A NOVEL METHOD FOR SHOWING RACIALLY POLARIZED VOTING: BAYESIAN IMPROVED SURNAME GEOCODING

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ABSTRACT

In *Thornburg v. Gingles*, the Supreme Court provided the elemental test for vote dilution claims under § 2 of the Voting Rights Act. In part, § 2 requires Plaintiffs to prove that voting patterns within the challenged jurisdiction are polarized by race. Because most states do not track the race of voters, social scientists developed statistical methods to make the evidentiary showing required in *Gingles*. These methods are decades old and are often the subject of intense scrutiny in vote dilution trials. In some cases, the size of the jurisdiction and the quality of the voter file and voting records prevent plaintiffs from meeting their burden of proof. Analyzing the presence of racially polarized voting will be one of the most important issues during and after the 2021−22 redistricting round. Within the last year, an innovative method adapted from other fields of study has been applied to the racially polarized voting analysis in vote dilution cases and has been approved by a federal district court and the Second Circuit: Bayesian Improved Surname Geocoding (BISG). BISG has received little scholarly attention in legal scholarship addressing voting rights yet promises to be the most critical advancement in detecting vote dilution in decades. This Article seeks to showcase this method, equipping voting rights advocates and governments alike in their effort to secure equal voting rights nationwide. This Article argues that BISG should be used by voting rights advocates as an additional method to bolster racially polarized voting analysis conclusions when the necessary data is available and of sufficient quality. Further, BISG should be utilized by governments in jurisdictions with limited access to American Community Survey or decennial census block data to redistrict in compliance with § 2.

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I.
INTRODUCTION

The United States is entering what could be the most racially discriminatory redistricting cycle since the passage of the federal Voting Rights Act (VRA) in 1965.[2] Voting rights advocates face this significant risk amid a rise in racial differences in voting patterns. Yet decades-old social science methods are used to support legal challenges to vote dilution. Ensuring fair and equitable redistricting during this cycle requires the most updated and advanced methods. Within the last year, one innovative method to support legal challenges to vote dilution has finally received judicial approval: Bayesian Improved Surname Geocoding (BISG).[3] Although BISG has received significant scholarly attention over the last decade as a highly reliable way to estimate race across a number of disciplines and applications, BISG's more recent application to estimating the race of voters that promises to be the most critical advancement in detecting vote dilution in decades. This Article seeks to showcase the BISG method, equipping voting rights advocates and governments alike in their effort to secure equal voting rights nationwide.

Today, minority communities lack critical protections that previously shielded them from discriminatory voting laws, practices, and procedures. As enacted, the VRA included a preclearance requirement in its § 5, which prohibited jurisdictions with a history of discrimination from implementing any change affecting voting without receiving preapproval from the U.S. Attorney General or the U.S. District Court for D.C. The provision was meant to thwart efforts to disenfranchise voters by requiring federal government confirmation that a proposed change in voting practices would not discriminate against protected minorities. *Shelby County v. Holder*[4] decimated the preclearance regime in 2013, striking down the preclearance formula of Section 4(b), which determined which areas of the country were covered under preclearance. Plaintiffs now bear the evidentiary burden in all federal cases seeking a remedy for vote dilution under the VRA. The 2021–22 redistricting round is the first redistricting round to lack § 5's protections since 1971.

In every vote dilution case under § 2, the plaintiff must prove that the relevant minority group "is politically cohesive. . . . [And] that the white majority votes sufficiently as a bloc to enable it . . . usually

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[2] MICHAEL C. LI, BRENNAN CENTER FOR JUSTICE, THE REDISTRICTING LANDSCAPE, 2021-22, 3 (Feb. 11, 2021), https://www.brennancenter.org/our-work/research-reports/redistricting-landscape-2021-22.
[3] *See* NAACP Spring Valley Branch v. East Ramapo Central School Dist., No. 17-CV-8943 (CS) (S.D. N.Y. 2020); Clerveaux v. E. Ramapo Cent. Sch. Dist., 984 F.3d 213 (2nd Cir. 2020); *see also infra* Part IV(c).
[4] 570 U.S. 529 (2013).

to defeat the minority's preferred candidate."[5] The evidence offered by social science experts to meet this evidentiary standard is referred to by practitioners and courts alike as "racially polarized voting analysis."

Because census data is not reported at the level of individual voters and most states do not track the race of voters, social scientists have developed statistical methods to estimate voters' racial information. Under certain circumstances, these methods may struggle. It is well established that different racial groups register and vote at different rates depending on the electoral context. In jurisdictions with similar rates of registration and turnout across racial groups, it may be that existing methods of showing racially polarized voting remain highly accurate. However, in places where there is a particular imbalance in turnout rates, conventional methods may not be precise enough to speak to the race of those who actually voted. BISG works to fill these data gaps. The method relies on the voter file and vote history data, which is now broadly accessible to analysts and in many cases already digitized and ready for analysis. In other words, it harnesses widely available information on actual voters to understand voting patterns with more precision.

Analyzing the presence of racially polarized voting will be one of the most important issues during and after the 2021−22 redistricting round. Voting rights plaintiffs will need to demonstrate racially polarized voting to prevail in their vote dilution claims, and governments must redistrict in compliance with the VRA. BISG is a critical innovation in providing the precision demanded by both processes.

This Article seeks to describe the racially polarized voting evidentiary burden in vote dilution cases, some of the challenges to meeting this burden when using conventional methods, and how the BISG method can help meet the burden under certain circumstances. Part II of this Article provides a background of § 2 of the VRA and outlines the legal framework currently used for § 2 cases. Part III identifies the potential limitations of current methods used to show racially polarized voting. In Part IV, this Article makes the case for utilizing BISG. It demonstrates why BISG is an important tool for voting rights litigation and redistricting and documents the recent judicial approval of the method. The Article concludes that, while it should not be *required* by courts, BISG should continue to be accepted by courts and considered by expert witnesses and voting rights advocates as an additional method to bolster racially polarized voting analysis conclusions when the necessary data is available and of sufficient

[5] Thornburg v. Gingles, 478 U.S. 30, 49 (1986).

quality. Further, BISG should be utilized by governments in jurisdictions with limited access to American Community Survey (ACS) or decennial census block data to redistrict in compliance with § 2.

II.
BACKGROUND ON VOTING RIGHTS ACT § 2: THE LEGAL FRAMEWORK

Section 2 of the Voting Rights Act of 1965 provides a cause of action for the denial or abridgement of the right to vote through the use of voter qualifications, practices, or procedures.[6] Section 2 Part (a) proscribes any "voting qualification or prerequisite to voting or standard, practice, or procedure . . . which results in a denial or abridgement of the right of any citizen of the United States to vote on account of race or color . . . . ."[7] Part (b) provides some guidance as to when Part (a) is triggered. Under Part (b), violations are established if, based on a totality of circumstances, it is determined that the political processes in a state or political subdivision are not equally open to participation by members of a protected class, in that members of the protected class have less of an opportunity to participate in the political process and elect representatives of their choice.[8] Section 2 clarifies that it does not "establish[] a right to have members of a protected class elected in numbers equal to their proportion in the population."[9]

In *City of Mobile, Ala. v. Bolden*,[10] the Court determined that Section 2 required a finding of intentional discrimination, stating that "it is apparent that the language of Section 2 no more than elaborates upon that of the Fifteenth Amendment"[11] which is violated "only if motivated by a discriminatory purpose" or intent.[12] In response, Congress sought to enact a legislative override of the Court's decision. In 1982, Congress amended Section 2 of the VRA to permit plaintiffs to prove a Section 2 claim by proving that a policy has a discriminatory *effect*, whether or not that policy was adopted with an *intent* to discriminate.[13] These amendments created a new "results test," prohibiting electoral structures that "result[ ]" in members of a class of citizens defined by race or color "hav[ing]

[6] 52 U.S.C.A. § 10301 (originally enacted as 42 U.S.C.A. § 1973 (1965)).
[7] 52 U.S.C.A. § 10301(a).
[8] 52 U.S.C.A. § 10301(b).
[9] *Id.*
[10] City of Mobile, Ala. v. Bolden, 446 U.S. 55 (1980).
[11] *Id.* at 60.
[12] *Id.* at 62.
[13] *See generally* Thomas M. Boyd and Stephen J. Markman, *The 1982 Amendments to the Voting Rights Act: A Legislative History*, 40 WASH. & LEE L. REV. 1347 (1983).

less opportunity than other members of the electorate to participate in the political process and to elect representatives of their choice."[14] The amendment lacked a rigid standard of what it means for a racial minority to have unequal political opportunity. Instead, Congress prescribed a "totality of the circumstances" analysis of an electoral structure, providing a committee report reciting a non-exhaustive list of factors to be weighed when making such an inquiry.[15]

In 1986, the Supreme Court further clarified the evidentiary burden for Section 2's new language in *Thornburg v. Gingles*, at least with respect to vote dilution claims.[16] Writing for a five-justice majority, Justice William Brennan determined that the plaintiffs had to satisfy certain preconditions in order to show that multimember districts operate to impair minority voters' ability to elect representatives of their choice.[17] Specifically, plaintiffs must show: "First, [that] the minority group . . . is sufficiently large and geographically compact to constitute a majority in a single-member district. . . . Second, [that] the minority group . . . is politically cohesive. . . . [And third,] that the white majority votes sufficiently as a bloc to enable it . . . usually to defeat the minority's preferred candidate."[18] The latter two conditions are the "racially polarized voting" requirement. Only after these preconditions are met will a court evaluate the totality of the circumstances liability standard prescribed by the VRA.

Later, in *Johnson v. DeGrandy*,[19] the Supreme Court added an additional feature to the § 2 analysis: proportionality. In addition to satisfying the *Gingles* factors, challengers should show that they do not "form effective voting majorities in a number of districts roughly proportional to the minority voters' respective shares in the voting-age population."[20] Simply put, if the minority group can elect candidates of their choice in the target jurisdiction roughly commensurate to the minority group's share of the voting age population, a court is unlikely to find vote dilution. The majority wrote: "[w]hile . . . proportionality is not dispositive in a challenge to single-member districting, it is a relevant fact in the totality of circumstances to be analyzed when determining whether members of a minority group have 'less opportunity than other members of the electorate to participate in the political process and to elect

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[14] 52 USC § 10301.
[15] *See* Voting Rights Act Extension: Report of the Committee on the Judiciary United States Senate on S. 1992 with Additional, Minority, and Supplemental Views, S. Rep. No. 97-417 at 28–29 (listing the "[t]ypical factors" that a plaintiff could show to establish a violation).
[16] *Gingles*, 478 U.S. at 56–63.
[17] *Id.* at 49.
[18] *Id.*
[19] 512 U.S. 997 (1994).
[20] *Id.* at 1000.

representatives of their choice.'"[21] So, while not per se necessary, the lack of proportionality is an important condition for plaintiffs to satisfy.

Currently, the legal framework for a Section 2 case is as follows. First, plaintiffs must meet the *Gingles* preconditions and show a lack of proportionality under *DeGrandy*. If those preconditions are met, the Court then engages in a totality of the circumstances inquiry based on the factors outlined in the 1982 Senate Report.[22] Factors considered under a the totality of the circumstances include: (1) the extent of any history of official discrimination in the jurisdiction at issue; (2) the extent to which voting in elections in the jurisdiction at issue is racially polarized; (3) if the jurisdiction has used malapportioned districts, majority vote requirements, anti-single shot provisions, or voting procedures that enhance discrimination; (4) existence of a candidate slating process; (5) if the protected class bear the effects of discrimination in areas such as education, employment, and health; (6) if there have been racial appeals (overt or subtle) used in political campaigns in the jurisdiction; and (7) the extent to which members of the protected class have been elected to office in the jurisdiction.[23] These factors are not exclusive or comprehensive, and a plaintiff need not show any specific number of factors to succeed on a claim.[24]

III.
PROVING RACIALLY POLARIZED VOTING

a. *Racially Polarized Voting*

As discussed in Part II, a precondition for determination of whether there are the effects of racial discrimination in a § 2 VRA suit is racially polarized voting. Racially polarized voting is at the heart of vote dilution law. The 8th Circuit has deemed it the ''key stone of a vote dilution case.''[25] Indeed, many courts, including the U.S. Supreme Court, have held that racially polarized voting is the most important factor to be shown in a vote dilution case.[26]

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[21] *Id.* at 1000.
[22] S.Rep. No. 97-417, 97th Cong., 2d Sess. (1982), pages 28−29.
[23] *Id.* at 28−9. The Senate Report also lists additional factors such as lack of responsiveness by elected officials at the needs of the protected class and whether the policy underlying the state of jurisdiction's use of the voting qualification, practice, or standard is tenuous. *Id.* at 29.
[24] *See Gingles*, 478 U.S. at 79.
[25] Buckanaga v. Sisseton Indep. Sch. Dist., 804 F.2d 469, 473 (8th Cir. 1986).
[26] *See, e.g.*, *Gingles*, 478 U.S. at 35 (calling racially polarized voting "one of the most important elements of a § 2 vote dilution claim"); Citizens for a Better Gretna v. City of Gretna, La., 834 F.2d 496, 499 (5th Cir. 1987) (stating that racial bloc voting is the "linchpin" of a § 2 vote dilution claim); Lucas v. Townsend, 967 F.2d 549,

The focus of such an inquiry is (1) whether minorities vote differently from the majority vote, and (2) whether the majority is voting as a bloc against minority-preferred candidates thereby preventing minority voters from electing their candidates of choice.[27] Since *Thornburg v. Gingle*s, plaintiffs have had to satisfy both conditions, among others.[28] The test serves several purposes. First, it can determine the possibility of a judicially mandated remedy should the court find in favor of liability (e.g., by ensuring that different voting district boundaries would actually grant a minority group the political opportunity demanded by Section 2). The preconditions also serve as a limiting principle that restricts the number of cases in which courts must make delicate decisions about racial fairness in the distribution of political opportunity.[29] Finally, the preconditions enable the court to make a normative diagnosis about whether the harm in question rises to the nature of the harm contemplated by Section 2.[30]

The racially polarized voting burden can be a substantial hurdle for plaintiffs to prove in vote dilution cases involving a jurisdiction with limited vote behavior data. For starters, the lower courts have not established a quantitative standard for what is or is not legally significant racially polarized voting.[31] The degree of legally significant minority cohesiveness and the level of white bloc voting sufficient to defeat a minority preferred candidate depends on a variety of factual circumstances, meaning the test hardly lends itself to bright-line rules.[32] Beyond uncertainty as to *how much* evidence needs to be presented, there is also uncertainty about *what kind* of evidence is required. The courts have never articulated a requirement as to the type of data that a plaintiff can depend upon or the kind of statistical models that can be used to interpret this data—the uniqueness of each case necessarily requires a flexible approach. Both qualitative and quantitative information is often considered,[33] with the latter

551 (11th Cir. 1992); Westwego Citizens for Better Government v. City of Westwego, 946 F.2d 1009, 1122 (5th Cir. 1991); Terrebonne Parish Branch NAACP v. Jindal, 274 F. Supp. 395, 410 (M.D. La 2017).

[27] *Gingles*, 478 U.S. at 56.

[28] *See supra* Part II.

[29] *See* Marisa Abrajano et al., *Racially Polarized Voting*, 83 Univ. Chicago L. Rev. Unbound 587, 595−98 (2016).

[30] *Id.* at 589−90.

[31] *See* Jenkins v. Red Clay Consol. School Dist. Bd., 4 F.3d 1103, 1126 (1993) (holding that the third *Gingles* precondition "may be satisfied with a variety of evidence, including lay testimony or statistical analysis of voting patterns").

[32] *See* Cottier v. City of Martin, WL 6949764, *18 (S.D. 2005) ("no mathematical formula or simple doctrinal test is available to determine whether plaintiffs satisfied the third factor.")

[33] *See* Cottier v. City of Martin 445 F.3d 1113, 1118 (8th Cir. 2006) ("Proving political cohesiveness requires evaluating elections through statistical and non-statistical evidence."), *citing* Growe v. Emison, 507 U.S. 25, 41 (1993) (finding the district court erred in concluding political cohesiveness was prove where it was unsupported by statistical or anecdotal evidence); *see also* Sanchez v. Bond, 875 F.2d 1488, 1494 (10th Cir. 1989) ("The experiences and observations of individuals involved in the political process are clearly relevant to the question of

being of far greater significance. As discussed below, though, the courts have articulated a preference for certain types of quantitative data over others.[34] While the test must remain flexible in the face of differing circumstances, plaintiffs often cannot predict the type of evidence a fact-finder might find most persuasive. This reality alone suggests that new and better social science methods should be offered in any plaintiff's case.

Historically, the process of showing racially polarized voting depends on making inferences via statistical models using voting information, demographic data on the considered jurisdiction, and election results in that jurisdiction. Individual level vote choice, which in large statewide elections is sometimes discovered through exit polls, is often unknown in local elections. Thanks to the secret ballot format adopted nearly everywhere, specific information regarding the candidates for which each individual voter actually cast her ballot is not available from public sources. The only information available is whether or not an individual voted. Voting patterns, where they can be discovered, can be aligned with demographic information. The sole source of citizenship data by race published by the Census Bureau now comes from the American Community Survey ("ACS"). The ACS is an annual nationwide survey to collect demographic information, including age, race, ethnicity, and citizenship, from roughly at 2 percent sample of all households. With this data, the Census Bureau is then able to estimate the citizen, voting-age population (CVAP) of states, counties, cities, census tracts, and census block groups. The Census Bureau aggregates CVAP data over five-year periods in order to provide more estimates for small areas, such as census tracts and block groups.[35] The five-year data represents about a 10 percent sample of households, from which inferences are made to the population, given published margins of error. This information on the eligible voting population can be matched with the actual precinct-level vote results in a given election. With this information, the voting patterns of majority and minority voters can be inferred using statistical methods. However, scholars and practitioners should take note that CVAP data represents racial population estimates for all adult *eligible* voters in or around the voting precinct, not the racial population estimates for the *actual* voters in an election.

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whether the minority group is politically cohesive. This testimony would seem to be required if the court is to identify the presence or absence of distinctive minority group interests.").

[34] *See infra* Part IV.

[35] *See generally* U.S. CENSUS BUREAU, A COMPASS FOR UNDERSTANDING AND USING AMERICAN COMMUNITY SURVEY DATA: WHAT GENERAL DATA USERS NEED TO KNOW (Oct. 2008), https://www.census.gov/content/dam/Census/library/publications/2009/acs/ACSResearch.pdf.

Several methods are available to assess the *Gingles* preconditions of minority cohesion and white bloc voting.[36] Ecological Inference (EI) "has been the benchmark in evaluating racial polarization in voting rights lawsuits and has been used widely in comparative politics research on group and ethnic voting patterns."[37] Two variations of EI that have emerged are referred to as King's EI and EI: RxC. The two methods are closely related, and Professor Gary King, the creator of King's EI,[38] was a co-author and collaborator on the RxC method.[39] Generally speaking, both methods take ecological data in the aggregate —such as precinct vote totals and racial demographics—and use Bayesian statistical methods to find voting patterns by regressing candidate choice against racial demographics within the aggregate precinct. Kings EI is sometimes referred to as the iterative approach, in that it runs an analysis of each candidate and each racial group in iterations, whereas the RxC method allows multiple rows (candidates) and multiple columns (racial groups) to be estimated simultaneously in one model. In essence, both versions of EI operate as described above: by compiling data on the percentage of each racial group in a precinct and merging that with precinct-level vote choice from relevant election results. One popular software program *eiCompare*, imports data and runs both King's EI and RxC models and offers comparison diagnostics.[40] Researchers have concluded that both EI and RxC tend to produce similarly reliable regression estimates of vote choice.[41] The EI models are agnostic on what type of input data political scientists use for racial demographics. It can be CVAP data on *eligible* voters, it can be a Spanish surname analysis of *registered* voters, or it can be a BISG estimate of race of *actual* voters. The models will perform the same analysis and produce inferences about voter preference by race. One team

[36] For an approachable overview of this material, see Bruce M. Clarke & Robert Timothy Reagan, Federal Judicial Center, *Redistricting Litigation: An Overview of Legal, Statistical, and Case-Management Issues* (2002).
[37] Loren Collingwood, Kassra Oskooii, Sergio Garcia Rios, and Matt Barreto, *eiCompare Comparing Ecological Inference Estimates across El and EI:R x C*, 8 R.J., 93 (2016); *see also* Abrajano et al., *Using Experiments to Estimate Racially Polarized Voting*, UC Davis Legal Studies Research Paper No. 419 (2015) ("ecological inference (EI)...[is] the standard statistical tool of vote-dilution litigation"). Despite the method's prominence, researchers have identified certain limitations on EI's ability to reveal race-correlated voting patterns in jurisdictions with more than two racial groups and non-trivial residential integration. *See* D. James Greiner, *Re-Solidifying Racial Bloc Voting: Empirics and Legal Doctrine in the Melting Pot*, 86 INDIANA L.J. 447–497 (2011); D. James Greiner & Kevin M Quinn, *Exit Polling and Racial Bloc Voting: Combining Individual Level and Ecological Data*, 4 ANNALS APPLIED STAT. 1774, 1774–1796 (2010). Strategic calculations by potential candidates as well as interest groups and donors also skew EI data. *See* Marisa Abrajano et al., *supra* note 30, at 595–98; James D. Greiner, *Causal Inference in Civil Rights Litigation*, 122 HARV. L. REV. 533, 533–598 (2008).
[38] *See* GARY KING, A SOLUTION TO THE ECOLOGICAL INFERENCE PROBLEM RECONSTRUCTING INDIVIDUAL BEHAVIOR FROM AGGREGATE DATA (1997).
[39] *See* Ori Rosen, Wenxin Jiang, Gary King, and Martin Tanner, *Bayesian and Frequentist Inference for Ecological Inference: the R x C case*, 55 STATISTICA NEERLANDICA, 134–46 (2001).
[40] Collingwood et al., *supra* note 38, at 93.
[41] *Id.*

of political scientists and demographers[42] recommends using turnout data first and suggests that BISG is one tool researchers can then use to understand the race and ethnicity of voters in a given precinct.

b. *Potential Limitations of Census Data in EI Models*

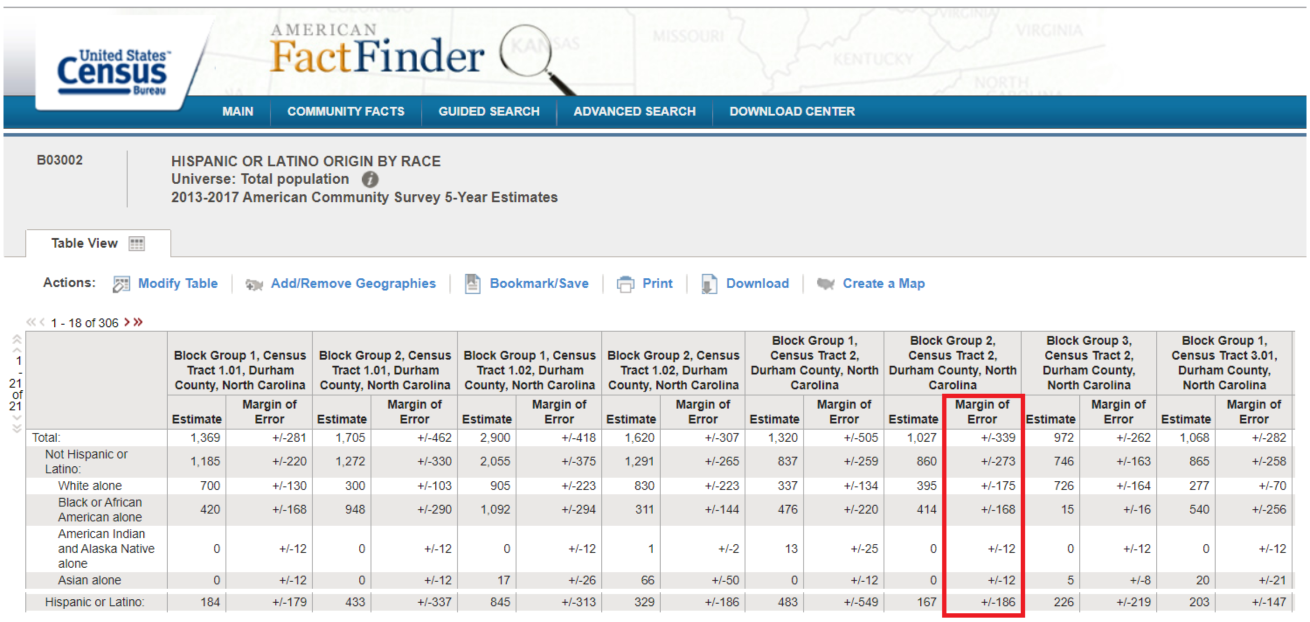
The use of ACS's CVAP data at the local level has some underlying methodological limitations. While CVAP data is often useful for estimating districtwide population estimates, for use at the much smaller precinct level CVAP has three main limitations: (1) 5-year CVAP data is roughly a 10% household sample and all estimates contain a margin of error, it is not the 100% household sample of the decennial Census; (2) CVAP data does not know who the actual voters are, rather it reflects sample data on the overall pool of eligible adult citizens; and (3) CVAP data is available at the census block group level, which does not align neatly to local precinct boundaries, often creating a mismatch. Each of these three issues could introduce some amount of bias, noise, and uncertainty into the precinct-level race estimates produced by CVAP, and in combination, they can sometimes result in error, especially in areas with lower turnout rates. In some instances, however, CVAP racial data aggregated to precincts is the *only* available data. In these instances, it can often be used to give the factfinder well supported analysis to support a finding of racially polarized voting. We offer these limitations as a cautionary note that analysts and litigators should consider when deciding what type of demographic data to rely on in their analyses.

The first consideration is the 10% sample on which the 5-year ACS CVAP data relies. The ACS sample might have few, or even zero, responses from smaller census block groups. Even when the ACS data are aggregated over a 5-year period to increase the number of observations, census block groups often report large margins of error. After all, the ACS only interviews approximately 2% of households each year. Consider recent data from North Carolina as an example. Population estimates by race from the census ACS 2013-2017 5-year aggregate for Durham County, North Carolina illustrates the margin of error issue at census block group geography. Figure 1 is a screenshot from the U.S. Census website and shows, for example, that Census Tract 2, Block group 2 the white alone, not Hispanic population is estimated to be 395 people, with an accompanying range of plus or minus 175 people. Likewise, there are an estimated 414 Black people, +/- 168 and an estimated 167 Latinos +/- 186. Table 1 compares the

[42] *See* M.V. Hood III, Peter A. Morrison & Thomas M. Bryan, *From Legal Theory to Practical Application: A How-To for Performing Vote Dilution Analysis*, 99 SOC. SCI. QUART. 536, 547 (2017) ("Given a choice, the order of preference for data type would be turnout, otherwise registration, otherwise CVAP or VAP.").

racial population estimates of block groups, depending on if the mid-point, lower, or upper bound of the estimate used. Across seven block groups in Durham that we randomly selected, population counts vary widely when the margin of error is taken into account. The same Block Group (Tract 2, BG 2) could be anywhere from 21% to 56% white, not Hispanic, while the Black population might be anywhere from 24% to 57% and the Latino population from 0% to 34%. While the mid-point of the estimate is the most likely and most probable outcome, the small sample size of the ACS reveals that census race estimates can contain considerable noise and uncertainty at the block group level and that this possibility must be carefully considered by the analyst. In reality, this census block group *could be* 25% white and 75% minority; or it *could be* 55% white and 45% minority—two very different racial compositions that we would be feeding into our EI model.

Figure 1: Example of Census ACS Published Margin of Error for Selected Census Block Groups in Raleigh County, N.C.



	Block Group 1, Census Tract 1.01, Durham County, North Carolina		Block Group 2, Census Tract 1.01, Durham County, North Carolina		Block Group 1, Census Tract 1.02, Durham County, North Carolina		Block Group 2, Census Tract 1.02, Durham County, North Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	1,369	+/-281	1,705	+/-462	2,900	+/-418	1,620	+/-307
Not Hispanic or Latino:	1,185	+/-220	1,272	+/-330	2,055	+/-375	1,291	+/-265
White alone	700	+/-130	300	+/-103	905	+/-223	830	+/-223
Black or African American alone	420	+/-168	948	+/-290	1,092	+/-294	311	+/-144
American Indian and Alaska Native alone	0	+/-12	0	+/-12	0	+/-12	1	+/-2
Asian alone	0	+/-12	0	+/-12	17	+/-26	66	+/-50
Hispanic or Latino:	184	+/-179	433	+/-337	845	+/-313	329	+/-186

	Block Group 1, Census Tract 2, Durham County, North Carolina		Block Group 2, Census Tract 2, Durham County, North Carolina		Block Group 3, Census Tract 2, Durham County, North Carolina		Block Group 1, Census Tract 3.01, Durham County, North Carolina	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total:	1,320	+/-505	1,027	+/-339	972	+/-262	1,068	+/-282
Not Hispanic or Latino:	837	+/-259	860	+/-273	746	+/-163	865	+/-258
White alone	337	+/-134	395	+/-175	726	+/-164	277	+/-70
Black or African American alone	476	+/-220	414	+/-168	15	+/-16	540	+/-256
American Indian and Alaska Native alone	13	+/-25	0	+/-12	0	+/-12	0	+/-12
Asian alone	0	+/-12	0	+/-12	5	+/-8	20	+/-21
Hispanic or Latino:	483	+/-549	167	+/-186	226	+/-219	203	+/-147

Table 1: 2013−2017 ACS 5-year Racial Population Data for Selected Census Block Groups in Raleigh County, N.C.

	Tract 1.01, BG 2			**Tract 1.02, BG 2**			**Tract 2.0, BG 1**			**Tract 2.0, BG 2**		
	low	est	up	low	est	up	low	est	up	low	est	up
White	197	300	403	607	830	1053	203	337	471	220	395	570
Black	658	948	1238	167	311	455	256	476	696	246	414	582
Asian	-12	0	12	16	66	116	-12	0	12	-12	0	12
Latino	96	433	770	143	329	515	-66	483	1032	-19	167	353
Total		1705			1620			1320			1027	
	%	%	%	%	%	%	%	%	%	%	%	%
White	12%	18%	24%	37%	51%	65%	15%	26%	36%	21%	38%	56%
Black	39%	56%	73%	10%	19%	28%	19%	36%	53%	24%	40%	57%
Asian	-1%	0%	1%	1%	4%	7%	-1%	0%	1%	-1%	0%	1%
Latino	6%	25%	45%	9%	20%	32%	-5%	37%	78%	-2%	16%	34%
		Tract 3.01, BG 1			**Tract 3.01, BG 1**			**Tract 3.01, BG 2**				
	low	est	up	low	est	up	low	est	up			
White	562	726	890	207	277	347	189	286	383			
Black	-1	15	31	284	540	796	178	332	486			
Asian	-3	5	13	-1	20	41	-4	26	56			
Latino	7	226	445	56	203	350	-38	120	278			
		972			1068			768				
	%	%	%	%	%	%	%	%	%			
White	58%	75%	92%	19%	26%	32%	25%	37%	50%			
Black	0%	2%	3%	27%	51%	75%	23%	43%	63%			
Asian	0%	1%	1%	0%	2%	4%	-1%	3%	7%			
Latino	1%	23%	46%	5%	19%	33%	-5%	16%	36%			

low = lower bound of the estimate; est = midpoint of the estimate; up = upper bound of the estimate

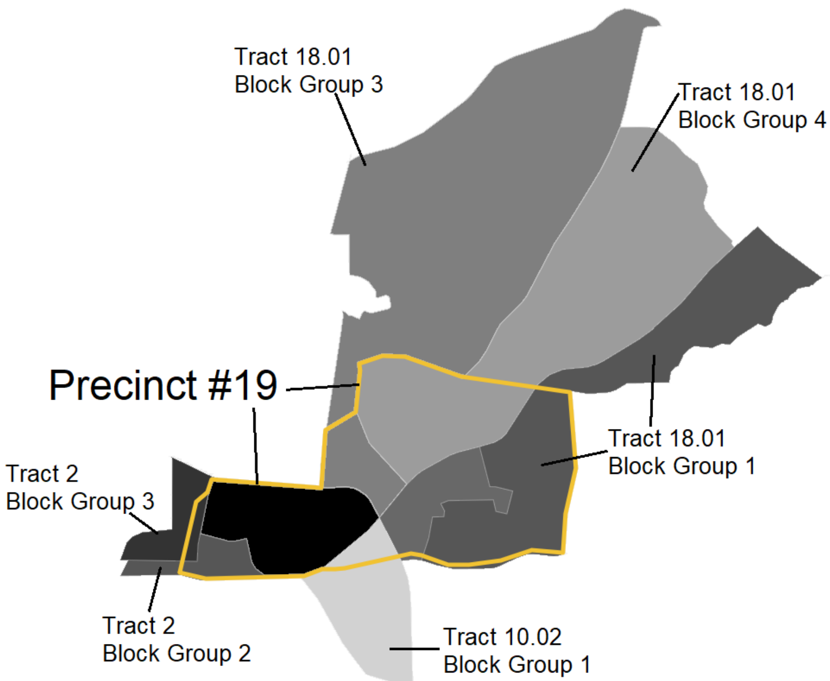
Defendants in voting rights cases in Texas have argued this point in court, citing "high margins of error for the ACS data" and arguing that "combining data from the ACS and Census is statistically problematic," especially given "various errors and uncertainties in estimating the number, location, and citizenship status" of minority voters like Hispanics.[43]

A second limitation of ACS CVAP data is that it does not represent the actual voters who participated in the election being analyzed. CVAP represents the totality of all eligible voters, including those not registered to vote, who reside in or around the precinct. Durham, North Carolina can offer an example once again. According to the ACS, the city of Durham has an adult eligible voter population of 183,757. In the November 2019 election for mayor of Durham a total of 34,867 votes were cast, or 19% of the total CVAP. When we plug CVAP data into our EI models to predict vote choice we have a less precise starting point for the population, especially in the case of local elections with lower turnout rates. In this case, 81% of the citizen voting-age population did not vote, yet they are included in the ACS CVAP data.[44] Using the actual voter rolls for people who voted should always be the standard we strive for when such data are available.

Third, ACS CVAP can result in misalignment between voting precinct and census block group, misplacing voters and altering the data for individual precincts (see Figure 2). When interested in people in a specific precinct, it is best to gather data only on voters who live within that specific precinct's boundaries. CVAP data is reported by the census at the block group level, not at the voting precinct geographic level. As such, there is always some degree of geographic misalignment between census boundaries and precinct boundaries, and demographers have to split census block groups and try to assign them to a voting precinct to get an accurate picture of the racial makeup of the precinct. As depicted in Figure 2 for an actual voting precinct (#19) in Durham, North Carolina, as many as nine different census block groups are partially overlapping with a precinct. Some are entirely inside the precinct, others are half-in and half-out, and others only have a small portion inside the precinct. This misalignment may reduce the precision of using census block groups to estimate precinct voters' race.

[43] *Fabela v. City of Farmers Branch*, Tex., WL 3135545, *7 (N.D. Tex. 2012); *see also* Cisneros v. Pasadena Indep. Sch. Dist., WL 1668500 (S.D. Tex. 2014) (dismissing plaintiff's arguments about the insufficiency of the ACS data).
[44] Incorporating a separate candidate column for "no vote" may reduce the error associated with using CVAP as racial data input. But the data model using CVAP must still estimate who did and did not vote, adding an additional layer of uncertainty.

Figure 2: Misalignment Between Census Block Group and Voting Precinct in Durham, N.C.



Despite these limitations, EI using CVAP data can, and should, be reliably used to provide vote choice estimates. In some jurisdictions, access to electronic lists of actual voters is not readily available. In jurisdictions with a larger total number of precincts, and greater variation in racial populations across precincts, EI using CVAP might produce vote choice estimates similar to those with EI using data on actual voters. When other methods are available, like those described here, they should be considered. Nevertheless, EI with CVAP data, standing alone, is more than enough to establish racially polarized voting in the vast majority of political jurisdictions. The point is simply that ACS CVAP data is not a panacea. It includes caveats, uncertainty, and error that leave social scientists searching for more precise data when attempting to infer voter preferences in some cases. This is where BISG can help.

ACS CVAP data remains the gold standard for meeting the first *Gingles* precondition.[45] This data is completely sufficient when it comes to jurisdiction-wide population tasks, such as drawing district boundaries and examining the size and geographic compactness of the minority community.

As is clear by now, this is not always true for showing racially polarized voting. The limitations on ACS's sample methodology for analysis of small jurisdictions played out dramatically in *Cisneros v. Pasadena Independent School Dist*.,[46] in which the court found that polarization could not be proved due to the sparsity of the data.[47] The court rejected the very method discussed below,[48] opting instead to rely solely on ACS data despite its limitations under the circumstances. Doing so led the court to conclude that "that there is no evidence of racially polarized voting in the recent endogenous elections," despite statistical evidence derived from an alternative method showing otherwise.[49] These evidentiary barriers are not uncommon. The next Part discusses alternative methods that should be considered by Plaintiffs seeking to meet this evidentiary burden on similar circumstances.

IV.
BISG: A PROMISING ADDITIONAL METHOD

As explained, EI attempts to determine racial voting patterns without knowing (1) the precise vote choice of each voter who cast a ballot or (2) the race or ethnicity for each voter who cast a ballot. The challenge is compounded by the fact that the racial data which is readily available—ACS CVAP data—is of *eligible* voters and not only those who *actually voted* in a given election.[50] If data on actual voters were available, it could be determined with more precision how candidate vote choice varies across precincts given the racial demographics of the precinct's voters. Indeed, data on actual voters is

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[45] CVAP is very effective in meeting the first *Gingles* precondition. When showing that a minority group is sufficiently large and geographically compact to constitute a majority in a single-member district, CVAP data accurately captures enough data in nearly all jurisdictions.
[46] *Cisneros*, WL 1668500 at *1.
[47] *Id.* at 30-1.
[48] *See infra* Part IV(c).
[49] *Cisneros*, WL 1668500 at *21.
[50] Other means of mitigating these limitations exist, but generally involve a dramatic shift in the data captured. For example, experts propose supplementing the potential errors in EI calculations that arise from strategic candidates and interest groups. This can be accomplished by measuring racial polarization with surveys that ask about policy preferences or preferences over hypothetical candidates, rather than preferences over actual candidates. *See* Abrajano, *supra* note 38.

often used for racial voting analysis. According to political scientist and voting expert M.V. Hood, turnout data on actual voters is always the most preferred source.[51]

As Dr. Hood explains, sometimes plaintiffs in voting rights cases can access the voter sign-in records. In jurisdictions where this information is available, experts have been able to tally the data to show racial polarization. This method has been in use for several decades.[52] Indeed, one of the first applications of this method was by political scientist Henry Flores, who testified as an expert witness for plaintiffs in *Leal and League of United Latin American Citizens v. San Antonio River Authority* (SA-85-CA-2988). According to Dr. Flores, the census data was not precise enough because voter turnout for Latinos was far lower than for Anglos in San Antonio, Texas. Instead, Flores did a manual tally of Spanish surnames on the voter sign-in sheets, by precinct, and correlated that with the number of votes given to Spanish surname candidates. While the census population data did little to reveal voting patterns, Flores' more precise method of looking at the *actual voter list* showed a very strong pattern of racially polarized voting.

Nevertheless, some courts prefer the use of ACS CVAP data in establishing racial demographics.[53] The concern expressed by courts is that Spanish surnames are an imperfect proxy for Hispanic self-identification.[54] Latino voters lacking a Spanish surname will be omitted by the method, and non-Latino voters who acquired Spanish surnames (through marriage, for instance) will be commissioned by the method as a Latino voter.[55] But, as the court articulated in *The Citizens for a Better Gretna v. City of Gretna*,[56] ''*Gingles*...suggests flexibility in the face of sparse data.'' The *Westwego Citizens for Better Gov't v. City of Westwego* court agreed, suggesting that "other probative evidence," including "registered voter data by race," could be considered when census data proved difficult to obtain.[57] Indeed, because analysts are not trying to identify the race of specific individuals, but rather are

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[51] M.V. Hood III et al., *supra* note 43, at 547 ("Given a choice, the order of preference for data type would be turnout, otherwise registration, otherwise CVAP or VAP.").
[52] *See, e.g.,* League of United Latin American Citizens, Council No. 4434 v. Clements (LULAC), 999 F.2d 831, 866–67 (5th Cir. 1993) (en banc).
[53] Westwego Citizens for Better Gov't v. City of Westwego, 906 F.2d 1042, 1045 n. 3 (5th Cir.1990); *see also* Reyes v. City of Farmers Branch, Tex., WL 4791498, *9 (N.D. Tex. 2008).
[54] *See* United States v. Alamosa Cnty., Colo., 306 F.Supp.2d 1016, 1022 (D. Colo. 2004); *see also* Rodriguez v. Bexar Cnty., Tex., 385 F.3d 853, 866 n. 18 (5th Cir. 2004) ("without a strict showing of its probativeness, Spanish-surname data are disfavored, and census data based upon self-identification provides the proper basis for analyzing Section 2 vote dilution claims in the future.")
[55] *See Cisneros*, WL 1668500 at *6.
[56] 834 F.2d 496, 502–03 (5th Cir.1987), *cert. denied* 492 U.S. 905 (1989).
[57] *Westwego Citizens for Better Gov't*, 906 F.2d at 1045 n. 3.

aggregating totals to precincts and creating percentages, minor errors often end up cancelling each other out -- particularly in jurisdictions with extreme racial segregation.

Accordingly, many courts have accepted surname analysis of the voter file.[58] The court in *Reyes v. City of Farmers Branch, Tex.*[59] was presented with a choice between Census data from 2000 and surname estimates from 2006. Finding that the Census data was “outdated and therefore less likely to be accurate,” the court found that the Spanish surname data was sufficiently probative of the first Gingles factor to be considered.[60] In *Fabela v. City of Farmers Branch, Tex.*,[61] the Court used surname data to corroborate ACS's estimate of CVAP for a small geographic area.[62] Citing *Reyes*, the court in *Cisneros* acknowledged that “there is an important need for flexibility in the face of sparse data for vote dilution claims.”[63] If census data were unavailable or unreliable, surname data would be an appropriate alternative source of evidence.[64] Even the Department of Justice has relied on this sort of information in its own VRA litigation.[65]

a. *How the BISG Method Works*

Whatever limitations courts have observed in surname data can be overcome via a statistical modeling method called Bayesian Improved Surname Geocoding, which political scientists have tested in application to analysis of voter files.[66] This technique is commonly used in social science analysis of

[58] Overton v. City of Austin United States Court of Appeals, 871 F.2d 529, 539 (5th Cir. 1989) (“[the expert] estimated the number of Mexican–American voters, on the other hand, from the number of Spanish surnames on precinct voter registration lists.”).
[59] WL 4791498 (N.D. Tex. 2008).
[60] *Id.* at *9.
[61] WL 3135545 (N.D. Tex. 2012).
[62] *Id.* at *8.
[63] *Cisneros*, WL 1668500 at *9.
[64] *See, e.g.*, *Reyes*, WL 4791498 at * 9.
[65] *See, e.g., Alamosa Cty.*, 306 F. Supp. 2d at 1022; *see also* United States’ Brief in Opposition to Defendants’ Motion to Exclude Bayesian Improved Surname Geocoding (BISG) Evidence, United States v. City of Eastpointe, WL 4144225 (E.D. Mich. 2018).
[66] *See* Kosuke Imai and Kabir Khanna, *Improving Ecological Inference by Predicting Individual Ethnicity from Voter Registration Records*, 24 POL. ANAL. 263, 263−72 (2016).

voting patterns and in other contexts,[67] including healthcare,[68] epidemiology,[69] and government.[70] The federal government has employed BISG to assess racial discrimination in consumer finance and voting rights litigation.[71] Most recently, two federal courts have affirmed the reliability of BISG to analyze racially polarized voting in an EI model (in Eastpointe, MI and East Ramapo, NY).[72] The method relies on a combination of census surname analysis and census block-level racial demographics to provide an overall probability assessment of the voter's race or ethnicity.[73] Voting rights litigants already use one of these measures; census data matched to precincts is widely used for understanding precinct racial demographics, and as reviewed above, surname analysis is regularly used against the voter file to understand race and ethnicity. By using both sources of data, it is possible to gain a more precise understanding of voter demographics—two pieces of evidence, instead of just one, provides more reliable estimates by far.

BISG analysis begins by undertaking the surname analysis. This is a technique that is commonly used by health scientists, demographers and sociologists for examining racial and ethnic patterns in health disparities. That is, surname analysis is not new, experimental, or controversial. Rather, it is a well-established method backed by data from the U.S. Census. With respect to voting analysis, where it is possible to obtain a voter file, political scientists have published surname analysis in peer-reviewed political science journals for decades.[74] Surname analysis in BISG starts by taking each last name in the

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[67] *See generally Use of Geocoding and Surname Analysis to Estimate Race and Ethnicity*, Kevin Fiscella and Allen M. Fremont (2006); Marc N. Elliott, Peter A. Morrison, Allen Fremont, Daniel F. McCaffrey, Philip Pantoja, and Nicole Lurie, *Using the Census Bureau's Surname List to Improve Estimates of Race/Ethnicity and Associated Disparities*, 9 HEALTH SERVS. OUTCOMES RES. METHODOLOGY (2009).
[68] *See, e.g.*, Dzifa Adjaye-Gbewonyo, Robert A. Bednarczyk, Robert L. Davis, and Saad B. Omer, *Using the Bayesian Improved Surname Geocoding Method (BISG) to Create a Working Classification of Race and Ethnicity in a Diverse Managed Care Population: A Validation Study*, 49 HEALTH SERV. RES. (2014).
[69] Stephen F. Derose et al., *Race and Ethnicity Data Quality and Imputation Using U.S. Census Data in an Integrated Health System*, 70 MED. CARE RES. & REV. 330 (2012).
[70] Marc N. Elliott et al., *Using Indirect Estimates Based on Name and Census Tract to Improve the Efficiency of Sampling Matched Ethnic Couples from Marriage License Data*, 77 PUB. OPINION QUART. (2013); *see also* United States v. City of Eastpointe, 378 F.Supp.3d 589, 599 (2019) (showing that CFPB uses BISG to assess racial discrimination in residential and consumer finance).
[71] *See, e.g.*, *Alamosa Cty.*, 306 F. Supp. 2d at 1022.
[72] *See infra* Part IV(c).
[73] *See* Imai and Khanna, *supra* note 67, at 263−72 (2016).
[74] Matthew Barreto, Gary Segura & Nathan Woods, *The Effects of Overlapping Majority-Minority Districts on Latino Turnout*, 98 AM. POL. SCI. REV. 65 (2004); Matthew Barreto, *Latino Immigrants at the Polls: Foreign-born Voter Turnout in the 2002 Election*, 58 POL. RES. QUART. (2005); Christian Collet, *Bloc Voting, Polarization and the Panethnic Hypothesis: The Case of Little Saigon*, 67 J. POL. (2005); Bernard Fraga, *Redistricting and the Causal Impact of Race on Voter Turnout*, 78 J. POL. (2016).

voter file and checking it against the published directories created by the Census Bureau itself. This list, assembled based on research by demographers at the Census Bureau, has created a probability for each last name in the United States, based on the official census records. When a person fills out the census, they record their last name and their self-reported race. The resulting probability estimate for each name that can be cross-referenced with the voter file. So, for every single last name that might be found on a voter file, a surname database can assign a probability to, for example:[75]

Table 2: Probabilities Assigned in Surname Databases

% Surname	% White	% Black	% Hispanic	Asian
Barreto	12.6	0.9	83.1	2.8
Cohen	88.9	5.9	3.3	0.7
Dunn	80.1	14.4	2.3	0.8
Collingwood	80.8	4.9	1.6	0.5
Williams	45.7	47.7	2.5	0.5
Johnson	58.9	34.6	2.4	0.5
Zimmer	95.6	0.3	1.9	0.6
Washington	5.2	87.5	2.5	0.3
Gonzalez	4.0	0.4	95.0	0.4
Yu	1.5	0.1	0.7	96.1

For some names—including the authors' own—the surname database correctly assigns a very high probability of the voter's race or ethnicity. While the list has higher probability assignments for Hispanic and Asian names, there are also very commonly occurring names for white and Black voters as well. There are some names, such as Williams or Johnson, that could be commonly occurring for *both* white and Black voters. Still, the surname analysis is important because even for these voters it informs us that there is a very low probability that Williams or Johnson is either Hispanic or Asian. With this information in hand, we can move to the next phase of BISG to learn more about voters' racial estimates.

The second step of BISG relies on the address of the voter from the publicly available voter file or sign-in sheet from election day. All registrants must report their physical address to be correctly assigned to a congressional or state legislative district as well as a specific voting precinct. Using a procedure known as geocoding, this address information can be cross-referenced with the data from the

[75] For example, an easy-to-use tool which uses the 2010 Census surname list was compiled by Newsday: https://projects.newsday.com/databases/long-island/census-last-names.

decennial census at the block level. The census data contains the self-reported race of residents, aggregated to the census block level. According to 2002 U.S. Census report,[76] Black Americans face the highest rates of residential segregation, followed by Hispanics and Asian Americans. Using updated data from ACS 2016, the Washington Post[77] reported that at the neighborhood level "data show most of our neighbors are the same race." Thus, census blocks provide very useful information to assess the probability of a voter's race or ethnicity.

Based on census statistics for the racial and ethnic composition for the block in which a voter resides, that probability can be used to refine the initial estimate of voter race by surname alone. By using a smaller level of aggregation (i.e., census block), researchers have more precision in their racial estimates. BISG uses two intuitive sources of voter race information—a voter's name and where they live—to generate an estimate of their race. By employing the Who Are You (WRU) package in R[78] to estimate the probability that a voter is of a certain race, more accurate vote choice preferences can be inferred from the combination of surname and geolocation data -- as opposed to using just surname or geolocation. In one validation exercise, Imai and Khanna demonstrated that the predicted race of the voter very closely matched the actual, self-reported race of the voter for the state of Florida.

Some examples will demonstrate how the method works and why it is an improvement over ACS CVAP data alone. For this, we again return to North Carolina to examine racial segregation at the census block level. Figure 3 contains a dot map for Durham and Raleigh for the race and ethnicity within each census block using 2010 decennial census data. For most parts of both cities, there is clear residential segregation. Returning to our names above, for a voter with a surname that is 83% Hispanic, such as Barreto, but who lived in one of the census blocks in Durham that was 80% Hispanic population (e.g., block 2033 in tract 11), BISG would provide an overall score of the racial probabilities taking both data points into account. The statistical probability of a voter with an 83% Hispanic occurring surname, living in an 80% Hispanic populated census block, being white, Black or Asian is extremely low. The two high-probability occurrences reinforce each other to produce an overall Hispanic probability estimate of well over 90%.

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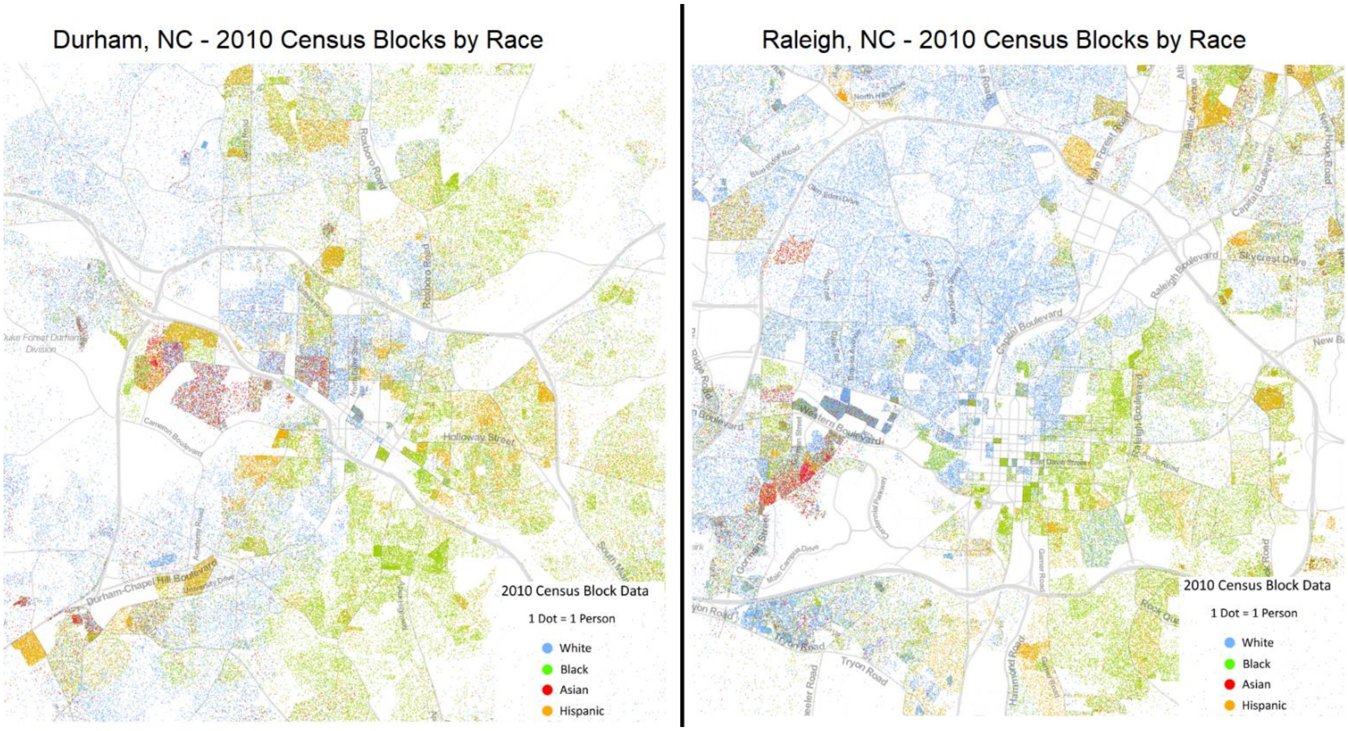
[76] JOHN ICELAND, DANIEL H. WEINBERG, & ERIKA STEINMETZ, U.S. CENSUS BUREAU, RACIAL AND ETHNIC RESIDENTIAL SEGREGATION IN THE UNITED STATES: 1980-2000 (2002), https://www.census.gov/hhes/www/housing/resseg/pdf/paa_paper.pdf.

[77] Aaron Williams and Armand Emamdjomeh, *America is More Diverse Than Ever – But Still Segregated*, WASH. POST (May 10, 2018), https://www.washingtonpost.com/graphics/2018/national/segregation-us-cities.

[78] Kabir Kahnna & Kosuke Imai, *Who are You? Bayesian Prediction of Racial Category Using Surname and Geolocation*." Package: WRU; Version 0.1-9 (Feb. 20, 2019), available at https://github.com/kosukeimai/wru.

Figure 3: Dot Map of Racial Segregation at Census Block Level in Durham and Raleigh, N.C.[79]



For surnames that are less unique to one racial group, the census block data greatly helps assign racial probabilities. Take the surname Williams, which is 45.7% white and 47.7% Black. If we know this voter, Williams, lives in a census block in central Raleigh which are overwhelmingly white – many of these census blocks are over 90% white—then we have far greater confidence that this Williams is white. However, if a different voter named Williams lived in the eastern/central parts of Durham, which has large Black and Hispanic populations, but almost no white residents—indeed many of these census tracts are less than 5% white—then we would have very high confidence that this Williams is Black. Even though parts of Durham have Black and Hispanic populations living in proximity, the surnames such as Williams or Gonzalez are not overlapping between Blacks and Hispanics. To this point, only 2.5% of people named Williams are Hispanic, and 0.4% of people named Gonzales are Black. Thus, the combination of both surname analysis and census block level data provides a more precise estimate of each voter's race or ethnicity, than just using one method alone.

The method operates much like a familiar probability problem involving a deck of cards. The probability of drawing a red card and a face card will depend on the number of hearts and diamonds

[79] University of Virginia, Demographics Research Group, The Racial Dot Map, http://racialdotmap.demographics.coopercenter.org.

(red) in the deck, qualified by the number of jacks, queens and kings (face cards) in the deck. It uses principles of conditional probability to more precisely estimate racial and ethnic probabilities for a given voter. Since we only have candidate vote choice at the precinct level, we are not concerned with individual level outcomes of BISG, but rather, we want to aggregate the probabilities for each precinct, to correlate with precinct vote totals. Roughly, it is via this method that BISG can infer voter preference—for actual voters—using a combination of surname and geolocation data. We propose that this creates an even more robust picture of voter behavior when implementing EI models.

BISG has at least three significant advantages over relying on ACS's CVAP data in EI models, each directly responsive to the three limitations explained in Part III: the composition of voters included in the data, the survey coverage, and the geographic alignment. First, the population data drawn on by the BISG model are the actual voters, not eligible citizen adults from which actual voters must be inferred. Recall our example from Durham above. CVAP data includes the entire adult eligible population, in the case of Durham that was 183,757 people, however in the mayoral election just 34,867 ballots were cast. Plugging in CVAP race data assumes that racial groups vote in proportion to their size and fails to observe non-linear differences in turnout by race and precinct. Studies have shown that Black and Latino voters often have lower turnout than white voters. Using CVAP data might suggest one precinct is close to 50% Latino, but the actual voter file data might suggest that same precinct was only 30% Latino among those who cast a ballot on election day. Whenever possible, using data of the actual voters is a more precise way to estimate vote preference.

Second, the ACS 5-year data represents a sample of roughly 10% of households, meaning 90% of residents in each census block group are not interviewed and their race is unknown. BISG, by contrast, uses data from the decennial census, at the census block level, providing data on every household and avoiding uncertainty in the estimates. By working with data about everyone in the geographical area, racial estimates are more precise.

Third, ACS CVAP can result in misalignment between voting precinct boundaries and census block group boundaries. Demographers often must trim, collapse, or interpolate how the population in a census block group potentially fits into a voting precinct boundary. We demonstrated this above in figure 2 by depicting voting precinct #19 in Durham County, North Carolina, which includes parts of eight census block groups, only two of which are entirely contained inside the precinct geography, while six census block groups extend well beyond the boundary of precinct #19. The BISG model, by contrast, only counts people, voters in fact, who are within each specific precinct, based on the voter file.

This method has proved extremely effective in political science research. Imai and Khana implemented the BISG method to check if it could improve estimates of race and ethnicity at the precinct level when such data was not present.[80] They started with a case in which self-reported race was present on the voter file in the state of Florida. Using BISG, they first estimated the probability that each voter was white, Black, Latino or Asian, and then checked the model accuracy by comparing to the self-reported race that more than 10 million Florida voters indicated on their voter registration forms. They found BISG accurate and capable of improving our understanding of race and ethnicity in demographic research. Their work is not alone. "Numerous validation studies have shown that BISG and related methods have an excellent ability to measure race/ethnicity. Concordance between self-reported race/ethnicity and BISG estimates is typically 90 to 96 percent for the four largest racial/ethnic groups—Blacks, Asians/Pacific Islanders, Hispanics, and Whites."[81] This makes it "19% more effective than its predecessor and 41% and 108% more efficient than single-source surname and address methods, respectively."[82] Scholars who have worked as experts in voting rights cases recommend the use of BISG.[83] BISG enjoys robust support in the literature for this application.

b. ***Aggregate Racial Characteristics, Not Individual Level Predictions***

The researchers who developed and fine-tuned BISG provide important advice about the implementation and use of this method. They instruct analysts not to get preoccupied about the racial probabilities or even the *prediction* of a single individual. BISG works best when researchers look for patterns across racial probabilities as opposed to interpreting the racial classification of a single individual. Numerous scholars suggest that BISG racial probabilities should be summed and aggregated at the group level. As explained by the authors of the method, "the BISG method is intended to estimate differences at the group or population level; greater caution should be used in classifying specific individuals' race/ethnicity."[84] In one expert report for a voting rights lawsuit, analysts explain the rationale: "here, we are not necessarily interested in the racial assignment for any single individual voter

[80] *See* Imai and Khanna, *supra* note 67.
[81] Allen Fremont et al., *When Race Ethnicity Data Are Lacking*, 6 RAND HEALTH QUAR. 1, 2 (2016); *see also* Marc N. Elliott et al., *supra* note 68, at 69 (describing that when held up against self-reporting data, BISG yields an average weighted concordance of 93%).
[82] Marc N. Elliott et al., *supra* note 68, at 252.
[83] M. V. Hood III et al., *supra* note 43; *see also* Imai & Khanna, *supra* note 67.
[84] Allen Freemont et al., *When Race Ethnicity Data Are Lacking*, 6 RAND HEALTH QUART. 1 (2016).

because we use the aggregate precinct data to evaluate patterns across precincts, and are therefore more interested in the combined or aggregate racial assignments across precincts. Using the aggregate data gives us a much more refined read on the racial and ethnic demographics of the voters from one precinct to another because the data is more accurate at an aggregate level."[85]

When the aggregation technique is followed, it smooths out any misclassification that might have occurred at the individual level, and by drawing on the probabilities (instead of a single prediction) it provides a more accurate final count of voters by race and ethnicity. For example, it is possible that an individual voter who self-identifies as Hispanic is only assigned a 30% probability of being Hispanic and a 70% probability of being white. Elsewhere in the same voting precinct another voter who self-identifies as white is assigned a probability of being 70% Hispanic and 30% white. Whatever the reason for these misclassifications, surname or neighborhood demographics, previous research has shown that they tend to smooth out when aggregated. That is, the 30% Hispanic assignment for Voter 1 is added to the 70% Hispanic assignment for Voter 2 and BISG reports the precinct to have one Hispanic voter—which is true. In practice, these misclassifications by BISG are very uncommon, and would not impact the final analysis. When summing the racial probabilities and aggregating to precincts to allow for group level comparison, the BISG model performs extremely well -- although empirical research is ongoing in this space.

c. *BISG in Court*

For these reasons, BISG is a powerful and effective additional tool, supplementing the limitations of CVAP data which are especially prevalent in the analysis of smaller jurisdictions. Although its usage in voting rights cases is relatively new, it has quickly been proven reliable and its reliability has been affirmed by a federal appeals court.

BISG has arisen in at least two district court cases. When plaintiffs in *United States v. City of Eastpointe*[86] introduced BISG evidence, the court denied Defendants' motion to exclude it.[87] The court went on to affirm that the plaintiffs had "provided sufficient facts and data to support the reliability of

[85] Matt A. Barreto and Loren Collingwood Expert Report of Racial Voting Patterns, NAACP Spring Valley v. East Ramapo Central School District, No. 17:17-cv-0894 (S.D.N.Y 2019).
[86] 378 F. Supp. 3d 589 (E.D. Mich. 2019).
[87] *Id.* at 593.

BISG data in this case," and that the method "the product of reliable principles and methods."[88] Because the case settled, however, the reliability of BISG was never conclusively affirmed.[89]

The matter recently arose again in *NAACP Spring Valley Branch v. East Ramapo Central School Dist.*,[90] in which plaintiffs sought to rely on BISG to show racially polarized voting.[91] In this lawsuit, the two opposing expert witnesses used the same ecological inference (EI) models, but they each used different inputs for the race and ethnicity of voters. The defense's expert used ACS CVAP data, while the plaintiff's experts used BISG analysis of the actual voter sign-in data.[92] This provides an opportunity to compare how each method works.

The East Ramapo Central School District is a small jurisdiction that contains only 10 voting precincts during school board elections. Their low turnout means that the ACS CVAP data on all eligible voters, which number 60,000, is a poor match to the 13,000 people who actually show up to vote. Further, both defense and plaintiffs' experts agreed that Black and Latino voter turnout was lower than whites, which means CVAP likely overestimates how many minorities were voting on election day, introducing bias into the EI estimates.

According to the ACS CVAP data presented by the defense, white voters were cohesive and voted as a bloc, but the data on Blacks was inconsistent and inconclusive. Plaintiffs' use of BISG on the voter file allowed for a more precise look at actual voters and their probability of being Black and found a clear pattern of cohesive voting among Blacks. Two immediate trends are clear with the BISG data. First, for both white and Black voters, the confidence interval, or uncertainty estimate surrounding the vote choice prediction is smaller and tighter, which is evidence of a more accurate prediction. For instance, CVAP estimates cohesion among whites, but gives a confidence interval range of 21 points (75 to 96); whereas the BISG estimate for whites contains a range of just 9 points (68 to 78). Likewise, for Blacks the BISG dramatically improves the reliability. CVAP produces a confidence range of 79 points (10 to 89) while BISG contains a range of 43 points (5 to 48). Second, BISG detects a clear pattern of cohesive voting among Blacks that CVAP fails to observe. CVAP data estimates a split among Blacks with 53% preferring the white candidate, Grossman, and 47% preferring the Black candidate, Goodwin.

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[88] *Id.* at 613.
[89] United States Department of Justice, Justice Department Reaches Agreement with City of Eastpointe, Michigan, Under the Voting Rights Act (June 5, 2019), https://www.justice.gov/opa/pr/justice-department-reaches-agreement-city-eastpointe-michigan-under-voting-rights-act.
[90] 462 F.Supp. 3d 368 (S.D. N.Y. 2020).
[91] *Id.* at 382.
[92] *Id.* at 387.

The BISG data finds evidence that Goodwin was actually preferred by 77% of Blacks, to just 23% for Grossman.

After hearing extensive evidence supporting the reliability of BISG, the district court in *East Ramapo* admitted and relied upon BISG, calling it "extensively validated by experts"[93] and, "given the unique characteristics of the District," "a better data set than CVAP for use as an input for ecological inference, and…therefore used the superior methodology."[94] The judge dismissed the defendant's expert witness's effort to undercut the accuracy of BISG as "unpersuasive."[95] On appeal, East Ramapo School District argued that the district court abused its discretion in admitting and relying on data derived through BISG.[96] The Second Circuit disagreed. Notably, the Second Circuit found BISG data admissible and reliable. The court stated that BISG's results could be tested,[97] had been subject to peer review,[98] were reliable,[99] and accepted in the scientific community.[100] Considering the conditions of the case, the Second Circuit agreed with the district court that BISG was the "superior data set."[101] Having secured the Second Circuit's approval, voting rights plaintiffs and local governments should consider BISG safe to rely upon in court.

Table 3: Comparison of CVAP and BISG Method in Real Election Data in Rockland County, N.Y.

	White		**Black**	
	CVAP	BISG	CVAP	BISG
Grossman (White)	86% (75,96)	74% (69,78)	53% (10,89)	23% (5,48)
Goodwin (Black)	14%% (4,25)	26% (22,31)	47% (11,90)	77% (52,95)
Weissmandl (White)	84% (73,94)	72% (69,75)	56% (11,92)	19% (4,39)
Morales (Hispanic)	16% (6,27)	28% (25,31)	44% (8,89)	81% (61,96)
Lefkowitz (White)	82% (70,93)	67% (62,71)	42% (6,81)	25% (7,46)
Charles-Pierre (Black)	16% (6,29)	31% (27,35)	53% (15,89)	71% (50,92)

[93] *Id.* at 383.
[94] *Id.* at 387.
[95] *Id.* at 389.
[96] Clerveaux v. E. Ramapo Cent. Sch. Dist., 984 F.3d 213, 219 (2nd Cir. 2020).
[97] *Id.* at 226.
[98] *Id.*
[99] *Id.* at 226–27.
[100] *Id.* at 227.
[101] *Id.* at 237.

The BISG method shows promise in at least two contexts. First, although not required by *Gingles*, plaintiffs in vote dilution cases should consider using BISG as an additional measure to show racially polarized voting in contexts in which it may yield greater accuracy. One such context is the evaluation of racially polarized voting in smaller jurisdictions. It isn't clear how many vote dilution cases are "just outside of the searchlight of extant litigation," for which ACS survey data does not equip plaintiffs to satisfy the *Gingles* preconditions. By introducing BISG, though, it is plausible that evidence of racially polarized voting in a great deal of cases becomes essentially uncontestable. Second, smaller jurisdictions should use BISG when drawing new district boundaries to ensure that they are complying with Section 2 of the VRA. The enhanced precision of BISG data empowers governments to make informed decisions about its voters and the mandate of Section 2. For these reasons, we propose it is time to move past the theoretical and to the applied, bringing BISG to the fore as a powerful tool for vote dilution plaintiffs and governments alike.

V.
CONCLUSION

This Article has shown that managing surname data through BISG modeling is an accurate and necessary innovation in the social science methods that lay the foundation for VRA liability. BISG data is a promising method when evaluating the VRA liability of jurisdictions for which it is difficult to gather the appropriate data using traditional methods. A federal court has recently deemed BISG admissible and reliable for the first time, laying the groundwork for future reliance on the method. The judicial approval of the method could not come soon enough. BISG has an important role to play as the country enters a redistricting round lacking key protections for minority voters and facing other difficulties which threaten to lead to new voting district maps that dilute the minority vote. Especially with the stakes as high as they are, voting rights plaintiffs should be equipped with the most advanced statistical methods when bringing their case. Furthermore, jurisdictions should use BISG when drawing new district boundaries to ensure compliance with VRA Section 2. Armed with this powerful method, voting rights advocates and governments are best equipped to enforce the equal right to vote.