Race and Redistricting in Local Governments

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Electoral maps translate residential geography into political representation, yet they have never been systematically measured for thousands of local governments across the country. We reconstruct 3,712 city council and county commission maps across 18,521 districts using nationwide voter-file and Census data. Enacted maps overrepresent White voters and underrepresent Black and Hispanic voters, with gaps predicting the racial composition of officeholders. We juxtapose these with simulated, race-blind maps satisfying common districting constraints. Simulated maps reproduce much of this disparity, showing that geography skews representation before any boundary-drawing. Enacted maps substantially improve on the race-blind baseline only in jurisdictions subject to oversight from the Voting Rights Act or districting litigation. As courts curtail race-conscious districting, local governments may revert to a baseline that is formally neutral but substantively unequal.

1 Introduction

Electoral rules can be formally race-neutral yet systematically produce unequal representation. District boundaries are drawn over residential patterns shaped by segregation, historical discrimination, housing policy, and migration. As a result, even maps drawn without reference to race may

convert equal population shares into unequal political power (*1–3*). Measuring the extent to which electoral institutions reproduce or mitigate the inequalities embedded in social geography is central for understanding democratic representation.

District boundaries can protect incumbents, favor parties, and dilute the electoral power of racial and ethnic minorities. More fundamentally, they determine how populations are translated into political representation. At the local level, that translation shapes the composition of city councils and county commissions, which make decisions about many policies residents experience directly, including policing, housing, land use, public health, infrastructure, and local public services. Greater Democratic representation on county legislatures increases county spending (*4*). Similarly, greater non-White representation on city councils directs more governmental attention and investment toward non-White neighborhoods (*5*). Yet local electoral maps remain difficult to study systematically, largely due to a lack of centralized data sources (*6, 7*). This matters because local districting operates under geographic and institutional conditions that may magnify representational inequality. Local districting divides small, often sharply segregated areas into few districts, with each comprising a substantial share of the governing body. Depending on the group's population share, geographic concentration, and extent of racially polarized voting (*8–10*), modest changes in neighborhood boundaries can induce substantial differences in representational opportunity (*11*). Yet our understanding of *local* districting is limited, as prior work either examines it within a single state (*11*) or documents nationwide underrepresentation without reconstructing maps (*12*).[1]

In this Research Article, we provide the first nationwide account of how local district maps translate racial and ethnic populations into expected representation. Using voter-file data linked to Census geography, we reconstruct 18,521 districts across 1,597 county commissions and 2,115 city councils. We then compare enacted maps with simulated maps that satisfy basic districting requirements but do not optimize representation by race. This comparison distinguishes disparities inherited from geography from those arising from mapmakers' choices.

Three results emerge. First, enacted local maps systematically overrepresent White voters and underrepresent Black and Hispanic voters, and these representation gaps predict the racial composition of elected officials. Second, simulated race-blind maps reproduce much of the same inequality. The spatial distribution of racial groups therefore creates substantial representational bias before officials draw any lines. Third, enacted maps are often less biased than the simulated alternatives.

This mitigation is concentrated in jurisdictions formerly subject to Voting Rights Act preclearance or districting litigation, where legal oversight and race-conscious compliance appear to partly offset the structural bias produced by geography.

These findings complicate a simple account of local gerrymandering as intentional manipulation. Enacted local maps remain inequitable, but simulated maps drawn without reference to race often produce even larger representation gaps because they reproduce inequalities embedded in residential geography. Race-conscious districting may therefore sometimes mitigate, rather than amplify, representational inequality (*3*). In our data, this mitigating effect is concentrated in jurisdictions where the Voting Rights Act and related litigation have shaped the redistricting process. The relevant distinction may therefore be less between gerrymandered and ungerrymandered maps than between forms of line drawing that amplify geographic inequality and those that mitigate it.

The institutional mechanisms encouraging such mitigation, however, have narrowed. *Shelby County v. Holder* (2013) rendered the Voting Rights Act's Section 5 preclearance regime largely inoperative, while *Louisiana v. Callais* (2026) substantially restricted Section 2 vote-dilution claims by limiting liability to circumstances that support a strong inference of intentional discrimination. These decisions reduce the legal pressure on local governments to consider whether formally race-neutral maps reproduce inequalities rooted in residential geography. This legal narrowing underscores a broader institutional problem: procedures applied neutrally to unequal social landscapes need not produce neutral outcomes.

2 Geography and the role of legal institutions

Racial groups in the United States are unevenly distributed across space. This geography reflects migration, public policy, private discrimination, exclusionary zoning, and unequal access to credit and housing (*13–18*). Electoral districts are drawn over neighborhoods shaped by this history. Districting rules such as equal population and contiguity can have racially unequal consequences. The spatial distribution of racial groups – whether highly concentrated, dispersed, or relatively even – may prevent the formation of enough majority-group districts under ordinary districting rules. This can create a baseline risk of underrepresentation.

Several features of the local context may amplify these forces. Local redistricting operates

under different governance structures from congressional and state redistricting, despite following the same timeline of redrawing maps after each decennial census. In most cases, local government officials draw their own district maps rather than having them drawn by a different level of government or relying on the independent redistricting commissions or advisory groups more common at higher levels of government (*19*).[2] City councils and county commissions often have a small number of seats (e.g., five), such that each district represents a larger share of the governing body. Because racial residential patterns, including segregation, are more pronounced at smaller geographic scales, local maps can translate concentration, dispersion, or separation into underrepresentation more sharply than state or federal maps (*20, 21*). The local level thus combines substantial line-drawing discretion with fine-grained racial geography and a small number of seats, making representation particularly sensitive to district boundaries.

The laws governing district map-drawing have long wrestled with these considerations. The historical shift towards district-based systems, away from at-large elections, came after civil rights litigation aimed to improve minority representation (*22*).[3] Consistent with this history, Voting Rights Act coverage increased Black local officeholding, with the largest gains occurring in counties that elected commissioners by district rather than at-large (*23*). Federal law requires local districts to satisfy equal-population requirements, just as at the congressional level.[4]

Local district maps are also constrained by two complementary provisions in the Voting Rights Act of 1965. Section 2, which applies nationwide, allows voters or the Department of Justice to sue over existing maps that dilute minority voting strength, including those that fragment cohesive minority communities or unnecessarily limit their electoral influence. In 1982, Congress amended the VRA in response to a Supreme Court decision (*City of Mobile v. Bolden*, 1980) to reduce the evidentiary threshold such that plaintiffs needed to show only that a map produces discriminatory results, not intent. Most Section 2 cases have targeted local governments – county commissions, city councils, school boards – rather than congressional or state maps (*24*). Section 5, by contrast, operated preemptively. Jurisdictions with histories of voting discrimination had to obtain federal approval ("preclearance") before any new district maps or voting rules could take effect. Preclearance mattered for local governments because many election changes at this level receive little scrutiny. More broadly, preclearance produced durable gains in minority political participation and representation, gains that began to erode after *Shelby County v. Holder* (*25*). These political gains also had

downstream economic consequences: Voting Rights Act coverage narrowed the Black–white wage gap through public-sector employment, with some of these gains reversing after *Shelby County v. Holder* (*26, 27*). After the preclearance regime was suspended, Black turnout declined relative to White turnout in formerly covered jurisdictions (*28*).

3 Constructing local government district maps

A central obstacle to studying local gerrymandering is the lack of comprehensive district-boundary data. We address this using 2020 L2 voter-file snapshots, which report registered voters' residential locations and local electoral districts, including city council and county commission districts. These districts were active in 2020 and largely reflect lines drawn during the 2012 redistricting cycle.[5]

We link voter addresses to Census block groups to reconstruct the correspondence between Census geography and local districts. When block groups cross district lines, we assign each to the district containing the largest share of its population. As detailed in the Supplementary Materials, block groups generally fall wholly or nearly wholly within districts, yielding a clean correspondence.

This procedure produces Census-based mappings for every city council and county commission we can identify in the L2 data. We then merge these reconstructed districts with Census data to measure district-level racial and ethnic composition and basic characteristics such as total population.

Our sample includes 1,597 counties, 9,028 county commission districts, 2,115 cities, and 9,493 city council districts. The average county commission has 5.7 districts, and the average city council has 4.5. The sample is not comprehensive, largely because many counties and municipalities do not elect their legislative bodies by district.

4 Measuring representation

We measure bias using an Expected Representation Gap: the difference between the share of districts in which a group constitutes a majority of the citizen voting-age population (CVAP) and the group's share of the entire jurisdiction's CVAP. Positive values indicate potential over-representation, while negative values indicate potential under-representation. For example, consider a five-district city

that is 40% Black but has only one majority-Black district. Under racially polarized voting, Black voters would have the opportunity to elect their preferred candidate in 20% of districts, producing an Expected Representation Gap of −0.2.

The Expected Representation Gap has several advantages. First, it has a direct interpretation: in a five-district council, a gap of +0.2 corresponds roughly to a one-seat advantage, assuming racially polarized voting (*10*). Second, unlike the efficiency gap (*29*), it is a property of the map rather than a measure calculated from ex post election outcomes – important when race- and ethnicity-specific vote shares are unavailable. This measure, or close variants, has also been used in prior scholarship (*30, 31*).

Supplementary Figures S1 through S6 map the Expected Representation Gap for White, Black, and Hispanic voters and show geographic coverage. Coverage reflects two constraints. First, we calculate gaps only where the relevant population could form a Black- or Hispanic-majority district.[6] We apply an analogous threshold to the combined non-White population for White gaps. Second, states differ in their use of district-based elections: all 58 California counties elect supervisors by district, compared with only a few mostly populous Pennsylvania counties, including Allegheny.

5 Constructing simulated electoral maps for comparison

Although local officials – usually city councils and county commissions themselves – have considerable discretion over district boundaries, they also face legal and geographic constraints. These include equal-population and contiguity requirements, as well as the spatial distribution of groups within their jurisdictions. Consequently, some observed bias may reflect what Chen and Rodden (*1*) call "unintentional gerrymandering": electoral bias produced by political geography rather than deliberate line drawing and therefore likely to appear even in randomly drawn maps.

To assess the role of geography, we generate simulated district maps for each city and county that satisfy a minimal set of rules, including equal population, contiguity, and the same number of districts. These districting rules are race-agnostic. We use a sequential algorithm to assign block groups to simulated districts, generating twenty-five maps per jurisdiction. The simulated benchmark is the mean Expected Representation Gap across the twenty-five plans.[7]

Comparing enacted maps with this simulated baseline indicates whether actual line drawing

amplifies or mitigates the bias embedded in residential patterns (*32*). Enacted maps that are more biased than the simulations suggest that line-drawing amplifies structural inequality; maps that are less biased suggest that it can mitigate it.

6 Results

6.1 Racial representation gaps

Figure 1 plots the distributions of Expected Representation Gaps by racial or ethnic group and type of government. Enacted local maps produce systematic representation gaps: White voters are overrepresented relative to their population shares, while Black and Hispanic voters are underrepresented. These patterns appear in both city councils and county commissions and are robust across alternative specifications.

The median Black representation gap is approximately -0.075 in counties – roughly one-third of a seat below proportional representation in a five-district body – and -0.095 in cities – one-half of one seat. The Black ERG is negative in 68% of cities. For Hispanic voters, the median gap is larger, ranging from -0.127 to -0.137, and is negative in 86% of cities. The White representation gap is approximately 0.10 across both types of government, equivalent to roughly half a seat above proportional representation in a five-district body. Because the patterns are similar for city councils and county commissions, we pool them in the remaining analyses.

We measure the racial and ethnic composition of elected officials using the American Local Government Elections Database (*7*), which includes city-council and county-commission election results through 2021. Although the Expected Representation Gap is defined solely from district maps, it strongly predicts election outcomes during the decade those maps were in effect. Figure 2 pools city councils and county commissions and plots the average share of White elected officials at each percentile of the White representation gap, together with a fitted relationship. Jurisdictions with larger White representation gaps elect larger shares of White officials. Table S1 reports analogous linear regressions for White, Black, and Hispanic representation. For all three groups, the Expected Representation Gap is positively and significantly associated with the group's share of elected officials.

6.2 Enacted maps versus simulated maps

Figure 3 plots the distributions of enacted and simulated Expected Representation Gaps by racial or ethnic group, using the pooled sample of city councils and county commissions. Figure S7 presents them separately.

The simulated maps reproduce the broad pattern found in enacted maps: expected underrepresentation of Black and Hispanic voters and overrepresentation of White voters. This shows how residential geography can generate representational bias even when maps are drawn without regard to race. It echoes partisan redistricting studies at higher levels of government showing that bias can result from residential geography under neutral map-drawing (*1, 32*).

Where enacted and simulated maps differ, enacted maps are often *less* racially biased. This does not imply that enacted maps are equitable or rule out efforts to weaken the influence of voters of color in particular jurisdictions. Rather, it suggests that race-blind districting could on its own produce systematic inequality and that actual line drawing sometimes mitigates that baseline. This pattern parallels evidence from state legislative redistricting (*3*). One possible explanation is that oversight from legal institutions encouraged jurisdictions to reduce disparities that would otherwise arise from geography alone. We examine this possibility, with a focus on the Voting Rights Act.

6.3 The role of federal oversight

Figure 4 divides jurisdictions by whether they were covered by the Voting Rights Act's preclearance provision or had faced litigation challenging their district boundaries or use of at-large elections by the last map-drawing cycle in 2011–2012. This period predates the Supreme Court's 2013 decision in *Shelby County v. Holder*, which effectively suspended the preclearance regime.

The patterns are striking. In jurisdictions subject to neither preclearance nor litigation (Panel B), the enacted and simulated distributions show substantial overlap. Geography generates systematic bias, and enacted line drawing does little, on average, to mitigate it. In jurisdictions that faced oversight, however, the enacted and simulated distributions diverge for Black and White voters. For Black voters, enacted maps subject to legal oversight improve on the simulated baseline by 5.1 percentage points more than in jurisdictions without oversight. Analogously, enacted maps reduce White overrepresentation by 4.1 percentage points more in the oversight group (Table S2). These

patterns are consistent with legal oversight, civil-rights pressure, and race-conscious compliance counteracting some of the representational bias produced by local geography. This interpretation echoes prior evidence that Voting Rights Act coverage increased Black representation in local government, particularly on county commissions elected from districts rather than at-large (*23, 27*).

For Hispanic voters, the enacted maps show modestly lower Hispanic representation gaps relative to the simulated baseline, but this decrease is not significantly larger in jurisdictions that faced oversight. Two contextual factors may help explain this result. First, preclearance coverage was concentrated in the South, where Black population shares were generally larger than Hispanic population shares. Second, 82% of county cases and 78% of city cases in our litigation data involved Black voters.[8]

7 Discussion

We show that local districting institutions can both reproduce the inequalities embedded in social geography and ameliorate them. Maps generated without regard to race systematically underrepresent Black and Hispanic voters under the observed spatial distribution of racial and ethnic populations. As such, the political consequences of race-neutral districting are not substantively neutral in the 3,712 local governments we study. Although the Expected Representation Gap measures expected opportunities for representation through majority-group districts rather than guaranteed electoral outcomes, it is strongly associated with the racial composition of elected officials.

The extent of inequality varies significantly by the conditions under which electoral institutions operate. In jurisdictions subject to VRA preclearance or districting litigation, enacted maps are significantly less biased than the race-blind baseline. In jurisdictions facing neither, the distributions of representation gaps in enacted and simulated maps overlap almost exactly. The stronger mitigation observed in the former is consistent with minimal correction by default and a potentially important role for electoral oversight.

These results have implications for ongoing debates in election law. Recent Supreme Court decisions assume in part that restricting the use of race shifts map-drawing toward neutrality. Our results suggest otherwise. Doing so may make it harder for local governments to offset the representational disadvantages created by geography. This risk is heightened at the local level because

small districts, few seats, and sharp racial separation make representation especially sensitive to boundaries.

Local districting therefore warrants study on its own terms. The legal frameworks and empirical approaches used for studying congressional and state maps may miss the distinctive way local electoral maps translate residential geography into representational inequality. One potential response is to expand the number of seats – usually small at the local level – particularly for larger jurisdictions. We show that doing so narrows Black and Hispanic representation gaps, although the improvements are insufficient to produce unbiased maps (Supplementary Materials). Documenting the extent of inequality under the race-neutral baseline, and identifying mechanisms for ameliorating it, are first steps for making local government more responsive in the post-*Callais* era.

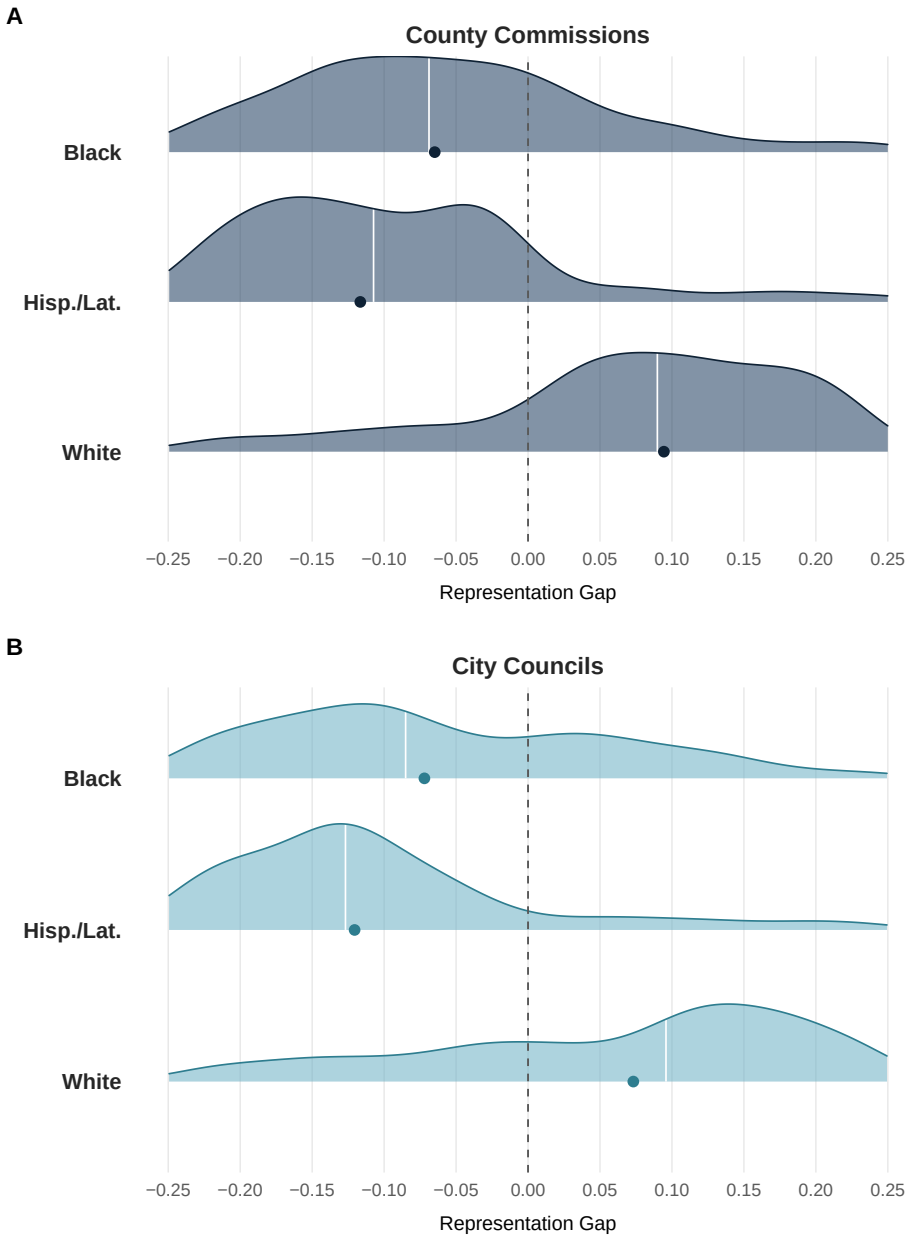


Figure 1: **Expected Representation Gaps are on average positive for White voters and negative for Black and Hispanic voters.** Panel (A) is our sample of county commissions. Panel (B) is our sample of city councils. Each plot is the distribution of expected representation gap (ERG) for the noted group. Dots indicate means; solid vertical lines indicate medians.

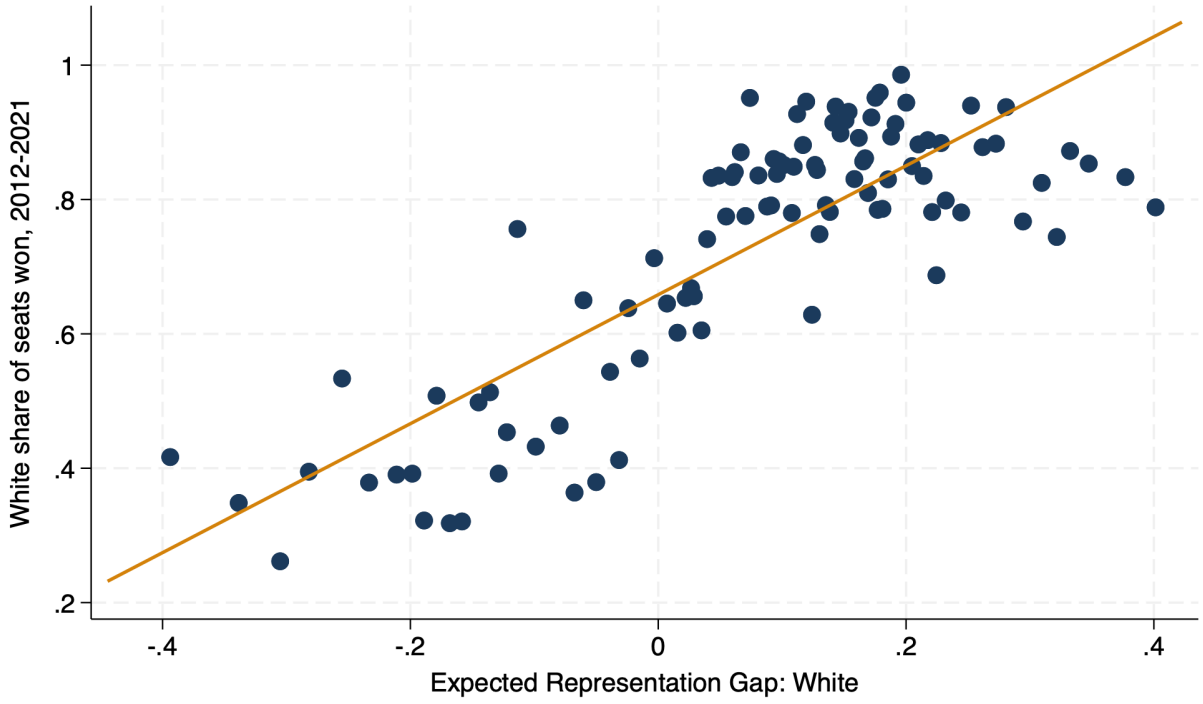


Figure 2: **Expected Representation Gap is related to the realized composition of elected officials.** The x-axis plots the White expected representation gap, pooling city councils and county commissions. The y-axis plots the share of elected officials who are White from 2012 to 2021 in cities and counties where non-White representation is possible, as defined in text. Each point is an average within a given percentile. The fitted line is based on a linear regression of the y-axis variable on the x-axis variable.

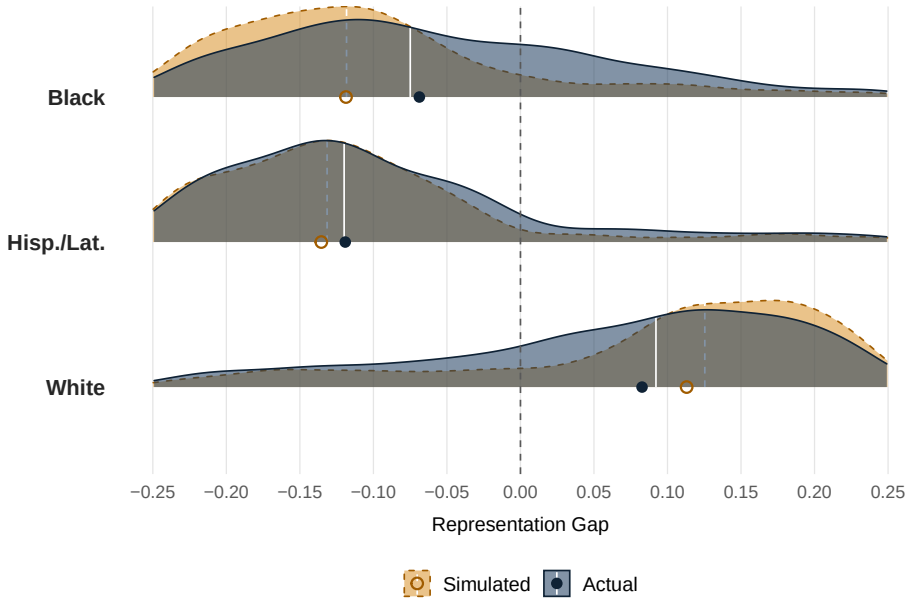


Figure 3: **Simulated maps reproduce most of the bias in enacted maps, on average, suggesting a large role of geography in driving representation gaps.** Each plot is the distribution of expected representation gap (ERG) and simulated ERG for the noted group. Plots pool city councils and county commissions. Dots indicate means; solid vertical lines indicate medians.

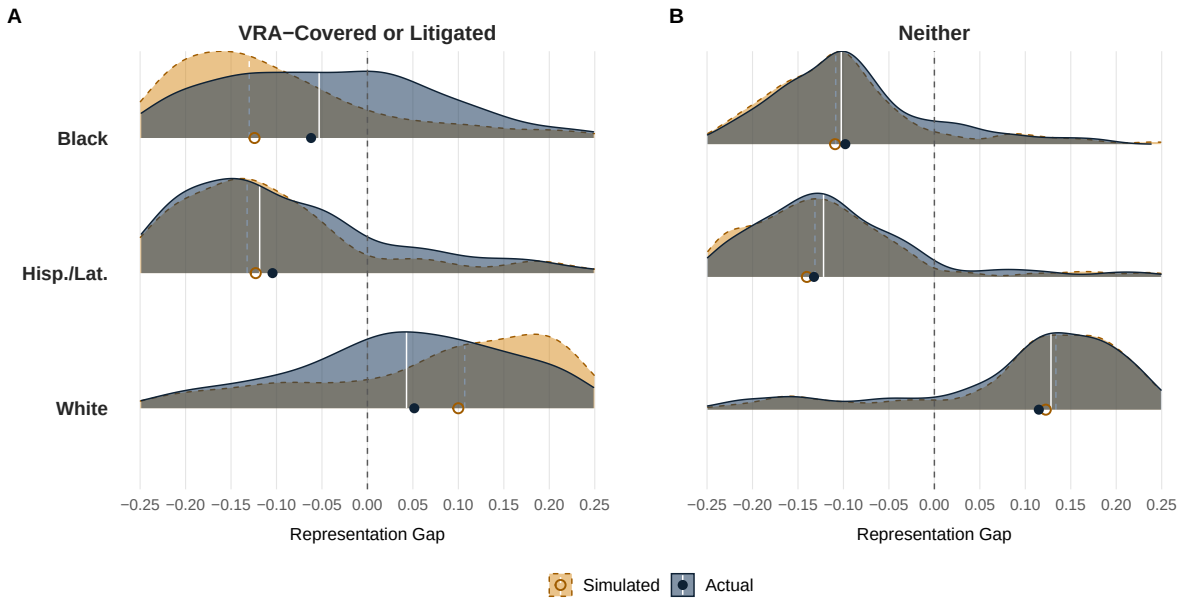


Figure 4: **Maps are less biased and diverge from simulated maps (for Black and White voters) in the presence of federal oversight, but not in its absence.** Each plot is the distribution of expected representation gap (ERG) and simulated ERG for the noted group. Dots indicate means; solid vertical lines indicate medians. The sample pools city councils and county commissions. Panel (A) is the subset of jurisdictions that were either covered by the preclearance provision or faced district-related litigation. Panel (B) is all other jurisdictions.

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Notes

1. Enacted maps among a sample of district-based city council elections in California generally place near the top of simulated maps for maximizing Latino representation (*11*). Minorities are underrepresented in local government across the nation through strategic institutional design (*33*), with the Voting Rights Act ameliorating proportionality in descriptive representation (*12*).

2. A small number of jurisdictions, most prominently in California, rely on independent redistricting commissions for local redistricting. Elsewhere, some jurisdictions use an advisory model, in which a committee proposes maps but the elected body remains free to amend them or adopt a plan of its own. But these are the exceptions rather than the rule.

3. Civil rights advocates argued that at-large rules diluted the voting power of geographically concentrated Black communities (*31, 34*). Over time, district-based systems became more common. They are more likely to be adopted in larger jurisdictions and therefore cover a large share of the population.

4. The Supreme Court extended the "one person, one vote" principle to local governments in *Avery v. Midland County* (1968).

5. Electoral districts are drawn with the intent of remaining in place for the decade. We investigate the possibility of interim districting in the Materials and Methods section of Supplementary Materials to establish that our local district maps were very likely drawn in the pre-*Shelby* era.

6. We require the group's jurisdiction-wide population share to exceed

$$0.5 \times \frac{1}{n},$$

where n is the number of districts. This majority district threshold may be relatively conservative, as recent evidence shows that minority candidates often win districts with minority populations comprising 40–50% (*35*). We discuss the construction of this measure in greater length in Supplementary Materials.

7. We use the R package `redist` to simulate district plans (*36, 37*). We provide details on the input data, modeling requirements, and steps to generate simulated maps under Supplementary Materials. In this section, we also describe the reasoning behind the choice of twenty-five simulations, which is in keeping with existing literature (*1*).

8. A related literature documents gains in Hispanic representation following California's widespread shift toward district-based elections under the California Voting Rights Act and associated litigation (*9, 38*). Although we do not find comparable gains here, that evidence highlights another route through which state oversight and election administration may affect Hispanic representation.

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Competing interests: There are no competing interests to declare.

Data and materials availability: Replication code, simulation outputs, documentation for the litigation data, figure and table source files, and all derived data that may be redistributed under the applicable data licenses will be provided.

The 2020 L2 voter-file data used to reconstruct local electoral districts are proprietary and cannot be redistributed by the authors. Researchers seeking access must obtain the data directly from L2 and comply with its licensing terms. The 2008–2012 American Community Survey five-year block-group data are publicly available from the U.S. Census Bureau. The American Local Government Elections Database is publicly available through the Open Science Framework at `https://doi.org/10.17605/OSF.IO/MV5E6`. Redistricting simulations were conducted using version 4.3.1 of the `redist` R package, available at `https://doi.org/10.32614/CRAN.package.redist`. The replication repository provides the software environment, processing instructions, and analysis code needed to reproduce all reported tables and figures from the accessible and redistributable materials.

Supplementary materials

Materials and Methods

Supplementary Text

Figs. S1 to S12

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Supplementary Materials for

Race and Redistricting in Local Governments

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Materials and Methods

Data: Constructing Electoral Districts and Measuring Racial/Ethnic Composition

We obtain administrative voter records from the vendor L2, which gathers voter files from state elections offices and modifies them into a national voter database containing over 190 million records. These data represent the universe of registered voters in 2020. Amongst other variables, the L2 data report the residential address, registered party affiliation, and electoral districts of registered voters. The reported electoral districts include all levels of elections, from U.S. House Congressional District to local elections, the latter of which we leverage. When the local jurisdiction (municipality or county) in question uses district-based elections, we observe the municipal or county legislative body district that the voter resides within.

Municipal and county legislative bodies both go by multiple names. In municipalities, these bodies might be referred to as city councils, town councils, borough council, board of aldermen, etc. For brevity, we refer to all of these as "city councils". In the L2 data, the city council district variable had two variants with different labels: city council commissioner district or city ward. In most cases one or the other was populated, and we used that as our input. In the cases where both were populated, we went on a state-by-state basis and used publicly available information on the number of local districts to choose the appropriate L2 variable. We furthermore validated our approach using web searches on the number of city council members elected in a district- or ward-based system, and comparing it with our L2-based measure, finding that the two measures agree in 96% of cases. Note that there is a large number of voters for whom neither the city council district nor ward variable are populated. That is expected, as a large number of municipalities use only at-large elections or a mix of at-large and ward-based systems. We drop observations that are missing information on city council districts.

County legislative bodies are generally referred to as either county commissions or county boards of supervisors. Again, for brevity, we refer to all of these as "county commissions". The variable identifying electoral districts for county commissions appears either under a county commission or county board of supervisors district variable. We keep the one that is populated. As with city councils, the variable is not populated when the county uses at-large elections and we drop those observations. This leads to varying coverage across states, as captured – for instance – in

Figure S3. A small number of counties appear in our data from Pennsylvania, as only a handful of county commissions in that state use district-based elections. This highlights the variety of electoral institutions across the states.

The L2 data are geocoded such that the residential addresses are placed within Census Block Groups, which is the smallest geographic unit with corresponding citizen voting age population data. The 2020 file relies on 2010 vintage Census Block Groups. We identify the city council and county commission electoral districts for each voter where relevant, then collapse the data to the Block Group-by-City Council District and Block Group-by-County Commission District levels. We sum the number of voters in each intersection to allow for cases wherein Block Groups do not nest completely into Districts. In practice, the mapping is relatively clean. For county commission districts, 62% of block groups lie entirely within one district. In cases where Block Groups are split across two districts, the split is generally minimal. After summing the number of voters within block-group-by-district intersections, we can characterize intersections by the share of a Block Group that sits across distinct districts. The version of this mapping that would be problematic would be one wherein Block Groups frequently have large shares of their voters across multiple districts – i.e., 55% of voters in one district and 45% in another. This is very rare. If we sort each Block Group-by-district intersection by the share of voters in each intersection and focus on the largest portion, rather than the largest portion frequently being close to 55% (as in the worst case scenario), the median is 100% and the mean is 95%. Restricting to those Block Groups that are split across multiple districts but still focusing on the largest portion, the median share is 97% and the mean is 87%. Meanwhile, if we focus on all intersections that are not the largest within a Block Group, the median share is 1% and the mean is 8%.[9] In other words, (1) a majority of Block Groups map perfectly into districts and (2) amongst those that do not, the split is best characterized as primarily falling within a unique district with a very small share of voters spilling into a different district. With that in mind, the approach we take to split Block Groups is that we simply assign them to the District that the majority of the Block Group falls within.

That process leads us to two unique Block Group-to-District mappings, one for City Councils and one for County Commissions. By basing our mapping on Block Groups, we can easily merge in Census demographic variables and construct district-level demographics. We merge in the 2008-2012 5-year ACS files, as that file provides data down to the Block Group level and matches the

block group vintage of the L2 data. We merge in data on total block group population and counts by race and ethnicity. For our main analysis, we merge in counts by race-ethnic group specifically for the citizen voting age population (CVAP) subset. We then aggregate data to the electoral district level and calculate racial-ethnic shares, while maintaining counts of registered voters from L2 and total population from the Census.

We then exclude some cases that either appear to be erroneous or that might produce unreliable district composition measures. We drop districts with fewer than 10 registered voters, which is roughly the first percentile. We exclude cities and counties that have only a single district in the data after aggregating. Finally, we drop cities and counties if any district holds less than one-fifth of its expected registered voter share, where "expected registered voter share" is $\frac{1}{\text{Districts}}$. In other words, we apply a conservative filter to drop cities and counties containing a district that is dramatically underpopulated. That generally reflects a data error, especially at the highly conservative level we apply, as districts are meant to be roughly equal population. To provide a sense of these filters, in our county-level data, we start with 1,685 counties before applying them and have 1,597 counties afterwards.

The resulting dataset allows us to calculate our key measure: the Expected Representation Gap, which is, for city/county c and race/ethnic group r:

$$\text{Exp. Rep. Gap}_{cr} = \frac{\text{Maj. Group r Districts}_c}{\text{Total Districts}_c} - \text{CVAP Share}_{cr}$$

Simply, this is the difference between the share of districts that are majority group r (based on CVAP) vs. the share of the city/county CVAP that is group r. (The latter is calculated by aggregating the same block group level CVAP data up to city or county.) Positive values indicate the share of majority group r districts exceeds that group's voting-eligible population share and that the group is, in that sense, "overrepresented". Negative values imply the opposite.

This measure is inspired by the approach taken by the Department of Justice in Voting Rights Act cases. In its 1991 objection to Powhatan County, Virginia's Board of Supervisors plan, for example, the Department noted that the county was 21.4% Black but had never elected a Black supervisor.[10] It further concluded that an alternative plan could provide Black voters an opportunity to elect their preferred candidate in one of five districts, but that the adopted plan divided the Black population across two districts. The Department therefore formally objected to the plan.[11]

We calculate the Expected Representation Gap for Black, Hispanic, and White populations only. For group-specific analyses, we restrict the sample to jurisdictions in which the relevant population is large enough to form a majority in at least one equal-population district. Specifically, the CVAP Share$_{cr}$ in the entire city or county c for racial and ethnic group r share must exceed $0.5 \times \frac{1}{\text{Districts}}$. In a five-district jurisdiction, the group must constitute at least 10% of the population, with the threshold decreasing as the number of districts increase. In practice, this threshold is sufficiently high to almost always exclude non-Black and non-Hispanic minority groups. Because the White population almost always exceeds this threshold, the relevant restriction for White representation gaps is whether the combined non-White population could form a majority in at least one district. We therefore require the non-White population share to exceed the same threshold. As Figures S1 through S6 show, coverage is widest for the White measure, where the sample restriction is the least binding. The patterns reveal White overrepresentation in most regions of the country – with the exception of some portions of the South and also California. Notably, the former of these was the target of the most federal oversight through the Voting Rights Act and the latter has been substantially shaped by the California Voting Rights Act.

Data: Timing of the observed district boundaries and the pre-*Shelby* decennial redistricting cycle

Local electoral districts are ordinarily redrawn following each decennial census. A time lag implies that updated maps do not appear in elections until a year or two afterwards. As such, the 2010 decennial may yield new boundaries in 2011 or 2012. The decennial cycle implies that they are intended to remain in place for the ensuing decade. The district boundaries in 2020, then, are based on the 2010 decennial census.

The question remains whether 2020 maps reflect interim redistricting since the boundaries were last set in the 2011 or 2012 cycle. At the congressional level, such changes have historically been rare. In the 55 years since 1970, there were only 40 instances of interim cycle redistricting (*39*). Yet as far as we are aware, there is no comparably broad empirical documentation of interim redistricting at the local level. To address this issue, we use historical voter registration snapshots from North Carolina, a state that has had the second-highest number of interim-cycle congressional redistricts (after Texas) in the nation. We reason that if local interim redistricting follows the patterns of higher

levels of government, it would be more likely to occur in North Carolina than in most other states.

We begin by taking all active registered voters in North Carolina in November 2012 and November 2020. We restrict to those who maintained the same addresses over this period, yielding nearly 2.5 million voters. Among those who resided in areas with non-missing city council or county commissioner district information (i.e., these local levels of government were not elected at-large), <1% of observations were assigned to a different city council district in 2020 than 2012. The analogous measure for county commissioners was 5%. Note that we cannot rule out that some of these changes were due to data entry and related measurement issues, boundary changes that involved a late implementation of the 2011 or 2012 redistricting cycle, and changing municipality boundaries due to annexation. So the true prevalence of interim districting at the local level is likely smaller than what is documented here. Furthermore, the majority of candidate counties involved in potential interim districting were not covered under Section 5 of the VRA, such that district assignments in VRA-covered counties were overwhelmingly stable from 2012–2020. Even if interim redistricting occurred in the handful of VRA-covered counties, that would attenuate our estimates towards zero, since we are including maps enacted without federal oversight among those attributed to the VRA.

Data: Constructing Simulated Electoral Districts

We construct simulated district maps for the cities and counties in our sample using the R package 'redist' (*36, 37*). Simulated maps illuminate representational differences arising from residential geography. The algorithm we use does not require enacted maps as a starting point, and generates a baseline independent of existing boundaries. The result then serves as a benchmark against which to compare representational disparities from enacted district boundaries.

The building blocks of the simulations are the same as those of our enacted-map reconstruction. We use 2010 Census block group shapefiles merged with demographic data from the ACS. The redistricting-simulation package then draws up maps subject to three constraints: 1) the simulated map must contain the same number of districts as the enacted map for that jurisdiction, 2) districts must be contiguous, and 3) districts should have roughly equal population. Aside from these rules and using the default compactness parameter, the simulation package imposes no additional considerations, including those involving race and ethnicity. As such, the simulation is race-blind.

Each simulation produces an assignment of every block group to a simulated district. We generate twenty-five simulated plans for each jurisdiction, or twenty-five alternative block group—to—district mappings. For every plan, we merge in the same block group CVAP data used to characterize the enacted districts. We then aggregate CVAP by race and ethnicity to the simulated-district level and calculate the Expected Representation Gap separately for White, Black, and Hispanic populations. For each jurisdiction and racial or ethnic group, the simulated benchmark is the mean Expected Representation Gap across the twenty-five plans.

The choice of twenty-five simulations derives from several considerations. Relying on a single randomly drawn map introduces noise. On the other hand, our simulations depart from procedures to redraw Congressional or state legislative districts because they are far smaller and contain fewer block groups. These constraints imply that there is a discrete and sometimes small number of distinct ways the maps can be drawn. We found that this limit is reached relatively quickly, and that adding simulations beyond twenty-five generated relatively little new variation. The twenty-five plans is also in keeping with the approach taken to simulate Florida districting maps in (*1*).

Supplementary Text

Additional results

Our main results show that in jurisdictions facing federal legal oversight in the form of the Voting Rights Act preclearance provision and redistricting litigation, enacted Expected Representation Gaps are significantly closer to zero than the representation gaps generated by simulated maps. The previous analysis pooled across jurisdiction types. Figures S8 and S9 now present the results separately for county commissions and city councils. They demonstrate that findings are not limited to the type of local government. The ERG is smaller in both county commissions and city councils subject to legal oversight, compared to same-type jurisdictions without.

We then scrutinize whether the form of legal oversight is a factor in the disparity between enacted vs. simulated ERGs. Figure S10 separates the pooled set of jurisdictions into four categories: preclearance and litigation, preclearance only, litigation only, and neither. The patterns are similar across the Panels A–C, in large part because of the substantial geographic overlap between these two forms of oversight. Of the 539 jurisdictions that were involved in redistricting litigations, 447 were also covered under the preclearance provision of the VRA.

Finally, we examine whether particular features of the local geography matters for the influence of federal oversight. Fig. S11 reproduces Figure 4 showing either form of legal oversight or neither form of oversight separately for jurisdictions with high and low levels of residential segregation. Prior research on the shift from at-large to district-based elections finds larger gains in minority representation when underrepresented voters are more spatially concentrated, in part because such concentration creates greater scope for drawing majority-minority districts (*9*). We find that federal oversight is associated with less biased enacted maps, relative to the simulated geographic baseline, in both less- and more-segregated jurisdictions. Among jurisdictions with a history of oversight, the enacted–simulated differences for Black and White voters are approximately 1.5 to 2 times larger in more-segregated jurisdictions than in less-segregated jurisdictions. This pattern is consistent with oversight having greater scope to mitigate geographically produced bias where racial groups are more spatially concentrated. By contrast, enacted maps in jurisdictions without a history of oversight deviate much less from the simulated baseline at either level of segregation. However, the difference across all four panels – that is, whether the difference between Panels B and D differs

from the difference between Panels A and C – is not statistically significant. We therefore interpret these patterns as suggestive.

The effects of adding additional districts on geography-induced bias

One barrier to drawing majority-minority districts in some cases may be the small number of districts that many jurisdictions use. Imagine a jurisdiction where the voting age population is 21% Group A and 79% Group B. Further imagine that the number of districts in the jurisdiction is five. Per the expected representation gap measure, we might expect one district to be majority Group A. If Group A is concentrated in one area within the jurisdiction, drawing such a district may be straightforward. If they are instead concentrated in three separate non-contiguous areas in the jurisdiction (say, each contains one-third of the Group A population), drawing one majority Group A district may be difficult. However, this problem becomes simpler with, say, 9 districts – where one-third of Group A could form the majority within a district.

In practice, the median number of County Commission districts in our sample is 5. In smaller counties, that number of districts may be appropriate, but one might expect that the number of districts scales up with county population or populated land area. That is not the case. Across all but the lowest quintile in population, the median number of districts is 5. (In the lowest quintile, it is 3.) Thus, counties from 23–38 thousand residents and counties with over 181 thousand residents have the same median number of districts. That, of course, further implies that the median number of residents per district changes dramatically across county size. In the first and second quintiles, the median district has 4,174 and 6,765 residents. In the fourth and fifth, those numbers are 21,483 and 75,238. This both means that, under the status quo, the nature of districts in larger counties is very different than in smaller counties, and also that there is substantial scope especially in larger counties to add more districts. (One state that stands out in this regard, and where this happens already, is Wisconsin. Wisconsin has some of the largest county commissions in the country; their commissions generally scale with county size.)

We use our simulation framework to consider a counterfactual wherein we assign more districts to some county commissions. We use the population per district as one relevant metric for doing so. Specifically, we take the sample-wide median of population per district, which is 10,926. We then identify counties that are above this median; those are the higher population counties which, with

some exceptions, generally still have roughly the same number of districts as the smaller counties and therefore much higher populations per district. In those counties, we impose a counterfactual number of districts that would bring their "population per district" metric down to the sample-wide median. However, to ensure practicality in the number of districts, we set a maximum number of districts at the sample-wide maximum, which is 37 districts (Dane County, WI). To provide some sense of the changes, in the fourth population quintile of counties, counties move from a median of 5 to 9 districts. In the highest, they move from a median of 5 to 32.

Figure S12 displays the actual population-to-district ratio medians across population quintiles and also the counterfactual population-to-district ratio medians that result from our re-assignment of numbers of districts. Notably, by design, the population-to-district ratio becomes stable across the top three quintiles, whereas the measure continues to increase with population under the actual number of districts.

Having established a change in the number of districts, we re-simulate maps for each county commission, producing – for each county – five simulated maps with the newly assigned counterfactual number of districts. We then calculate expected representation gaps for those newly simulated maps in the way that we do elsewhere in the paper.

The key comparison we make is between our main simulated maps and the newly simulated maps with (in some counties) a larger number of districts – as the key aim of this exercise is to consider how number of districts can address the geography-induced bias in the maps. Figure S13 plots the distributions of the resulting simulations and compares them to our main simulations. Figure S14 plots the differences in expected representation gaps for our original simulated maps (using the actual number of districts) and our new simulated maps (using the counterfactual number of districts). We plot differences for both the full sample and "treated only" counties; "treated" counties are those where the counterfactual number of districts is different than the actual. In those counties in particular, we see nontrivial differences in the expected representation gap for all three groups. For Black and white voters, the changes in the geography-induced expected representation gap resulting from adding more districts is roughly half the size of the difference in expected representation gaps in jurisdictions facing federal oversight vs. not (from Table S2.) For Latino voters, the change in the expected representation gap resulting from this counterfactual exercise is three times the size of the difference between jurisdictions with and without federal oversight.

Supplementary Tables and Figures

Figures S1–S3. Notes: The Expected Representation Gap is the share of districts in which the indicated racial or ethnic group constitutes a majority of the citizen voting-age population (CVAP), minus that group's share of jurisdiction-wide CVAP. Positive values indicate expected overrepresentation and negative values indicate expected underrepresentation. For Black and Hispanic voters, the sample is restricted to jurisdictions in which the group's jurisdiction-wide CVAP share is large enough to constitute a majority in at least one equal-population district. For White voters, the analogous restriction requires the combined non-White CVAP share to be large enough to constitute a majority in at least one district. County colors correspond to the ranges shown in the legend; gray denotes jurisdictions not included in the relevant group-specific sample.

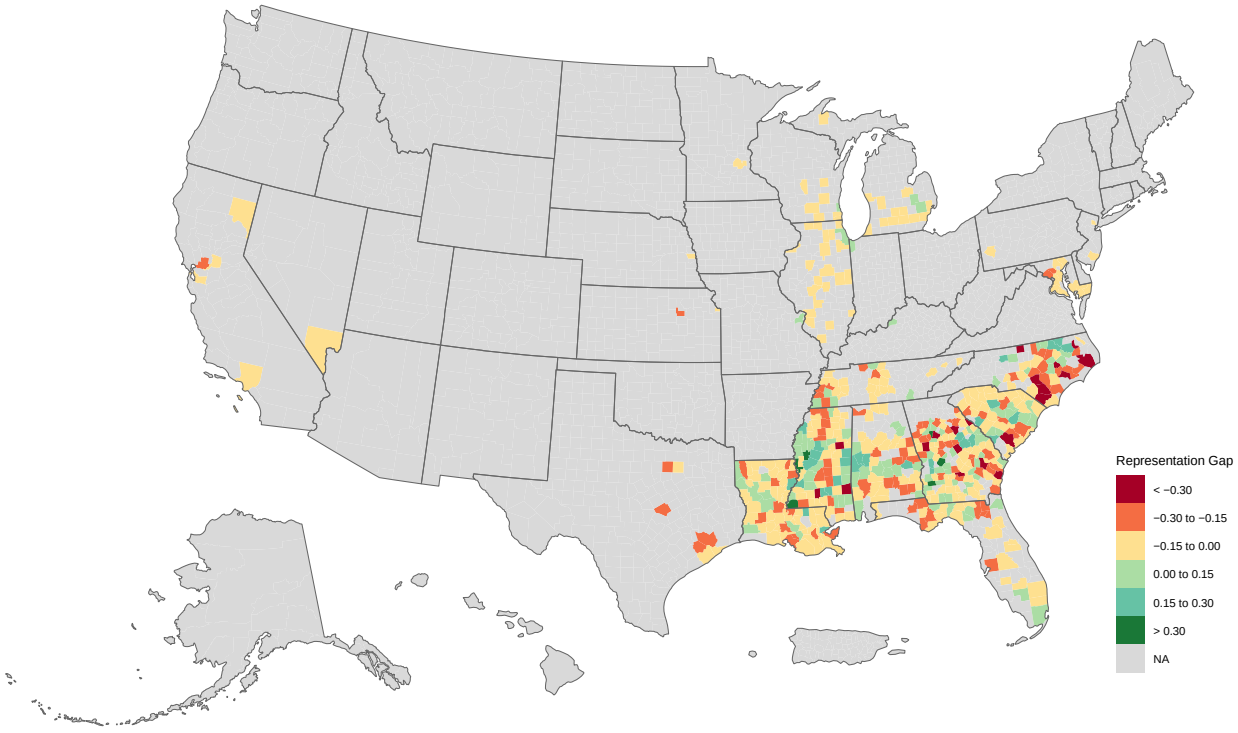


Figure S1: **County Commissions – Expected Representation Gap: Black.**

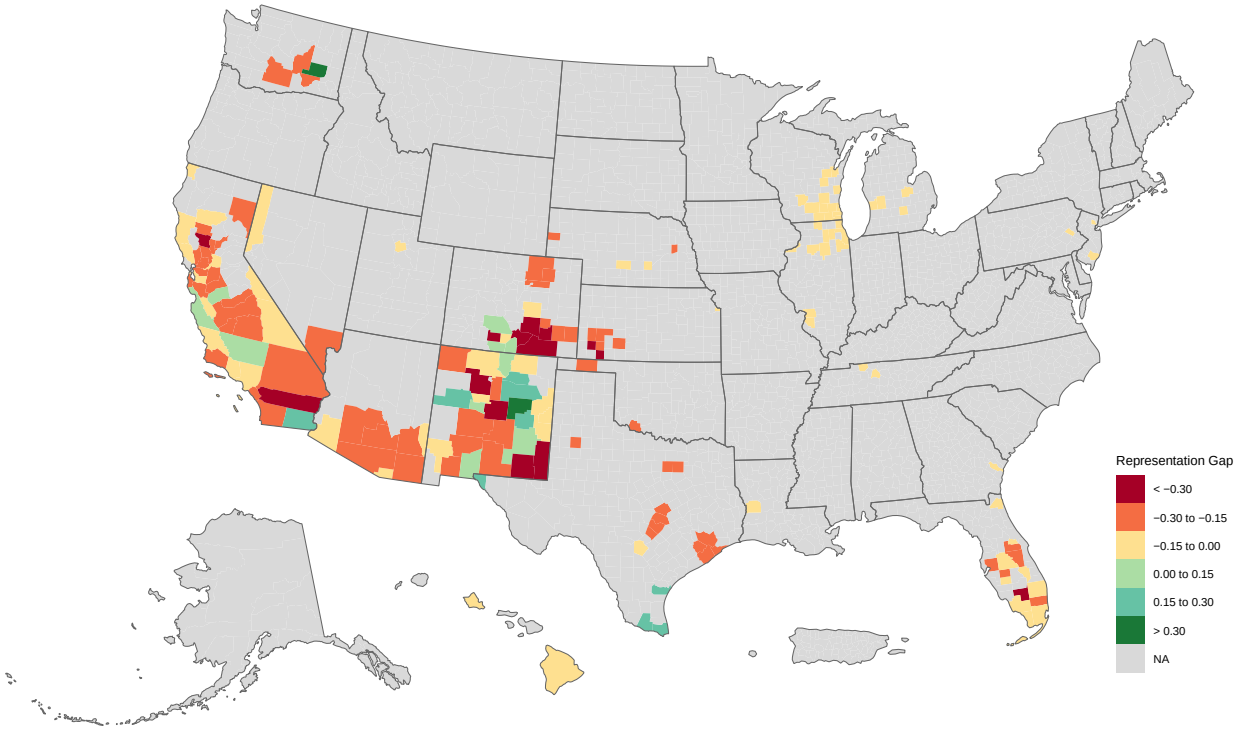


Figure S2: **County Commissions – Expected Representation Gap: Hispanic.**

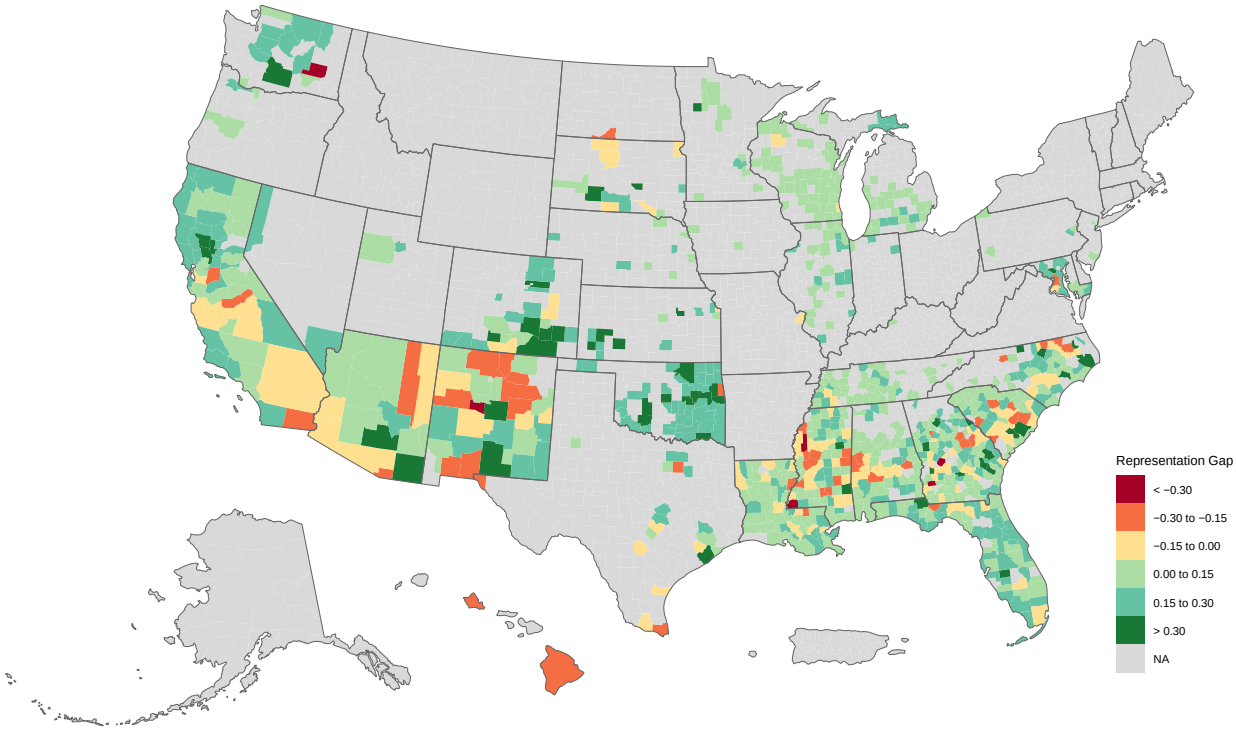


Figure S3: **County Commissions – Expected Representation Gap: White.**

Figures S4–S6. Notes: The Expected Representation Gap is the share of districts in which the indicated racial or ethnic group constitutes a majority of the citizen voting-age population (CVAP), minus that group's share of jurisdiction-wide CVAP. Positive values indicate expected overrepresentation and negative values indicate expected underrepresentation. For Black and Hispanic voters, the sample is restricted to jurisdictions in which the group's jurisdiction-wide CVAP share is large enough to constitute a majority in at least one equal-population district. For White voters, the analogous restriction requires the combined non-White CVAP share to be large enough to constitute a majority in at least one district. Each point represents a city, and point colors correspond to the ranges shown in the legend. Only cities included in the relevant group-specific sample are displayed.

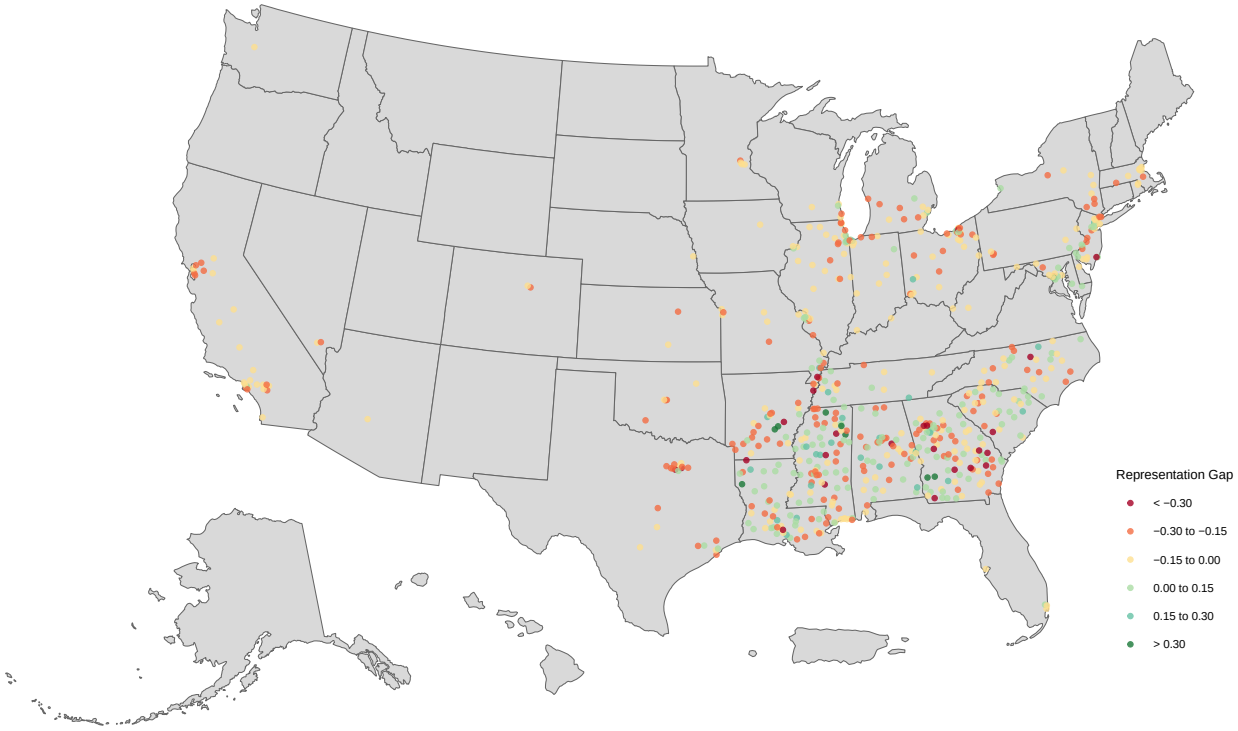


Figure S4: **City Councils – Expected Representation Gap: Black.**

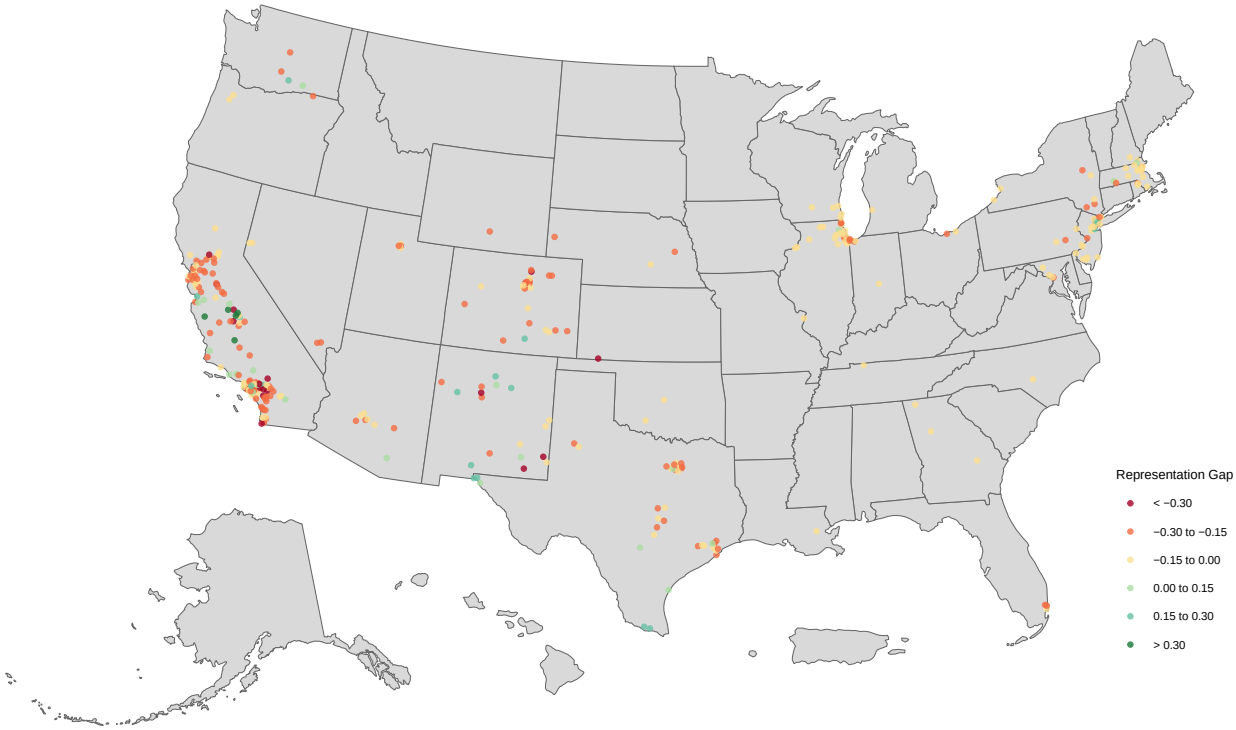


Figure S5: **City Councils – Expected Representation Gap: Hispanic.**

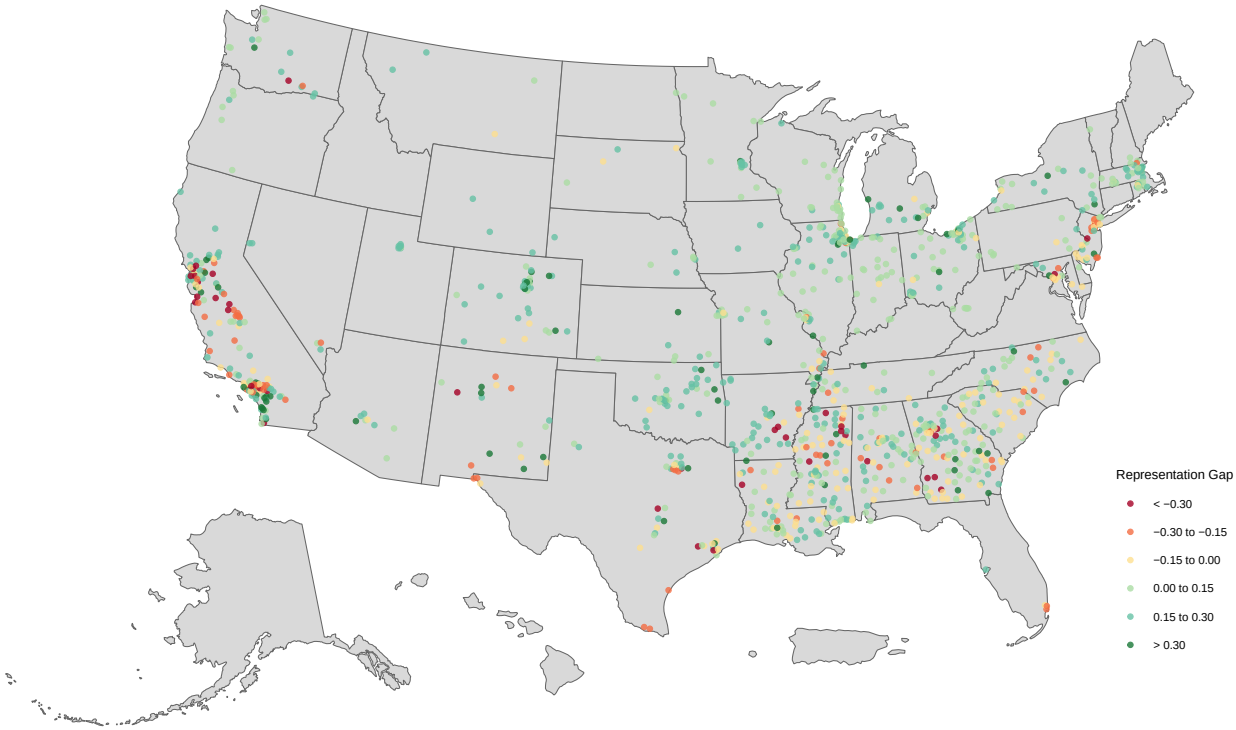


Figure S6: **City Councils – Expected Representation Gap: White.**

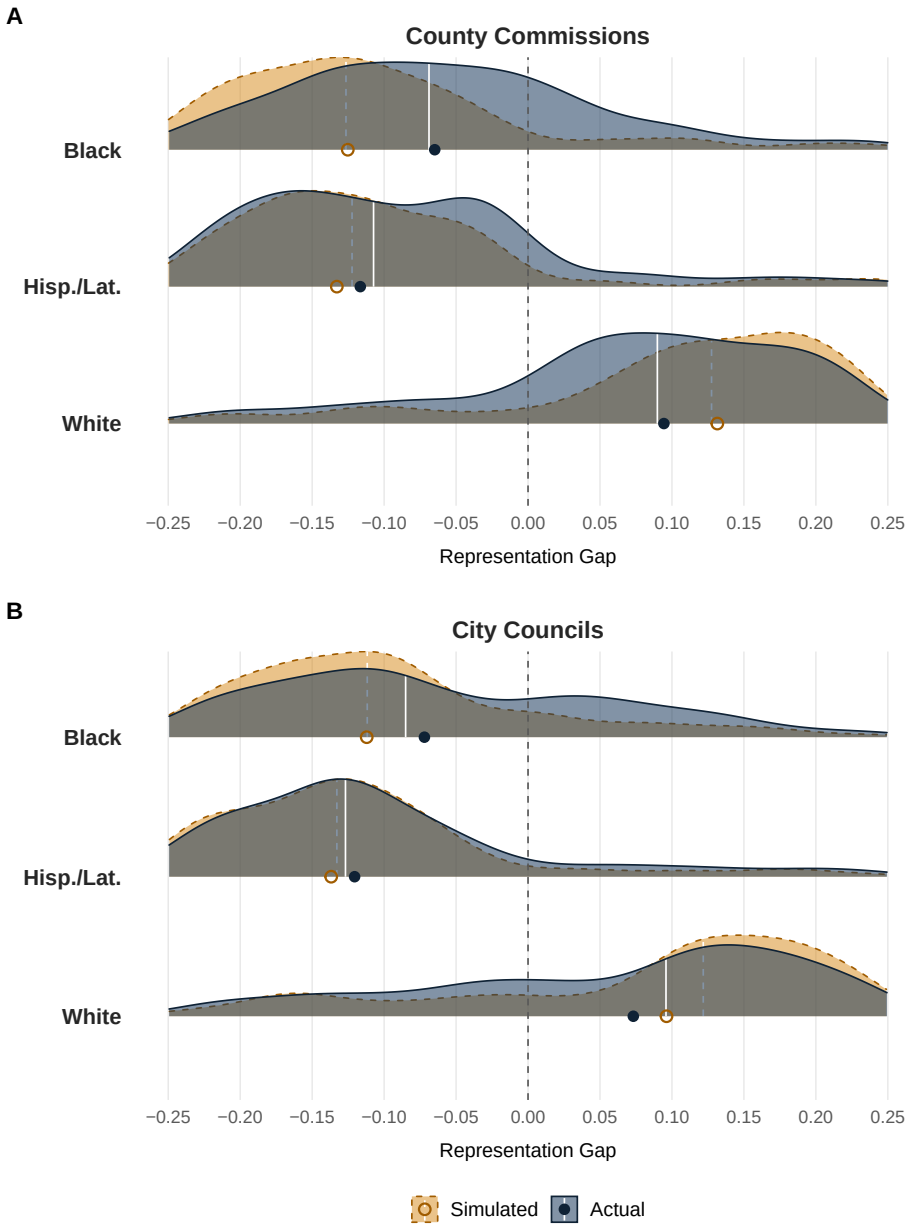


Figure S7: **Reproducing Fig 3, split by City Council and County Commission.** Each plot is the distribution of expected representation gap (ERG) and simulated ERG for the noted group. Dots indicate means; solid vertical lines indicate medians.

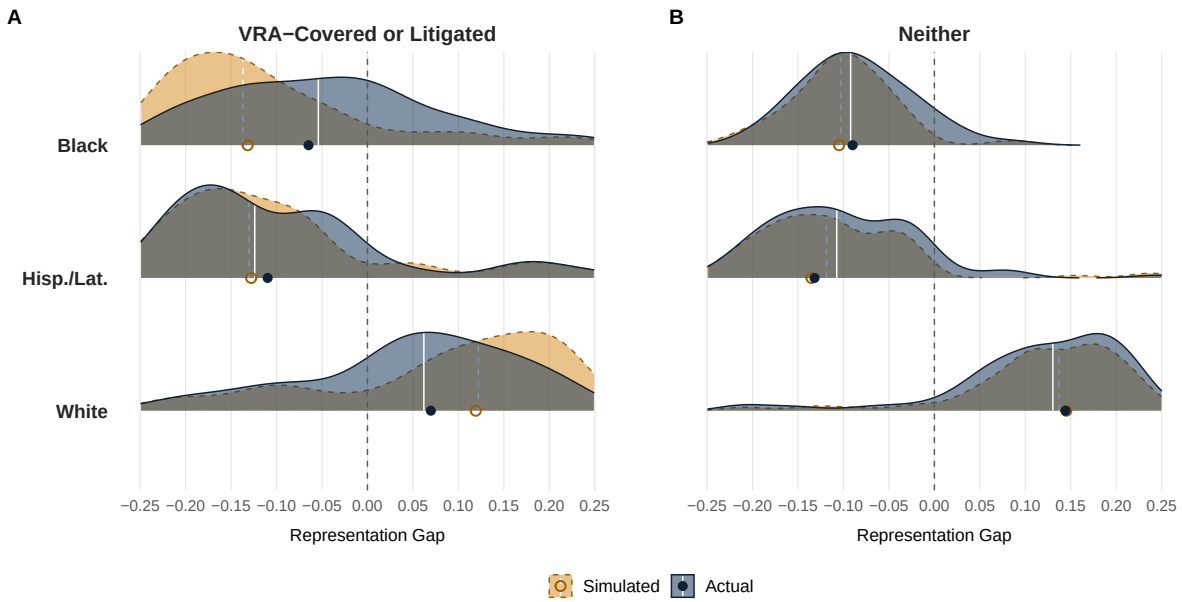


Figure S8: **Reproducing Fig 4, County Commissions only.** Each plot is the distribution of expected representation gap (ERG) and simulated ERG for the noted group. Dots indicate means; solid vertical lines indicate medians.

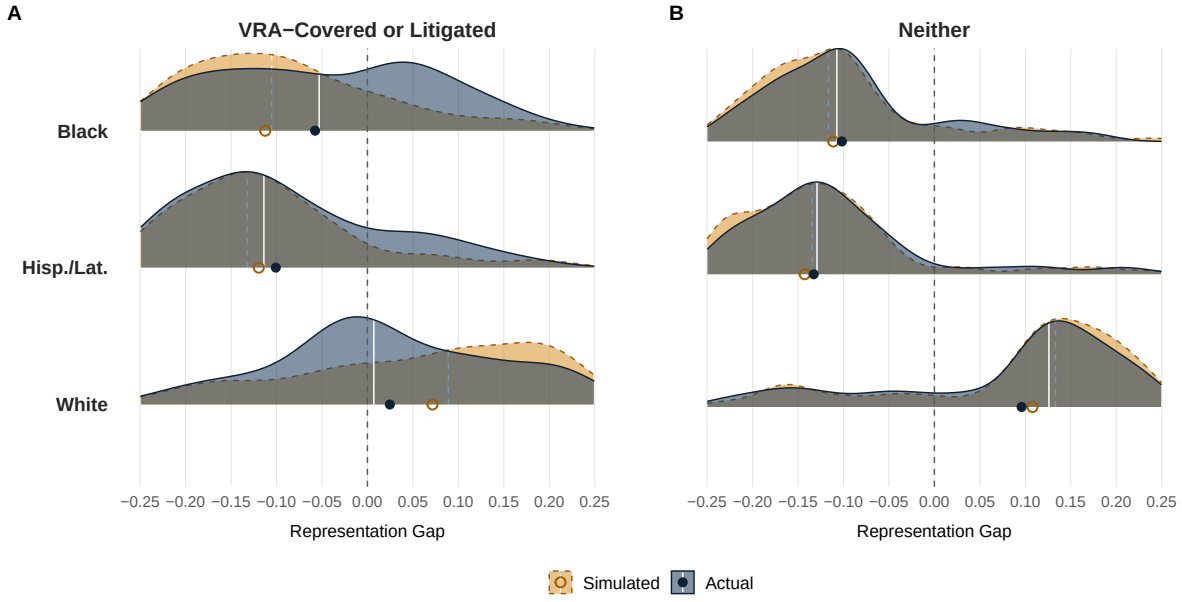


Figure S9: **Reproducing Fig 4, City Councils only.** Each plot is the distribution of expected representation gap (ERG) and simulated ERG for the noted group. Dots indicate means; solid vertical lines indicate medians.

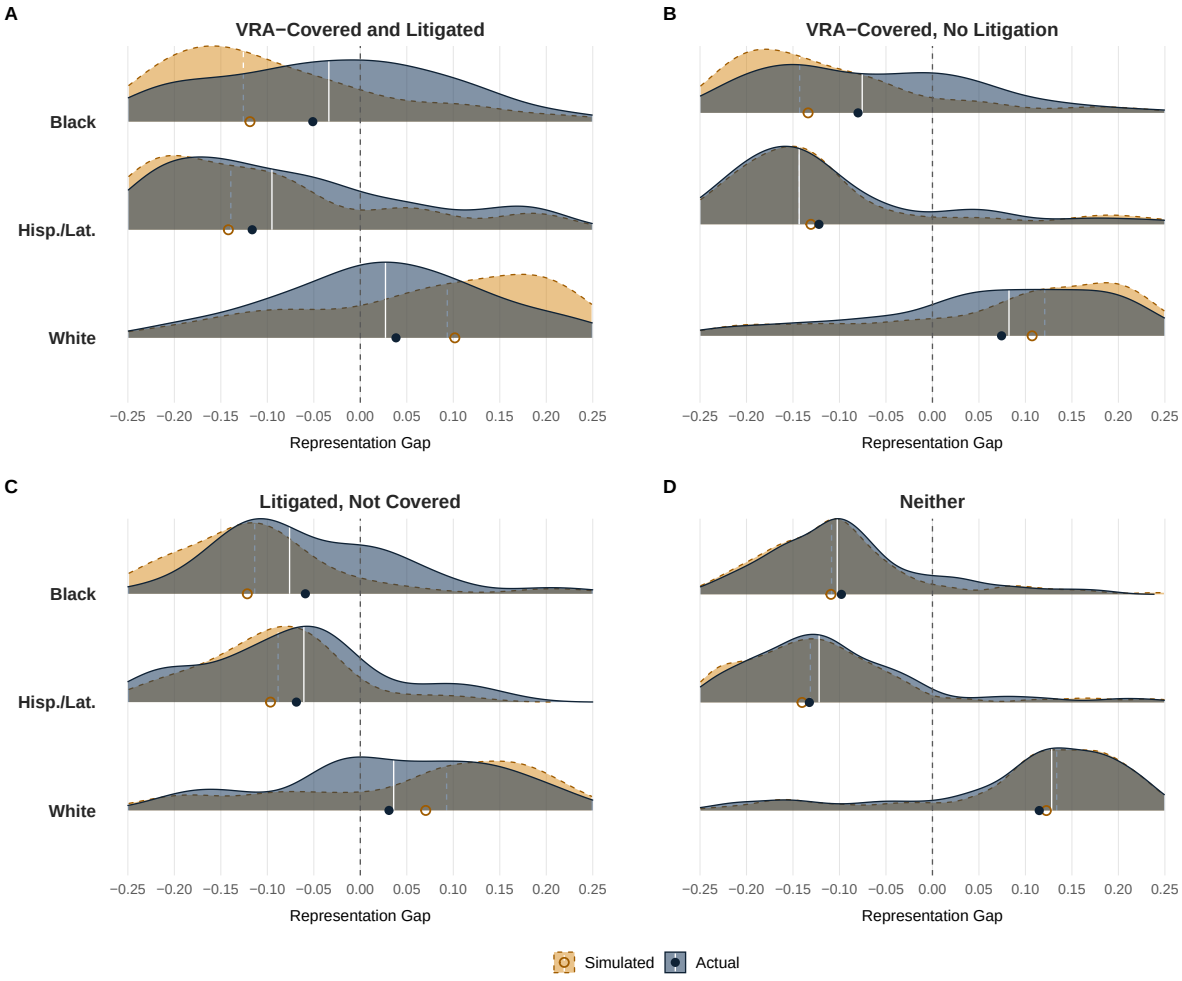


Figure S10: **Separating the two forms of Federal oversight.** Reproducing Fig 4, but splitting the combined oversight category into its parts: jurisdictions both covered by VRA preclearance and subject to pre-2011 districting litigation; covered but not litigated; litigated but not covered; and neither. Pooling city councils and county commissions. The two forms of oversight overlap heavily – of 539 litigated jurisdictions, 447 were also covered – so the "litigated, not covered" panel has a small number of observations (55 Black, 38 Hisp./Lat., 71 White). Dots indicate means; solid vertical lines indicate medians.

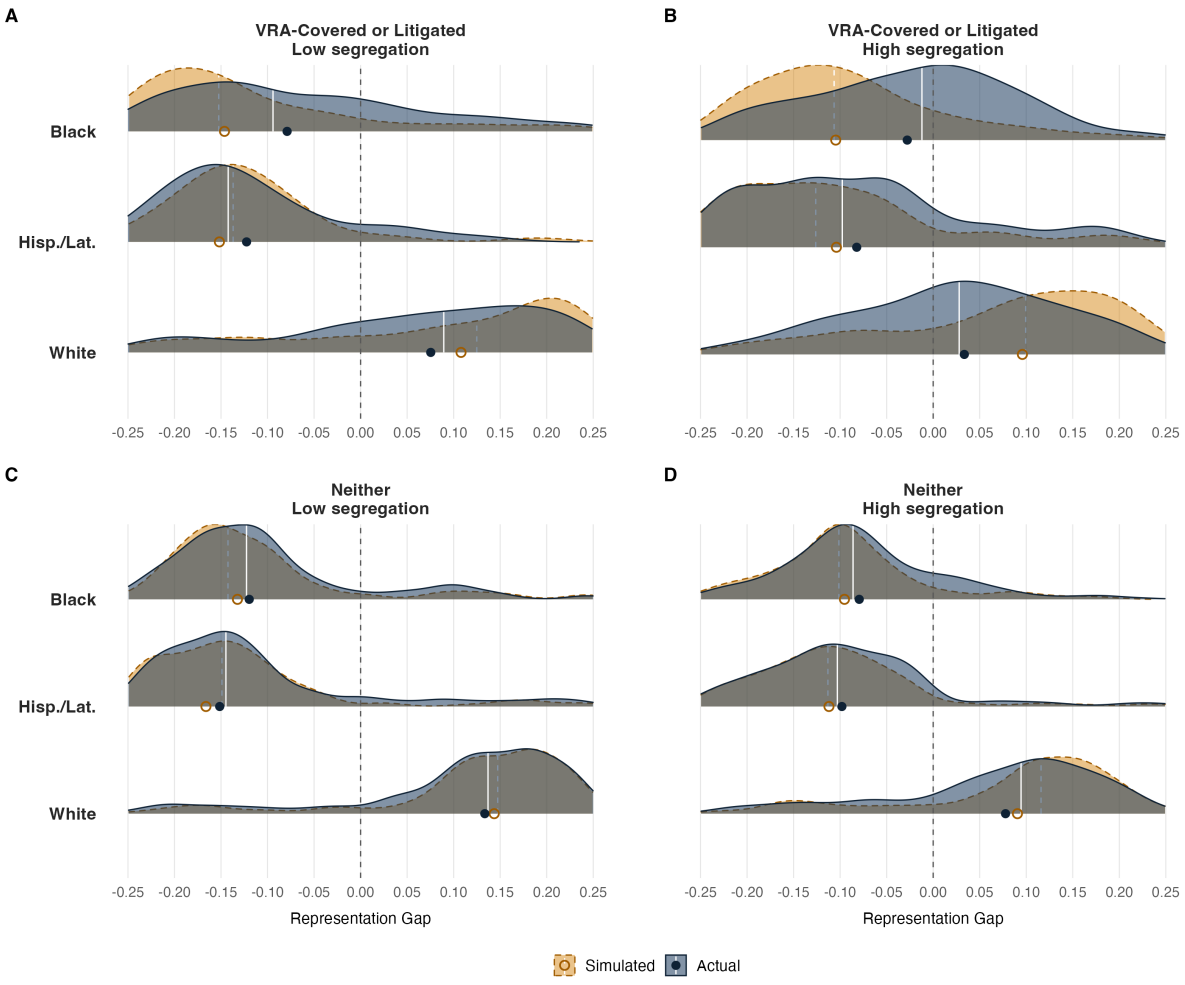


Figure S11: **Federal Oversight and Representation Gaps Across Levels of Segregation.** Reproducing Fig 4, but splitting jurisdictions into those above median (Panels B and D) and below median (Panels A and C) on a segregation index. Specifically, we construct and split on Black v. Non-Black Dissimilarity Index, Hispanic v. Non-Hispanic Dissimilarity Index, and White v. Non-white Dissimilarity Index. "VRA-Covered or Litigated" (Panels A and B) are defined as in Fig 4.

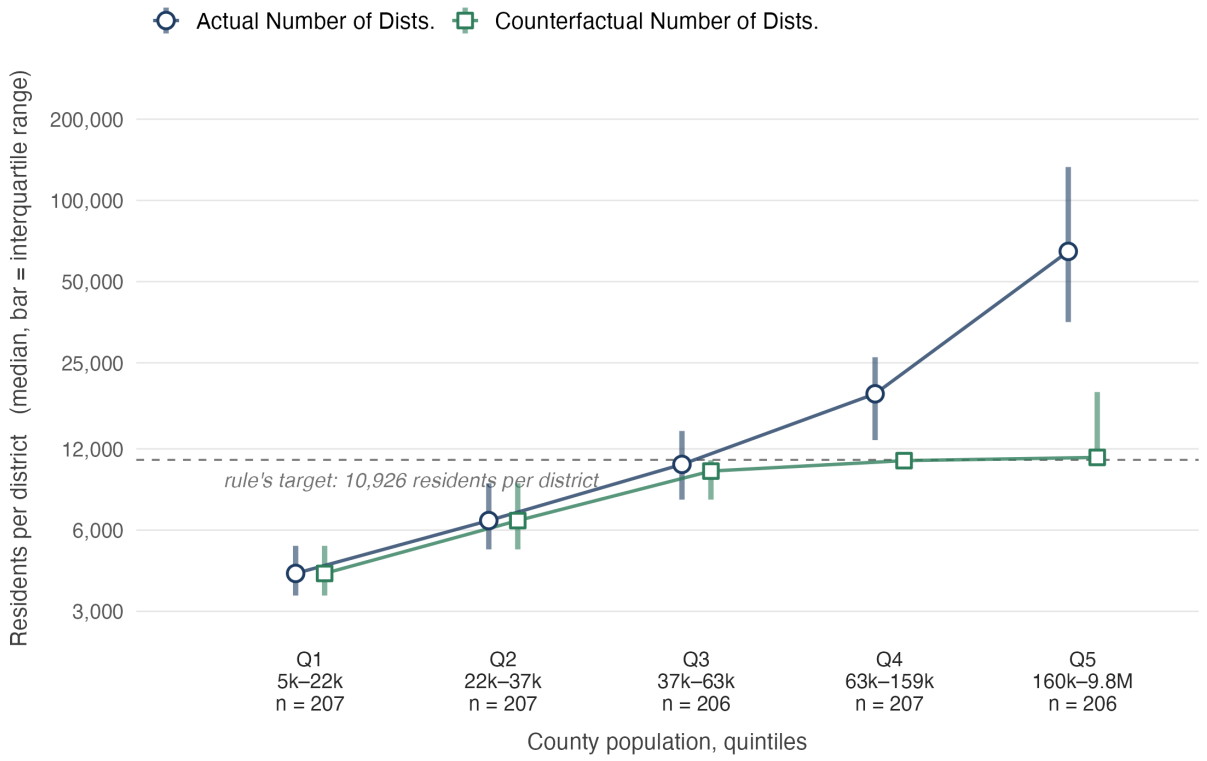


Figure S12: **Comparing the population-to-district ratio with actual numbers of districts vs. our counterfactual.** This plots includes county commissions only. Each point captures the median of population-to-district within a given population quintile. Blue circles are based on the actual number of districts; notably, district size grows with county population because many large counties use the same number of districts as smaller counties. The green squares capture the same figure, applying a counterfactual number of districts to each county commission so that the sample-wide median is never exceeded.

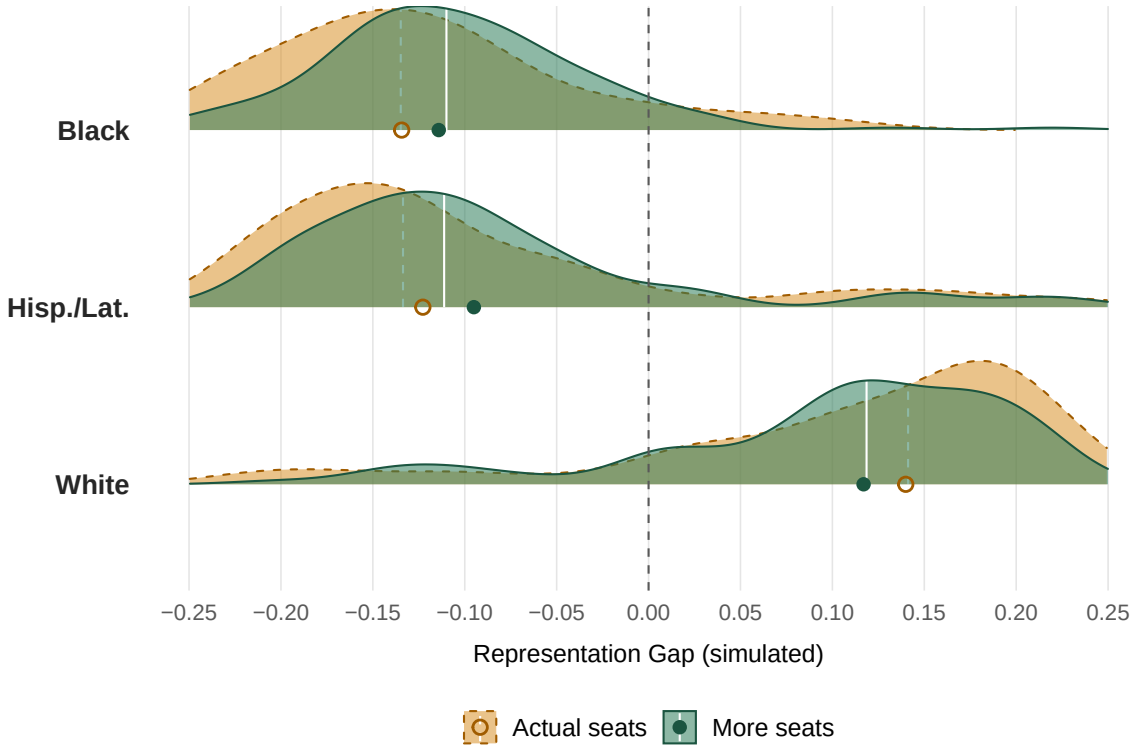


Figure S13: **Adding more districts impacts the Expected Representation Gap in simulated maps.** Each plot is the distribution of simulated expected representation gap (ERG) with the actual number of districts and simulated ERG with the counterfactual number of districts. Dots indicate means; solid vertical lines indicate medians.

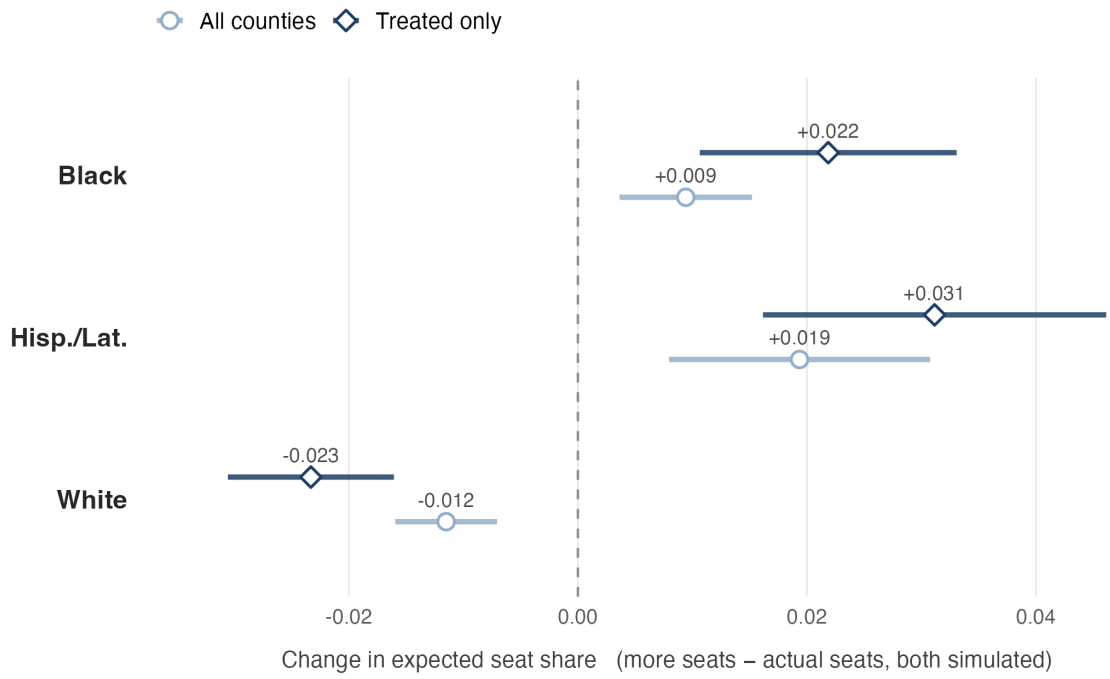


Figure S14: **Adding more districts impacts the Expected Representation Gap in simulated maps.** Each point is the difference between a group's Expected Representation Gap under simulated maps with the counterfactual (higher) number of districts vs. the simulated maps with the actual number of districts. The sample consists of county commissions only. The "treated only" points are those counties where the counterfactual number of districts is different than the actual. The plot includes 95% confidence intervals.

Table S1: **Expected Representation Gap is related to the realized composition of elected officials.** Each column regresses the share of seats won by a racial or ethnic group from 2012–2021 on that group's Expected Representation Gap. The unit of observation is a jurisdiction, pooling city councils and county commissions, with winners summed across all elections in the period. Samples are restricted to jurisdictions where representation for the group in question is possible, as defined in the text. All columns include body (city vs county) fixed effects; standard errors are clustered by state.

	(1)	(2)	(3)
VARIABLES	White Seat Share	Black Seat Share	Hisp./Lat. Seat Share
Exp. Rep. Gap: White	0.880***		
	(0.047)		
Exp. Rep. Gap: Black		0.762***	
		(0.123)	
Exp. Rep. Gap: Hisp./Lat.			0.498***
			(0.138)
Observations	527	270	278
R-squared	0.447	0.186	0.150

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table S2: Actual vs. simulated expected representation gap, by federal oversight exposure

			Mean ERG			
Group	Panel	*N*	Actual	Simulated	Difference	*p*-value
Black	VRA-Covered or Litigated	464	−0.0620	−0.1242	0.0622***	0.000
	Neither	281	−0.0979	−0.1092	0.0112**	0.026
	VRA/Lit. - Neither	745	–	–	0.0510***	0.000
Hisp./Lat.	VRA-Covered or Litigated	124	−0.1044	−0.1229	0.0185***	0.008
	Neither	334	−0.1324	−0.1403	0.0079*	0.069
	VRA/Lit. - Neither	458	–	–	0.0106	0.106
White	VRA-Covered or Litigated	568	0.0516	0.0999	−0.0484***	0.000
	Neither	791	0.1149	0.1225	−0.0076***	0.006
	VRA/Lit. - Neither	1359	–	–	−0.0407***	0.000

Difference = mean(actual) − mean(simulated); standard errors clustered by state (not shown). The italicized row per group (Cov./Lit. − Neither) tests whether the Covered/Litigated difference above is itself different from the Neither difference above it: a regression of the actual-minus-simulated gap on a Covered-or-Litigated indicator, clustered by state. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.