blountstown  Cocoa Beach
Boca Raton  Coconut Creek
Bonifay  Coleman
Bonita Springs  Cooper City
Bowling Green  Coral Gables
Boynton Beach  Coral Springs
Bradenton  Cottondale
Bradenton Beach  Crescent City
Branford  Crestview
Cross City  Crystal River
Cutter Bay  Dade City
Dania Beach  Davie
Daytona Beach  Daytona Beach
Daytona Beach Shores  De Funiak Springs
DeBary  DeLand
Deerfield Beach  Delray Beach
Delltona  Destin
Deltona  Doral
Dundee  Dunedin
Dunnellon  Eagle Lake
Eatonville  Edbro
Edgewater  Edgewood
El Portal  Eustis
Eveland Park  Fanning Springs
Felismera  Fernandina Beach
Flagler Beach  Florida City
Fort Lauderdale  Fort Meade
Fort Myers  Fort Myers Beach
Fort Pierce  Fort Walton Beach
Fort White  Frostproof
Gainsville  Glen Ridge
Glen St. Mary  Golden Beach
Gulf  Graceville
Grand Ridge  Grant-Valkaria
Green Cove Springs  Greenacres
Greenville  Greenwood
Greta  Groveland
Gulf Breeze  Gulf Stream
Gulfport  Haines City
Hallandale Beach  Hampton
Hastings  Havana
Haverhill  Hawthorne
Hialeah  Hialeah Gardens
High Springs  Highland Beach
Highland Beach  Hillcrest Heights
Hilliard  Hillsboro Beach
Holly Hill  Hollywood
Holmes Beach  Homestead
Horseshoe Beach  Howey-in-the-Hills
Hypoluxo  Indialantic
Indian Harbour Beach  Indian River Shores
Indian Rocks Beach  Indian Shores
Interlachen  Inverness
Islamorada, Village of Islands
Jacksonville  Jacksonville Beach
Jacob City  Jasper
Jay  Jennings
Juno Beach  Jupiter
Jupiter  Jupiter Inlet Colony
Jupiter Island  Kenneth City
Key Biscayne  Key West
Keystone Heights  Kissimmee
La Crosse  La Belle
La Belle  Lady Lake
Lake Alfred  Lake Buena Vista
Lake Butler  Lake City
Lake Clarke Shores  Lake Hamilton
Lake Helen  Lake Mary
Lake Park  Lake Placid
Lake Wales  Lake Worth
Lakeland  Lantana
Largo  Lauderdale Lakes
Lauderdale-by-the-Sea  Lauderdale Hill
Laurel Hill  Lawtey
Lee  Leesburg
Lighthouse Point  Live Oak
Longboat Key  Longwood
Loxahatchee Groves  Lynn Haven
Macclellan  Madeira Beach
Madison  Maitland
Malone  Manalapan
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### Appendix C


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*Source: Based on information contained in MyDistrictBuilder file provided by Legislative Defendants' counsel.*