MEASURING THE EFFECT OF VOTE-BY-MAIL ELECTIONS ON MINORITY CIVIC PARTICIPATION

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Yogi Patel, B.S.

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ON MINORITY CIVIC PARTICIPATION

Yogi Patel, B.S.

Thesis Advisor: Jeffrey Thompson, Ph.D.

ABSTRACT

In 2013, Colorado became the third state to begin conducting all statewide elections via Vote-by-Mail (VBM). One of the goals of VBM policy is to increase civic participation by lowering the costs associated with voting in an election. There is potential for improving the historically dismal turnout rates in elections in the US, specifically for racial and ethnic minority voters. Using official voter registration data and voting history records, I calculate the Bayesian-Improved Surname Geocoding (BISG) race proxy distribution for registered voters in Colorado and construct a novel panel dataset tracking voters' participation in statewide elections from 2000 to 2014. I then identify the impact VBM elections have on minority turnout using a logistic panel regression. My results indicate a modest increase in the likelihood a minority voter will participate in an election given that it is a VBM election.

I'd like to thank my parents, Navnit and Smita Patel,
for a lifetime of self-sacrifice and support

and

Jeff Thompson for his patience, encouragement, and guidance
throughout the duration of this research.

Many thanks,
Yogi Patel

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INTRODUCTION

Civic participation is the backbone of democracy. In the United States, citizens voice their opinion by electing officials to represent them in government. Elections with high voter turnout rates better serve as a catalyst for change by disrupting the status quo, challenging incumbents, and providing electoral volatility. Even so, voter turnout rates remain rather dismal in the United States. Since 1980, the largest voter turnout rate for a presidential election was in 2008, where 57% of all eligible voters participated in the election (DeSilver, 2015). In fact, the average level of turnout for all eligible citizens between 2000-2008 was just 51.2% (DeSilver, 2015).

Many efforts have been made to address these low rates of civic participation in the US. Voter ID, same-day registration, and absentee ballot policies have been implemented in many forms to increase the size of the electorate at the local, state, and national level. Three states in particular – Oregon, Washington, and Colorado – have made significant efforts to reduce the everyday citizen's costs associated with civic participation by implementing Vote-by-mail (VBM) policies for most local, state, and national elections.

Although many studies have attempted to quantify the effect VBM policies have on turnout, most have not been generalizable. This paper contributes to the relevant literature by examining the most recent state to switch to VBM, Colorado, and how the state's implementation of permanent absentee voting effects the civic participation levels of minority voters. Previous literature on VBM has failed to offer insights on how VBM implementation changes the voting behavior of racial and ethnic minorities, groups who are traditionally disproportionately underrepresented in the electorate, as detailed information on voter turnout and race is largely

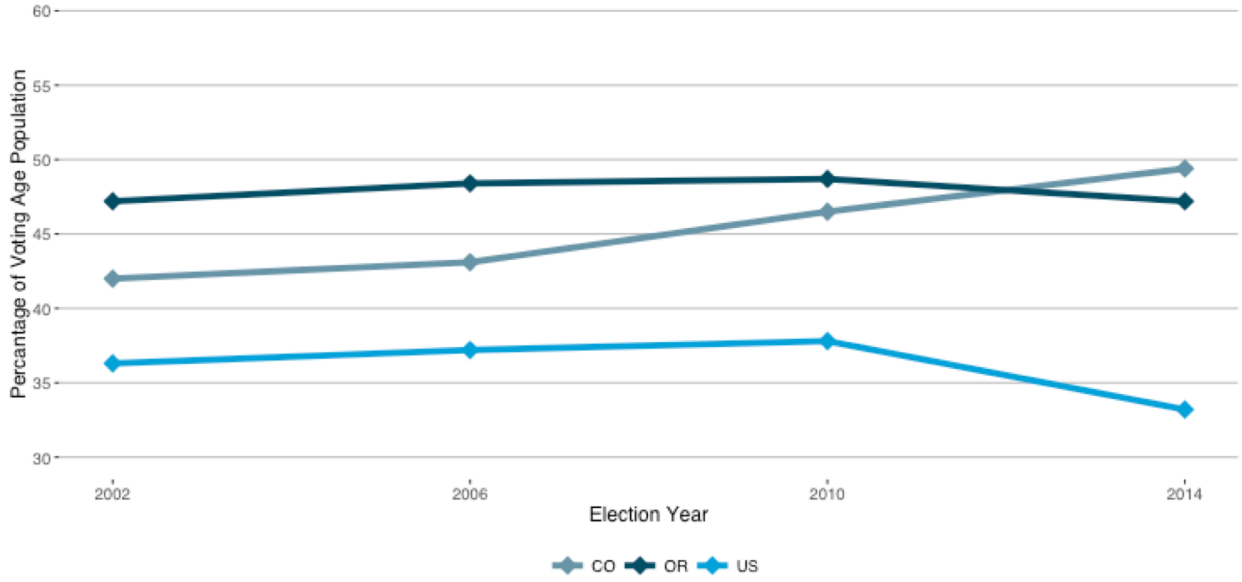
unavailable. Since Colorado has only recently implemented VBM, little analysis has been conducted on the effects of the policy change in the state.

Using individual voter registration and participation data collected from the Colorado Secretary of State, I will estimate the change in probability of a minority voter participating in a given election after VBM is implemented. Specifically, I use the Bayesian Improved Surname Geocoding (BISG) racial proxy methodology to estimate each registered voter's race based on their voter registration information and will use that predicted race to estimate a logistic model predicting an individual's probability of voting given their race and voting method used – VBM or traditional poll voting.

BACKGROUND

In 2000, Oregon became the first state to implement VBM state-wide, though many counties within the state had been conducting elections by mail since the late 80's. In 2012, the state of Washington also began mailing ballots. Unlike Oregon, Washington only had one county that had implemented mandatory VBM before the state-wide policy change. Since the early 2000's many counties in Colorado have conducted their odd-year Coordinated elections via VBM. In 2013, the Colorado state Senate passed HB 13-1303 which implemented changes to the "Uniform Election Code of 1992", directing that all general, primary, odd-year, coordinated, presidential, special legislative, recall, and congressional vacancy elections be conducted by mail. Figure 1 compares the historic turnout rates for Midterm General elections for the US, Colorado, and

Figure 1. Historic Voter Turnout for Midterm Elections

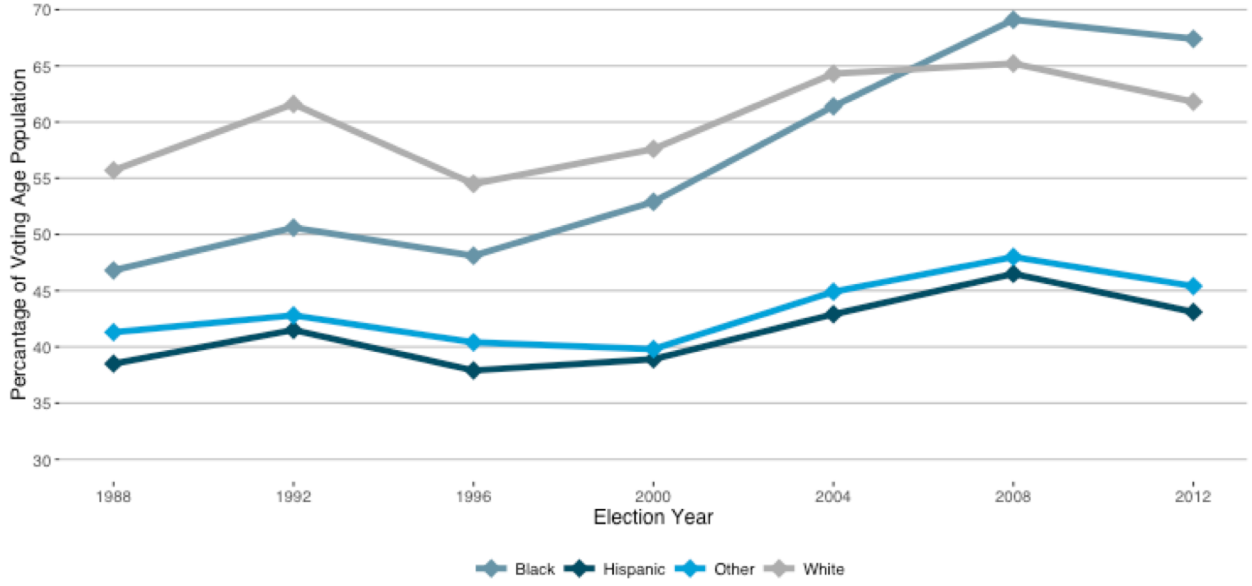


Note: Turnout is calculated as a percentage of total voting age population, including ineligibles.
Adapted from the United States Election Project, 2016. http://www.electproject.org.

Oregon. Both Colorado and Oregon have higher turnout rates than the US as a whole. While Oregon, which conducted all of the elections shown in Figure 1 via VBM, has a somewhat steady turnout rate, Colorado's turnout in Midterm elections increases over time. Ultimately, in 2014, the first year Colorado conducts their elections via VBM, the state surpasses Oregon's turnout rate.

National turnout statistics by race and ethnicity show that there is a large gap in representation for Hispanics and Asians in the electorate. Figure 2 shows the percentage of the voting age population to participate in Presidential elections since 1988, broken down by race and ethnicity. While Black voters were once underrepresented in the electorate, as compared to Whites, over time they closed the gap, and with the election of the first Black president in 2008, surpassed Whites in overall representation of their race in the electorate. Meanwhile, the relatively large gap between Whites and other racial minority groups, including Hispanics, remains the same over time.

Figure 2. Historic Voter Turnout for Presidential Elections



Note: Turnout is calculated as a percentage of total voting age population, including ineligibles.
Adapted from the United States Election Project, 2016. http://www.electproject.org.

LITERATURE REVIEW

In order to create effective policies that aim to increase civic participation it is important to understand how the choice is made whether or not to vote. The "calculus of voting" is a theory developed to help explain how any individual rationally chooses whether or not to vote, where voting consists of an investment in the future and the "expressive" components of voting, or the utility one gets from voting regardless of the outcome (Downs, 1957; Riker & Ordeshook, 1968). Though it is argued that voting on this basis is primarily an act of consumption (Fiorina, 1967), in general, voting is perceived as a low-cost, low-benefit activity where the decision to vote is made "at the margin" (Aldrich, 1993). The implications are that election reform can only have a significant impact on turnout if either the implicit cost of voting decreases or the expected benefit increases significantly. But in order to change the expected outcome of an election, participation

rates must first increase (Hansford & Gomez, 2010). This implies that in order to increase turnout, policy must aim to lower the costs associated with voting.

VBM policies aim to increase turnout by lessening the burden associated with going to the polls to vote. Most states in the US have adopted absentee ballot policies that allow voters to apply to have a ballot mailed to them, though these are typically reserved for individuals that meet a parrticular set of criteria. Some states have relaxed these eligibility requirements and now allow for permanent absentee voting for all voters. States like California, which adopted a form of these reforms prior to the 1996 presidential election, see a substantial proportion of the electorate opting for permanent absentee voting (Karp & Banducci, 2000). In 1996, 20% of California voters who participated in the presidential election submitted an absentee ballot (Karp & Banducci). In 2012, this number rose to 51% of all participating voters (California Secretary of State).

Though permanent absentee voting has become a popular option in states that have implemented the policy, voters still have to select into the program. On the other hand, Oregon experimented with a statewide, vote-only-by-mail special Senate election in 1996 and passed an initiative in 1998 that established permanent vote-only-by-mail (Southwell, 2007). Approximately 66% of Oregon's registered voters participated in the 1996 special election, and public opinion polls saw strong support of vote-only-by-mail elections, with 77% of respondents favoring all-mail over polling-place elections and 79% agreeing that VBM is more convenient than going to a polling place (Southwell & Burchett, 1997).

Since Oregon's passing of the VBM initiative in 1998, much research has been conducted to measure the impact that state-wide VBM has on turnout, and the results vary. There are two main finding: that significant effects in voter turnout happen in state and local elections, where

voters who already have a high level of civic participation in general elections cast ballots for low-stimulus local elections (Southwell 2009; Gronke & Miller, 2012), and that VBM does not significantly introduce new electors to the electorate, but mobilizes the infrequent voters who typically only voted in high-stimulus races at the polls (Karp & Banducci, 2000; Berinsky, Burns, & Traugott, 2001). Though Oregon did see a rise in average turnout levels from 56.5% in 1990-1998 to 63.3% in 2000-2008 (compared to 45.5% to 51.2% for the US as whole), the consensus is that this rise in turnout cannot be generalized since the effect could be due to Oregon's comparatively high rate of turnout even before implementing all-mail elections (Karp & Banducci, 2000; Southwell, 2007; Gronke & Miller, 2012).

While allowing for VBM in elections generally increases the turnout rate, the way the policy is implemented can cause different biases. Many opposed to the VBM option in elections claim that allowing voters to mail in their ballot will bias the electorate in the Democratic party's favor, but there is no evidence to support the claim that VBM causes any partisan advantage (Southwell & Burchett, 1997; Berinksy, Burns, & Traugott, 2001; Southwell, 2007; Hansford & Gomez, 2010; Bergman & Yates, 2011). In Oregon, a public opinion poll showed that 26% of VBM voters had another individual in the same room when they voted, but only 0.3% of all respondents claimed that the presence of this person pressured them to vote a certain way (Southwell & Burchett, 1997).

When comparing permanent absentee ballots to mandated VBM, evidence suggests mandated VBM will actually decrease turnout (Bergman & Yates, 2011). Though there are a large number of voters who, in states like California, choose permanent absentee voting, they can still go the polls to vote. In a state like Oregon, where mandatory VBM is implemented, voters do not

have this option. A study conducted on counties in northern California showed that when forced to switch from voting at the polls to VBM, the probability of any individual registrant voting decreased by 13.2% (Bergman & Yates, 2011). Colorado's implementation of VBM looks to correct this bias by mailing all eligible voters a ballot but allowing them to opt out of VBM in favor of voting at the polls.

Although evidence suggests that the overall impact that VBM policy has on voter turnout is modest, very little information exists about the effects of VBM specifically on minorities; a demographic which may benefit greatly from the reduction in costs that VBM offers. Historically, Asians and Hispanics, have a much lower turnout rate than Whites in elections. In 2012, the voter turnout rate for Asians and Hispanics was 47.3 and 48 percent, respectively, compared to a 64.1% for Whites (Taylor & Lopez, 2013). This comes out to 12.1 million Latinos who did not vote in the 2012 general election, up from 9.8 million in 2008 (Taylor & Lopez, 2013). While the 2003 Oregon Annual Social Indicators survey showed no statistically significant difference in preference of VBM to polling place between White and nonwhite Oregonians, the small number of respondents (N = 673), and the self-reporting nature of the survey do not provide concrete evidence on the effect VBM has on minority participation (Southwell, 2004).

Since elections data often lack reliable racial/ethnic information, it is difficult to study the disparities in turnout for minority groups. In other areas of research, proxy methods have been employed to estimate race information where none has been provided (Elliot et al. 2009; Baines & Courchane, 2014). The two main methods to estimate an individual's race/ethnicity indirectly involve using geocoding and surname analysis (Elliot et al. 2009). Geocoding links an individual's home address to the Decennial Census measure of racial and ethnic population composition for

the neighborhood at the block group, tract, or zip code level. Blacks are more segregated and concentrated in many neighborhoods around the country, making geocoding alone a fairly effective method to distinguish Black individuals from Whites (Fremont et al. 2005). Historically, Asians and Hispanics are far less segregated and tend to live in more diverse communities than Blacks (Massey & Denton, 1989; Logan ,2001), so geocoding alone cannot reliably distinguish these minorities from Whites. Surname analysis infers race/ethnicity from surnames that are distinctive to particular racial/ethnic groups using the US Census Bureau national tabulation of surnames, a list of 6 million surnames with self-reported race in the 2000 Census (Elliot et al. 2009). Since individuals of Hispanic ethnicity and Asian race tend to have distinct surnames from Blacks and Whites, this method performs particularly well for these minority groups. But using the surname list alone cannot accurately distinguish Blacks from non-Hispanic Whites (Elliot et al. 2009), who tend to have similar surnames.

In recent years, a few methods have been developed to use both address and surnames information generate a more robust proxy estimation, including the Bayesian Improved Surname Geocoding (BISG) method. Compared to previous hybrid proxy methodologies, BISG is 19% more efficient as well 41% and 108% more efficient than surname-only and geocoding-only methods, respectively (Elliot et al. 2009). Overall, BISG has a correlation of 0.76 with self-reported race, with the largest improvements for Blacks and Asians (Elliot et al. 2009). Though the BISG method does perform better overall, when using both threshold values and continuous probability measures, the method may overestimate the number of minorities in any given population (Baines & Courchane, 2014). In particular, the method tends to inflate the disparity between Blacks and non-Hispanic Whites (Baines & Courchane, 2014).

METHODS

Theoretical Considerations and Hypotheses

Many factors influence an individual's decision to participate in an election. A person's age, race, party affiliation, and gender can influence his or her decision to vote in any particular election. The overall voter turnout of an election is determined by factors such as election type, election day, the duration of the election, and voting method(s) used. These individual demographics and election-specific factors can determine the costs and benefits of individual participation in any given election. Specifically, an election's voting method determines the individual's costs associated with participating in the election. This study attempts to capture the difference in costs associated with voting between VBM and traditional polling place elections by estimating the effect VBM elections have on an individual's probability of voting. Furthermore, I attempt to estimate the effect separately for racial and ethnic minorities. In seeking to understand this effect, my analysis is rationalized into two main hypotheses.

Hypothesis I: In order for an individual to choose to participate in a given election, the benefits associated with voting must outweigh the costs. Conducting an election via VBM significantly reduces the costs associated with voting. Therefore, if an election is conducted via VBM, an individual will be more likely to vote.

Hypothesis II: Participating in a traditional poll election is a very costly activity for minority voters as compared to White voters who can better afford to show up to the polls. VBM elections offer more time and flexibility for minorities to complete and submit their ballots. Therefore, the increase in the likelihood of voting credited to VBM elections will be greater for minority individuals than White individuals.

The implications of these hypotheses are tremendously consequential. If the effect of VBM on turnout can be identified and these hypotheses verified, there is potential to not only increase civic participation but also change the composition of the electorate. As discussed in previous sections, Hispanic and Asian voters are vastly underrepresented in elections. VBM elections may offer an opportunity for policymakers to address this issue. If VBM does increase minority participation, in order to be a more inclusive democracy, states across the nation will need to reconsider the way they elect officials to public office. Changing the method in which elections are conducted can bring formerly silent voices into the democratic process and allow for a more representative government at all levels.

Empirical Modeling

I estimate a logistic panel regression to predict the probability an individual voter casts a vote in an election to measure the impact VBM elections have on voter turnout. The overall panel will be unbalanced, as voters will enter the panel when they are eligible to participate in an election and exit for any elections they are deemed ineligible. In general, I estimate the following model:

$$ln\left(\frac{Vote_{it}}{1-Vote_{it}}\right) = \alpha_i + \beta_1 VBM_{it} + \beta_2 Black_i + \beta_3 Hispanic_i + \beta_4 Asian_i + \beta_5 (Black_i * VBM_{it}) + \beta_6 (Hispanic_i * VBM_{it}) + \beta_7 (Asian_i * VBM_{it}) + \cdots + \varepsilon_{it} \quad (1)$$

$$Where \;\; i = Voter, \; t = Election$$

The coefficients of interest are those associated with VBM and the Race*VBM interactions in Equation (1). Specifically, if Hypothesis I is correct, we should expect to see a positive, significant β_1 indicating that VBM elections increase likelihood of voting. In order for Hypothesis

II to be correct, β_5, β_6, and β_7 must be positive and significant. If the coefficients on the interaction terms are positive, VBM elections increase the likelihood of minority voters participating in an election more than they do for White voters and ultimately, increase minority civic participation.

As previously mentioned, various individual and election specific factors influence one's likelihood of participation. To control for individual-specific factors, I estimate both a fixed effects model and a random effects model with time-invariant controls. These controls include an individual's political party affiliation and gender. I also control for the individual's age at the time of the election. I include indicators for the type of election and ultimately estimate separate models for different election types.

Data Description

This study utilizes data from three sources: The Colorado Secretary of State's voter registration and voting history databases, the US Census Bureau's Demographic Aspects of Surnames list, and the 2010 Decennial Census. The voter registration data include over 3.6 million voters registered in Colorado in 2014 along with their first and last names, address, phone number, party affiliation, birth year, voter registration date, and registration status. Along with the registration data for each voter, the Colorado Secretary of State provided the complete ballot history for each voter, comprising of approximately 32.6 million individual casted votes. The Demographic Aspects of Surnames from the US Census Bureau list contains racial and ethnic breakdown of the 151,671 surnames that were reported in the 2000 Decennial Census by at least 100 individuals. US Census Block Group level racial and ethnic breakdowns were taken from 2010 Decennial Census.

Panel Creation

In order to conduct the analysis, I first created a novel unbalanced panel dataset that comprises of each individual voter's complete voting history starting at the 2000 General election, including the times each voter did and did not vote in an eligible election using information from the three primary data sources. This involved estimating each individual's race, determining eligible voters for each election, and indicating which elections were conducted via VBM.

The Bayesian-Improved Surname Geocoding (BISG) Racial Proxy Model (2)

$$Q(i|j,k) = \frac{p(i|j) \times r(k|i)}{u(1,j,k) + u(2,j,k) + u(3,j,k) + u(4,j,k) + u(5,j,k) + u(6,j,k)}$$

$$Where \;\; u(i,j,k) = p(i|j) \times r(k|i)$$

Where i = race, j = surname, k = location

Where race = {White, Black, Hispanic, Asian/Pacific Islander, American Indian/Alaskan Native, Multiracial}

Equation (2) shows the model used to estimate the probability an individual voter is a given race[1] using the BISG proxy methodology. To calculate the BISG race distributions, each voter was matched to the Demographic Aspects of Surnames list to attach racial breakdowns based on the voter's surname. The address information provided in the voter registration data was then geocoded to determine which Census block group the individual lived in and racial breakdowns based on the 2010 Decennial Census were also attached. These racial breakdowns were then used in Equation (2) to calculate the BISG probability for each race. Collectively, the separate race

[1] For the purposes of this study Hispanic is considered a separate race. White, Black, Asian/Pacific Islander, American Indian/Alaskan Native, and Multiracial refer to individuals who are estimated as non-Hispanic. Hispanic refers to individuals of all races who are approximated to have Hispanic ethnicity.

probabilities sum to 1. Voters whose surname was not on the Surnames list or whose address could not be geocoded were dropped from the analysis.[2]

To create the panel, individual eligibility was determined for each election. In order to be eligible for an election, the voter needed to be over the age of 18 and have been registered to vote prior to the election date. Age was calculated by taking the difference between the election year and the voter's birth year. For each election, votes were summarized by county to determine if any counties did not report votes in the election. If this was the case, all individuals registered in the county were excluded from the panel for that particular election. For primary elections, only registered Republicans and Democrats were kept eligible. Once I obtained the subset of voters who were deemed eligible, they were matched to voting records for that election. Voters who did not match to any records for the election were considered nonvoters. For coordinated elections, the votes were then summarized by county and method used to determine if the county conducted the election via VBM. After the initial panel of all coordinated, primary, and general elections between 2000 and 2014 was created, the records were scrutinized for accuracy. Votes for individuals calculated to be over 99 years old were dropped from the panel. For voters whose 2014 registration status indicated they had moved, all observations after their last recorded vote was removed from the panel. Finally, I asserted that each voter only matched to one observation per election.[3]

Descriptive Statistics

This study uses a 75% threshold value to determine a voter's race, meaning a voter must have a BISG probability greater than or equal to 0.75 in order to be considered to be a particular race. Voters whose racial probabilities are less than 0.75 for all races are not included in the

[2] For further discussion on calculating BISG race proxy probabilities, see Appendix A.
[3] For a definition of variables used in the analysis, see Appendix Table B1.

estimation as we cannot conclusively determine their race. Table 1 provides descriptive statistics for the 75% threshold BISG panel of voters. The panel is comprised of 2,958,787 voters, 32,272,022 observations, and 20 elections. The overall turnout rate is 51.7% and 53.5% of the elections are VBM elections. The majority of observations are from White voters, who make up 88.6% of the panel, followed by Hispanics who represent 9.83%. Native American and Multiracial voters were dropped from the panel due to low observation counts for both groups. Female voters account for 52.1% of the observations. Less than 1% of votes come from voters belonging to a party other than the two major parties while over a quarter come from independent voters.

Table 1. Descriptive Statistics for 75% Threshold BISG Panel for All Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.517	0.500	0	1
Vote-by-Mail (VBM)	0.535	0.499	0	1
Race Characteristics				
White	0.886	0.318	0	1
White*VBM	0.473	0.499	0	1
Black	0.00659	0.0809	0	1
Black*VBM	0.00355	0.0595	0	1
Asian/Pacific Islander	0.00899	0.0944	0	1
Asian*VBM	0.00517	0.0717	0	1
Hispanic	0.0983	0.298	0	1
Hispanic*VBM	0.0532	0.224	0	1
Voter Demographic Characteristics				
Democrat	0.341	0.474	0	1
Republican	0.396	0.489	0	1
Independent	0.255	0.436	0	1
Other Party	0.00835	0.0910	0	1
Female	0.521	0.500	0	1
Age	47.62	16.19	18	99
Election Characteristics				
General	0.439	0.496	0	1
Coordinated	0.358	0.479	0	1
Primary	0.203	0.402	0	1
Panel Characteristics	**N**			
Voters	2,958,787			
Observations	32,272,022			
Elections	20			

Notes: Percentages for categorical variables may not sum to one due to rounding.

REGRESSION RESULTS

For initial exploration, I estimate a logistic panel regression to measure the general relationship between VBM elections and the probability of voter participation. The panel estimation results for voter participation in all elections using 75% threshold BISG race proxies are presented in Table 2. Model 1 estimates a random effects model and Model 2 estimates a fixed effects model. The results obtained are statistically significant at the 1% level. As expected, we see that overall, minority voters are less likely to participate in elections than White voters. Specifically from Model 1, for poll place elections, compared to White voters, Hispanics are only 0.423 times as likely to participate and Asians are only 0.435 times as likely. We see that belonging to a political party increases the likelihood one participates in an election. Compared to Independent voters, Democrats are 0.933 times more likely and Republicans are 1.356 times more likely to participate in an election. The type of election also significantly predicts an individual's probability of participating in an election. All else equal, an individual is only 0.103 and 0.0323 times as like participate in Coordinated and Primary elections, respectively, as compared to a General election. Both models indicate that VBM elections not only reduce the probability of voting, but also that this negative effect is exacerbated for minorities. Referencing Model 1, all else equal, Hispanics are only 0.550 times as likely to participate in an election conducted by VBM, while Asians are only 0.587 times as likely.

Though the initial results go against Hypothesis I and II, the model results indicate signs of misspecification. Specifically, the coefficients on the election type indicators, Coordinated and Primary, are relatively large. Only registered Republicans and Democrats are eligible to vote in

Table 2. Result of 75% Threshold BISG Probability Panel for All Elections

Dependent Variable:	(1)		(2)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.383***	0.682***	-0.306***	0.736***
	(0.00138)	(0.000940)	(0.00161)	(0.00118)
Race Variables				
Black	-0.917***	0.400***	-	-
	(0.0168)	(0.00671)		
Hispanic	-0.860***	0.423***	-	-
	(0.00469)	(0.00198)		
Asian/Pacific Islander	-0.833***	0.435***	-	-
	(0.0140)	(0.00608)		
Black * VBM	-0.0741***	0.929***	-0.0731***	0.929***
	(0.0136)	(0.0126)	(0.0140)	(0.0130)
Hispanic * VBM	-0.215***	0.807***	-0.200***	0.819***
	(0.00370)	(0.00299)	(0.00381)	(0.00312)
Asian * VBM	-0.151***	0.860***	-0.207***	0.813***
	(0.0117)	(0.0101)	(0.0124)	(0.0100)
Voter Demographic Variables				
Democrat	0.659***	1.933***	-	-
	(0.00324)	(0.00627)		
Republican	0.857***	2.356***	-	-
	(0.00316)	(0.00744)		
Other Party	0.449***	1.566***	-	-
	(0.0114)	(0.0179)		
Female	0.0992***	1.104***	-	-
	(0.00255)	(0.00281)		
Age	0.0630***	1.065***	0.0526***	1.054***
	(7.32e-05)	(7.79e-05)	(0.000166)	(0.000175)
Election Type Variables				
Coordinated	-2.272***	0.103***	-2.352***	0.0952***
	(0.00157)	(0.000161)	(0.00172)	(0.000164)
Primary	-3.433***	0.0323***	-3.459***	0.0314***
	(0.00180)	(5.81e-05)	(0.00184)	(5.78e-05)
Constant	-1.751***	0.174***	-	-
	(0.00386)	(0.000670)		
lnsig2u	1.246***	3.477***	-	-
	(0.00136)	(0.00474)		
Observations	32,272,022		27,821,293	
Number of Voters	2,958,787		2,208,608	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Primary elections and Coordinated elections have historically seen much lower participation rates. Furthermore, only one General election (the baseline election type category) and only one Primary election in the sample are VBM elections. Consequently, I cannot conclude that VBM elections discourage voter participation. To mitigate the effect that election type has on participation, I estimate separate models for Coordinated and General elections. It is important to note, the variation in models restricted to only Coordinated elections and only General elections will be quite different. Counties in Colorado adopted VBM policies for Coordinated elections at various times. So for any given Coordinated election, there will be some voters who are in VBM counties and some who are not. General elections, on the other hand, were all conducted via poll place statewide until the 2014 General election. So for General elections, all voters observe VBM only once, and they experience it at the same time. Since much of the sample is ineligible for Primary

Table 3. Result of 75% Threshold BISG Probability Panel for Coordinated Elections

Dependent Variable:	(3)		(4)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.151***	0.860***	-0.120***	0.887***
	(0.00275)	(0.00236)	(0.00299)	(0.00265)
Race Variables				
Black	-1.062***	0.346***	-	-
	(0.0374)	(0.0129)		
Hispanic	-1.202***	0.301***	-	-
	(0.00987)	(0.00297)		
Asian/Pacific Islander	-1.212***	0.298***	-	-
	(0.0364)	(0.0108)		
Black * VBM	-0.0499	0.951	0.0101	1.010
	(0.0357)	(0.0340)	(0.0380)	(0.0384)
Hispanic * VBM	0.124***	1.133***	0.252***	1.287***
	(0.00929)	(0.0105)	(0.00984)	(0.0127)
Asian * VBM	0.257***	1.293***	0.207***	1.230***
	(0.0354)	(0.0457)	(0.0374)	(0.0460)
Observations	11,556,980		6,213,751	
Number of Voters	2,712,716		1,095,279	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

elections, and because there is only one VBM Primary election in the sample, Primary elections are not included in any further analyses.

Table 3 presents the panel results of the 75% threshold BISG race proxies for Coordinated elections in Colorado.[4] The dependent variable for both models 3 and 4 is the dichotomous variable indicating whether or not an individual will participate in a given election. Both models 3 and 4 are statistically significant at the 1% level. After restricting the model to only Coordinated elections, VBM elections still show signs of less participation by White voters, but show positive outcomes for Hispanic and Asian voters. Specifically referencing Model 3, all else equal, White voters are only 0.86 times as likely to participate in a Coordinated election conducted by VBM compared to traditional poll-place elections. All else equal, Hispanics are 0.974 times as likely to participate in a Coordinated election conducted by VBM, compared to one that isn't VBM. On the other hand, all else equal, Asian voters are 0.112 times more likely to participate in VBM Coordinated elections. The fixed effects model, Model 4, also shows that both Hispanic and Asian voters are more likely to vote in a VBM Coordinated election than White voters. Specifically, White voters are only 0.887 times as likely to participate in a Coordinated election conducted by VBM, whereas Hispanic and Asian voters are 0.142 times more likely and 0.091 times more likely, respectively. Restricting the panel to only Coordinated elections, there is modest support for Hypothesis II, that minority voters benefit from VBM elections, but the results do not support Hypothesis I as VBM does not increase the probability of participation for all groups.

[4] For descriptive statistics for the 75% Threshold, Coordinated Election restricted panel, see Appendix Table B2. For full regression results, see Appendix Table B3.

Table 4. Result of 75% Threshold BISG Probability Panel for General Elections

Dependent Variable:	(5)		(6)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.233***	0.792***	0.196***	1.216***
	(0.00249)	(0.00197)	(0.00325)	(0.00396)
Race Variables				
Black	-1.308***	0.270***	-	-
	(0.0212)	(0.00573)		
Hispanic	-1.185***	0.306***	-	-
	(0.00601)	(0.00184)		
Asian/Pacific Islander	-1.206***	0.300***	-	-
	(0.0174)	(0.00522)		
Black * VBM	0.0255	1.026	0.0820***	1.085***
	(0.0236)	(0.0242)	(0.0243)	(0.0264)
Hispanic * VBM	-0.149***	0.862***	-0.105***	0.900***
	(0.00658)	(0.00567)	(0.00691)	(0.00622)
Asian * VBM	0.149***	1.160***	0.0774***	1.080***
	(0.0193)	(0.0224)	(0.0206)	(0.0223)
Election Type Variables				
Presidential	1.926***	6.865***	1.990***	7.318***
	(0.00222)	(0.0153)	(0.00231)	(0.0169)
Observations	14,174,259		6,732,961	
Number of Voters	2,958,029		1,235,476	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 shows panel results of the 75% threshold BISG race proxies for General elections in Colorado.[5] The dependent variable for both Models 5 and 6 is the dichotomous variable indicating whether or not an individual will participate in a given election and because participation in General elections fluctuates drastically during presidential elections, an additional control indicating whether or not the election was presidential is included in both models. Both models 5 and 6 are statistically significant at the 1% level. After restricting the sample to General elections, the results still do not fully show support for Hypothesis I, that VBM will increase the

[5] For descriptive statistics for the 75% Threshold, General Election restricted panel, see Appendix Table B4. For full regression results, see Appendix Table B5.

Table 5. Result of 75% Threshold BISG Probability Panel for Midterm Elections

Dependent Variable:	(7)		(8)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.306***	0.737***	-0.194***	0.824***
	(0.00255)	(0.00188)	(0.00414)	(0.00341)
Race Variables				
Black	-1.627***	0.196***	-	-
	(0.0257)	(0.00504)		
Hispanic	-1.338***	0.262***	-	-
	(0.00721)	(0.00189)		
Asian/Pacific Islander	-1.418***	0.242***	-	-
	(0.0214)	(0.00518)		
Black * VBM	0.379***	1.460***	0.427***	1.532***
	(0.0278)	(0.0406)	(0.0310)	(0.0474)
Hispanic * VBM	0.0642***	1.066***	0.0870***	1.091***
	(0.00761)	(0.00812)	(0.00826)	(0.00901)
Asian * VBM	0.388***	1.474***	0.314***	1.368***
	(0.0229)	(0.0338)	(0.0254)	(0.0347)
Observations	7,608,485		2,477,990	
Number of Voters	2,941,520		734,336	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

likelihood of participation. Though Model 5 estimates a negative coefficient for VBM elections, the fixed effects model does show that the probability of participating in an election increases overall under VBM. But, the results fail to support Hypothesis II as Hispanic voters' probability of participation decreases when the election is VBM in both models. But Models 5 and 6 both have relatively large coefficients for presidential elections, indicating that one is 5.865 times and 6.318 times more likely to participate in a General election if it is a presidential election, respectively. More importantly, the panel does include any presidential election conducted via VBM, as Colorado has yet to hold a presidential election using VBM. This presents a misspecification problem similar to those found in Models 1 and 2. Consequently, I further restrict the panel to include only midterm General elections.

Table 5 presents the panel results of the 75% threshold BISG race proxies for Midterm elections.[6] By removing presidential elections from the panel, the small positive effect shown in Model 6 is lost in Model 8. On the other hand, Both Model 7 and Model 8 support Hypothesis II by indicating that VBM elections will increase the probability that minorities will vote. Though it is important to note, the effect on Hispanic voters is negative. All else equal, a Hispanic voter is only 0.899 times as likely to vote in a Midterm VBM election compared to a Midterm election conducted via traditional polling places.

Model Specification

Table 6. Hausman Specification Test for 75% Threshold BISG Panel for Coordinated Elections

	(4) **Fixed Effects**	(3) **Random Effects**	**Difference**	**S.E.**
Vote-by-Mail (VBM)	-0.1197949	-0.1506025	0.0308076	0.0011742
Black * VBM	0.0100529	-0.049929	0.0599819	0.012937
Hispanic * VBM	0.2522533	0.1244791	0.1277742	0.0032499
Asian * VBM	0.2068123	0.2567825	-0.0499702	0.0122728
Age	0.0687213	0.073122	-0.0044008	0.0002281
Chi2(5) = 2552.27				
Prob > Chi2 = 0.0000				

Table 7. Hausman Specification Test for 75% Threshold BISG Panel for Midterm Elections

	(8) **Fixed Effects**	(7) **Random Effects**	**Difference**	**S.E.**
Vote-by-Mail (VBM)	-0.1941699	-0.305738	0.1115681	0.0032681
Black * VBM	0.426769	0.3785566	0.0482124	0.013673
Hispanic * VBM	0.0869847	0.0641606	0.028241	0.0031988
Asian * VBM	0.3136046	0.3876426	-0.074038	0.0109203
Age	0.0675545	0.0750104	-0.0074559	0.0004515
Chi2(5) = 5165.04				
Prob > Chi2 = 0.0000				

[6] For descriptive statistics for the 75% Threshold, Midterm Election restricted panel, see Appendix Table B6. For full regression results, see Appendix Table B7.

Tables 6 and 7 show the results of Hausman Specification tests performed for both the Coordinated election and Midterm election panels. The random effects models with time invariant controls are useful in that they show the effects that these controls have on an individual's probability of participating in an election. Specifically, the in each version of the panel, the random effects models indicate that in traditional polling place elections, being a minority is associated with a lower probability of civic participation. However, the results of the Hausman Specification indicate that the random effects coefficients are inconsistent. Thus, fixed effects estimators are preferred. Overall, the fixed effects estimations are in better agreement with Hypothesis I and II. For each variation of the panel estimated above, the fixed effects model shows a reduced negative impact on turnout for VBM elections. For minorities, the fixed effects models show a greater likelihood of voting for Hispanics while only slightly reducing the positive effects of VBM elections for Asian voters, as compared to the random effects models.

Robustness Checks

At a minimum, the estimates for race in each panel variation are correctly signed. To test the sensitivity of the race proxy and to address low observation counts for minorities with respect to that of Whites, I performed two robustness checks. First, I restricted the Coordinated and Midterm election panels further by setting the BISG probability threshold to 80%. Using this more conservative threshold value, the panels lose observations but as a whole gain a more rigorous estimation of race. Table 8 presents the results of the 80% threshold BISG race proxies for Coordinated Elections.[7] Model 9 is statistically significant at the 1% level and the estimates of interest in this model remain statistically significant at the 1% level. Interestingly, all the estimates

[7] For descriptive statistics for the 80% Threshold, Coordinated Election restricted panel, see Appendix Table B8.

Table 8. Result of 80% Threshold BISG Probability Panel for Coordinated Elections

Dependent Variable: Vote Casted	(9) **Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.120***	0.887***
	(0.00303)	(0.00269)
Race Variables		
Black * VBM	0.0664	1.069
	(0.0443)	(0.0474)
Hispanic * VBM	0.266***	1.305***
	(0.0101)	(0.0132)
Asian * VBM	0.221***	1.247***
	(0.0399)	(0.0497)
Voter Demographic Variables		
Age	0.0688***	1.071***
	(0.000252)	(0.000270)
Observations	6,043,658	
Number of Voters	1,064,082	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

are signed the same and the coefficient for VBM elections remains the same, but the coefficients for the interaction terms are actually larger in magnitude as compared to Model 4, the 75% threshold BISG race proxies for Coordinated Elections fixed effects model. All else equal, an individual White voter is 0.887 times as likely to participate in a Coordinated election conducted via VBM as compared to a traditional poll election. All else equal, Hispanic voters are 0.156 times more likely to participate in a Coordinated election conducted via VBM as compared to a traditional poll election. Model 4 estimated that all else equal, Hispanic voters are only 0.142 times more likely to participate in a Coordinated election conducted via VBM. Using the more conservative threshold for race probability actually better supports Hypothesis II for Coordinated elections.

Table 9. Result of 80% Threshold BISG Probability Panel for Midterm Elections

Dependent Variable: Vote Casted	(10) **Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.195***	0.823***
	(0.00421)	(0.00346)
Race Variables		
Black * VBM	0.441***	1.555***
	(0.0363)	(0.0565)
Hispanic * VBM	0.0877***	1.092***
	(0.00850)	(0.00928)
Asian * VBM	0.318***	1.375***
	(0.0268)	(0.0369)
Voter Demographic Variables		
Age	0.0676***	1.070***
	(0.000476)	(0.000510)
Observations	2,394,500	
Number of Voters	709,199	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9 presents the results of the 80% threshold BISG race proxies for Midterm Elections.[8] Model 10 is statistically significant at the 1% level. All of the estimates are signed the same and aside from the interaction term for Asian and VBM elections which increases in magnitude, the remaining coefficients of interest remain very similar to those estimated in Model 8, the 75% threshold BISG race proxies for Midterm Elections fixed effects model. Overall, both the Coordinated elections and Midterm elections panels perform just as well, if not better when restricted to a more conservative threshold for race estimation.

In the 75% threshold Coordinated election restricted panel, Asian voters make up less than 1% of total observations while Hispanic voters account for a little over 9% of total observations. These percentages are very similar in the 75% threshold Midterm election restricted panel as well. I estimate two final models to address low representation of separate minority categories by

[8] For descriptive statistics for the 80% Threshold, Midterm Election restricted panel, see Appendix Table B9.

Table 10. Result of 75% Threshold, Combined Race BISG Panel for Coordinated Elections

Dependent Variable:	(11)	
Vote Casted	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.120***	0.887***
	(0.00299)	(0.00265)
Minority * VBM	0.237***	1.267***
	(0.00932)	(0.0118)
Age	0.0687***	1.071***
	(0.000249)	(0.000266)
Observations	6,213,751	
Number of Voters	1,095,279	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11. Result of 75% Threshold, Combined Race BISG Panel for Midterm Elections

Dependent Variable:	(12)	
Vote Casted	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.194***	0.824***
	(0.00414)	(0.00341)
Minority * VBM	0.125***	1.133***
	(0.00773)	(0.00876)
Age	0.0675***	1.070***
	(0.000468)	(0.000501)
Observations	2,477,990	
Number of Voters	734,336	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

grouping Black, Asian, and Hispanic voters under an umbrella category representing minorities in the electorate. When grouped together, minorities account for just over 11% of observations in both the Coordinated election and Midterm election panels. Table 10 shows results of the 75% threshold, combined race Coordinated elections panel.[9] Model 11 is statistically significant at the 1% level and all of the coefficients of interest are statistically significant at the 1% level. All else equal, minorities are 0.124 times more likely to participate in a Coordinated election conducted

[9] For descriptive statistics for the 75% Threshold, Combined Race Coordinated Election restricted panel, see Appendix Table B10.

via VBM than an election conducted through traditional polling places. Table 11 presents the results of the 75% threshold, combined race Midterm elections panel.[10] Model 12 is statistically significant at the 1% level and all of the coefficients of interest are statistically significant at the 1% level. All else equal, minority voters are 0.934 times as likely to participate in a Midterm election conducted via VBM as compared to a Midterm election conducted through traditional polling places. When grouping minorities together, we see VBM elections have a modest, but positive impact on their probability of participating in Coordinated elections, but a slight deterring effect for Midterm elections conducted via VBM.

Overall, there is some support for the argument that VBM increases civic participation for minority voters. It is important to note that there are structural changes in voting behavior that vary based on election type. On the other hand, the immediate effect of VBM on White voters is negative, as they are approximately 0.20 times less likely to vote in VBM elections. Consequently, VBM elections, it seems, address the initial problem of relative underrepresentation of minorities in the electorate by closing the gap from both the top and bottom.

DISCUSSION AND CONCLUSION

Racial minorities have historically been underrepresented in the electorate. Voting can be seen as a costly activity for individuals who must take time and effort to visit a traditional polling place and cast their ballot, especially when the reward for voting is relatively low. In order to incentivize civic participation, and ultimately create a more representative electorate, policy makers must explore new methods to conduct elections that lower the costs associated with civic

[10] For descriptive statistics for the 75% Threshold, Combined Race Midterm Election restricted panel, see Appendix Table B11.

participation. As previous literature suggests, I found that the overall effects of VBM elections on turnout were small. The findings of my research show modest support for implementing VBM policy to resolve the issue of underrepresented minorities in the electorate as the probability of participating in an election if that election is conducted VBM does increase slightly for minorities. Although the effects of VBM may be problematic, if as my findings suggest, White participation decreases under VBM.

Although my findings were statistically significant, there are many opportunities for improvement and current limitations to this study. The most significant limitation of the study is the lack of recordkeeping for nonvoters. In order to conduct the study, I needed to create a panel in which I determined whether or not one was eligible to participate in an election. This is because information is only available for votes that were casted, not those that were not. I had to determine whether someone did not actually turn in their ballot or if they just were not eligible to vote in the election. Although a considerable amount of effort went into creating an accurate panel, and though the data were heavily scrutinized, there is still the potential for error.

The US Census data used for surname racial probabilities has not been updated since the 2000 Decennial Census. All proxy methodologies can potentially incorrectly classify individuals, but as mentioned earlier, even with old surname data, BISG performs very well at approximating race. That said, an updated version of the US Census Bureau's Demographic Aspects of Surnames list, using information collected from the 2010 Decennial Census can provide more accurate race probabilities and improve the performance of BISG.

Additionally, my results may not be generalizable as many factors of the implementation of VBM in Colorado are specific to the state. Colorado is not as racially diverse as other states in

the US and it is uncertain what effects states with larger shares of minorities would see with the implementation of VBM. Also, many counties have conducted local Coordinated election via VBM for many years, so the state-wide implementation of VBM did not impact the way the voted in those elections.

Looking toward the future, there will be many more opportunities to revisit this research and reevaluate its findings. In the immediate future, Colorado will be conducting its first ever Presidential election via VBM in November of this year. Turnout, in general, is much higher for presidential elections and so it will be interesting to see how VBM will impact the composition of the electorate and turnout rates. There is also only one Midterm election conducted via VBM in the state. As time goes on and more Midterm and Presidential General elections are conducted via VBM in Colorado, we will be able to measure the lasting effects the switch to VBM has on the electorate.

New election methods should look to close the gap between minority and White voter turnout while also increasing turnout rates across races. It seems that VBM fails at accomplishing the latter goal.

APPENDIX A – BISG METHODOLOGY

In order to correctly calculate BISG probabilities, the data were cleaned and edited to match the US Census data. For the sake of transparency, below, I outline the steps taken to calculate the BISG proxies.

1. The permanent address of each registered voter was assessed and, using RegEx pattern matching, stripped of any unnecessary information including special characters and apartment and mailbox information. Zip codes were stripped of nonnumerical characters and truncated to the first five digits.
2. These cleaned addresses were then geocoded to find longitude and latitude values using Geographic Information System (GIS) desktop software. Voters whose addresses couldn't geocode successfully was dropped from the sample.
3. These coordinate points were then matched to the US Census Block Group they were located in.
4. Using GEOID codes, the corresponding Census Block Group distribution of race from table P11. from the 2010 Decennial Census was attached to each registered voter.
5. The proportion of the US adult population for each race that is resides in each voter's Census Block Group was calculated.
6. Surname information was then assessed and, using RegEx pattern matching, standardized for efficient matching.
    a. Hyphenated last names were split into two separate names.

b. Special characters, Middle initials, and suffixes (Sr., Jr., IV.) were removed from the surnames.
c. All characters are capitalized.

7. Names were then matched to the US Census Bureau's Demographic Aspects of Surnames list and the count of people by race, given last name, was attached to each voter. For voters with hyphenated last names, the second name was only used if the first one could not match to the list. Observations with unmatched surnames were dropped from the sample.
8. Raw counts for each last name were then converted to probabilities.
9. Using the probabilities attached in step 4 and calculated in steps 5 and 6, the BISG probability for each race was calculated using Equation 2 from the Methods section.

APPENDIX B – SUPPLEMENTARY TABLES

Table B1. Definition of Variables

Voting Behavior	
Vote Casted	A dichotomous variable indicating whether or not the voter participates in the election
Vote-by-Mail (VBM)	A dichotomous variable indicating whether or not the election is VBM
Race Characteristics	
White	A dichotomous variable indicating whether or not the voter is White.
Black	A dichotomous variable indicating whether or not the voter is Black.
Asian/Pacific Islander	A dichotomous variable indicating whether or not the voter is Asian/Pacific Islander.
Hispanic	A dichotomous variable indicating whether or not the voter is Hispanic.
Voter Demographic Characteristics	
Democrat	A dichotomous variable indicating whether or not the voter is a registered Democrat.
Republican	A dichotomous variable indicating whether or not not the voter is a registered Republican.
Independent	A dichotomous variable indicating whether or not not the voter has no political party affiliation.
Other Party	A dichotomous variable indicating whether or not not the voter is a registered member of another political party.
Female	A dichotomous variable indicating whether or not not the voter is female.
Age	A continuous variable measuring a voter's age at the time of the election.
Election Characteristics	
General	A dichotomous variable indicating whether or not the election is a General election.
Coordinated	A dichotomous variable indicating whether or not the election is a Coordinated election.
Primary	A dichotomous variable indicating whether or not the election is a Primary election.
Presidential	A dichotomous variable indicating whether or not the election is a Presidential election.

Table B2. Descriptive Statistics for 75% Threshold BISG Panel for Coordinated Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.389	0.487	0	1
Vote-by-Mail (VBM)	0.867	0.339	0	1
Race Characteristics				
White	0.890	0.313	0	1
White*VBM	0.773	0.419	0	1
Black	0.00559	0.0746	0	1
Black*VBM	0.00486	0.0695	0	1
Asian/Pacific Islander	0.00924	0.0957	0	1
Asian*VBM	0.00840	0.0913	0	1
Hispanic	0.0953	0.294	0	1
Hispanic*VBM	0.0805	0.272	0	1
Voter Demographic Characteristics				
Democrat	0.307	0.461	0	1
Republican	0.366	0.482	0	1
Independent	0.317	0.465	0	1
Other Party	0.0101	0.1000	0	1
Female	0.518	0.500	0	1
Age	47.18	15.97	18	99
Panel Characteristics	**N**			
Voters	2,712,716			
Observations	11,556,980			
Elections	7			

Table B3. Result of 75% Threshold BISG Probability Panel for Coordinated Elections

Dependent Variable:	(3)		(4)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.151***	0.860***	-0.120***	0.887***
	(0.00275)	(0.00236)	(0.00299)	(0.00265)
Race Variables				
Black	-1.062***	0.346***	-	-
	(0.0374)	(0.0129)		
Hispanic	-1.202***	0.301***	-	-
	(0.00987)	(0.00297)		
Asian/Pacific Islander	-1.212***	0.298***	-	-
	(0.0364)	(0.0108)		
Black * VBM	-0.0499	0.951	0.0101	1.010
	(0.0357)	(0.0340)	(0.0380)	(0.0384)
Hispanic * VBM	0.124***	1.133***	0.252***	1.287***
	(0.00929)	(0.0105)	(0.00984)	(0.0127)
Asian * VBM	0.257***	1.293***	0.207***	1.230***
	(0.0354)	(0.0457)	(0.0374)	(0.0460)
Voter Demographic Variables				
Democrat	0.595***	1.814***	-	-
	(0.00400)	(0.00726)		
Republican	0.693***	2.001***	-	-
	(0.00382)	(0.00765)		
Other Party	0.420***	1.522***	-	-
	(0.0147)	(0.0223)		
Female	0.0326***	1.033***	-	-
	(0.00311)	(0.00321)		
Age	0.0731***	1.076***	0.0687***	1.071***
	(9.89e-05)	(0.000106)	(0.000249)	(0.000266)
Constant	-4.564***	0.0104***	-	-
	(0.00597)	(6.22e-05)		
lnsig2u	1.260***	3.524***	-	-
	(0.00210)	(0.00741)		
Observations	11,556,980		6,213,751	
Number of Voters	2,712,716		1,095,279	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B4. Descriptive Statistics for 75% Threshold BISG Panel for General Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.725	0.447	0	1
Vote-by-Mail (VBM)	0.206	0.404	0	1
Race Characteristics				
White	0.886	0.318	0	1
White*VBM	0.180	0.384	0	1
Black	0.00677	0.0820	0	1
Black*VBM	0.00149	0.0385	0	1
Asian/Pacific Islander	0.00938	0.0964	0	1
Asian*VBM	0.00229	0.0478	0	1
Hispanic	0.0979	0.297	0	1
Hispanic*VBM	0.0221	0.147	0	1
Voter Demographic Characteristics				
Democrat	0.310	0.463	0	1
Republican	0.357	0.479	0	1
Independent	0.321	0.467	0	1
Other Party	0.0108	0.103	0	1
Female	0.518	0.500	0	1
Age	46.91	16.18	18	99
Election Characteristics				
Presidential	0.463	0.499	0	1
Panel Characteristics	**N**			
Voters	2,958,029			
Observations	14,174,259			
Elections	8			

Table B5. Result of 75% Threshold BISG Probability Panel for General Elections

Dependent Variable:	(5)		(6)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.233***	0.792***	0.196***	1.216***
	(0.00249)	(0.00197)	(0.00325)	(0.00396)
Race Variables				
Black	-1.308***	0.270***	-	-
	(0.0212)	(0.00573)		
Hispanic	-1.185***	0.306***	-	-
	(0.00601)	(0.00184)		
Asian/Pacific Islander	-1.206***	0.300***	-	-
	(0.0174)	(0.00522)		
Black * VBM	0.0255	1.026	0.0820***	1.085***
	(0.0236)	(0.0242)	(0.0243)	(0.0264)
Hispanic * VBM	-0.149***	0.862***	-0.105***	0.900***
	(0.00658)	(0.00567)	(0.00691)	(0.00622)
Asian * VBM	0.149***	1.160***	0.0774***	1.080***
	(0.0193)	(0.0224)	(0.0206)	(0.0223)
Voter Demographic Variables				
Democrat	0.965***	2.624***	-	-
	(0.00439)	(0.0115)		
Republican	1.158***	3.183***	-	-
	(0.00431)	(0.0137)		
Other Party	0.535***	1.708***	-	-
	(0.0148)	(0.0253)		
Female	0.146***	1.157***	-	-
	(0.00349)	(0.00404)		
Age	0.0612***	1.063***	0.00288***	1.003***
	(0.000106)	(0.000113)	(0.000310)	(0.000311)
Election Type Variables				
Presidential	1.926***	6.865***	1.990***	7.318***
	(0.00222)	(0.0153)	(0.00231)	(0.0169)
Constant	-4.564***	0.0104***	-	-
	(0.00597)	(6.22e-05)		
lnsig2u	1.700***	5.471***	-	-
	(0.00197)	(0.0108)		
Observations	14,174,259		6,732,961	
Number of Voters	2,958,029		1,235,476	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B6. Descriptive Statistics for 75% Threshold BISG Panel for Midterm Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.627	0.484	0	1
Vote-by-Mail (VBM)	0.384	0.486	0	1
Race Characteristics				
White	0.884	0.320	0	1
White*VBM	0.336	0.472	0	1
Black	0.00681	0.0823	0	1
Black*VBM	0.00277	0.0526	0	1
Asian/Pacific Islander	0.00963	0.0977	0	1
Asian*VBM	0.00426	0.0651	0	1
Hispanic	0.0993	0.299	0	1
Hispanic*VBM	0.0412	0.199	0	1
Voter Demographic Characteristics				
Democrat	0.307	0.461	0	1
Republican	0.353	0.478	0	1
Independent	0.328	0.470	0	1
Other Party	0.0113	0.106	0	1
Female	0.516	0.500	0	1
Age	47.14	16.35	18	99
Panel Characteristics	**N**			
Voters	2,941,520			
Observations	7,608,485			
Elections	4			

Table B7. Result of 75% Threshold BISG Probability Panel for Midterm Elections

Dependent Variable:	(7)		(8)	
Vote Casted	**Random Effects**	**RE Odds Ratio**	**Fixed Effects**	**FE Odds Ratio**
Vote-by-Mail (VBM)	-0.306***	0.737***	-0.194***	0.824***
	(0.00255)	(0.00188)	(0.00414)	(0.00341)
Race Variables				
Black	-1.627***	0.196***	-	-
	(0.0257)	(0.00504)		
Hispanic	-1.338***	0.262***	-	-
	(0.00721)	(0.00189)		
Asian/Pacific Islander	-1.418***	0.242***	-	-
	(0.0214)	(0.00518)		
Black * VBM	0.379***	1.460***	0.427***	1.532***
	(0.0278)	(0.0406)	(0.0310)	(0.0474)
Hispanic * VBM	0.0642***	1.066***	0.0870***	1.091***
	(0.00761)	(0.00812)	(0.00826)	(0.00901)
Asian * VBM	0.388***	1.474***	0.314***	1.368***
	(0.0229)	(0.0338)	(0.0254)	(0.0347)
Voter Demographic Variables				
Democrat	0.897***	2.453***	-	-
	(0.00468)	(0.0115)		
Republican	1.144***	3.141***	-	-
	(0.00459)	(0.0144)		
Other Party	0.587***	1.798***	-	-
	(0.0158)	(0.0284)		
Female	0.0609***	1.063***	-	-
	(0.00370)	(0.00393)		
Age	0.0750***	1.078***	0.0676***	1.070***
	(0.000125)	(0.000135)	(0.000469)	(0.000501)
Constant	-3.008***	0.0494***	-	-
	(0.00627)	(0.000310)		
lnsig2u	1.645***	5.183***	-	-
	(0.00268)	(0.0139)		
Observations	7,608,485		2,477,990	
Number of Voters	2,941,520		734,336	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B8. Descriptive Statistics for 80% Threshold BISG Panel for Coordinated Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.391	0.488	0	1
Vote-by-Mail (VBM)	0.867	0.339	0	1
Race Characteristics				
White	0.895	0.307	0	1
White*VBM	0.778	0.415	0	1
Black	0.00417	0.0645	0	1
Black*VBM	0.00362	0.0601	0	1
Asian/Pacific Islander	0.00855	0.0921	0	1
Asian*VBM	0.00778	0.0879	0	1
Hispanic	0.0923	0.290	0	1
Hispanic*VBM	0.0778	0.268	0	1
Voter Demographic Characteristics				
Democrat	0.305	0.460	0	1
Republican	0.368	0.482	0	1
Independent	0.317	0.465	0	1
Other Party	0.0101	0.0999	0	1
Female	0.517	0.500	0	1
Age	47.24	15.97	18	99
Panel Characteristics	**N**			
Voters	1,095,279			
Observations	11,191,283			
Elections	7			

Table B9. Descriptive Statistics for 80% Threshold BISG Panel for Coordinated Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.630	0.483	0	1
Vote-by-Mail (VBM)	0.383	0.486	0	1
Race Characteristics				
White	0.889	0.314	0	1
White*VBM	0.337	0.473	0	1
Black	0.00509	0.0712	0	1
Black*VBM	0.00206	0.0453	0	1
Asian/Pacific Islander	0.00893	0.0941	0	1
Asian*VBM	0.00396	0.0628	0	1
Hispanic	0.0965	0.295	0	1
Hispanic*VBM	0.0401	0.196	0	1
Voter Demographic Characteristics				
Democrat	0.305	0.460	0	1
Republican	0.356	0.479	0	1
Independent	0.328	0.469	0	1
Other Party	0.0112	0.105	0	1
Female	0.516	0.500	0	1
Age	47.21	16.35	18	99
Panel Characteristics	**N**			
Voters	709,199			
Observations	2,394,500			
Elections	4			

Table B10. Descriptive Statistics for 75% Threshold, Combined Race BISG Panel for Coordinated Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.867	0.339	0	1
Vote-by-Mail (VBM)	0.389	0.487	0	1
Race Characteristics				
White	0.890	0.313	0	1
White*VBM	0.773	0.419	0	1
Minority (Black, Hispanic, Asian)	0.110	0.313	0	1
Minority*VBM	0.0938	0.292	0	1
Voter Demographic Characteristics				
Democrat	0.307	0.461	0	1
Republican	0.366	0.482	0	1
Independent	0.317	0.465	0	1
Other Party	0.0101	0.1000	0	1
Female	0.518	0.500	0	1
Age	47.18	15.97	18	99
Panel Characteristics	**N**			
Voters	1,095,279			
Observations	6,213,751			
Elections	7			

Table B11. Descriptive Statistics for 75% Threshold, Combined Race BISG Panel for Midterm Elections

Variable	Mean	Std. Dev.	Min	Max
Voting Behavior				
Vote Casted	0.627	0.484	0	1
Vote-by-Mail (VBM)	0.384	0.486	0	1
Race Characteristics				
White	0.884	0.320	0	1
White*VBM	0.336	0.472	0	1
Minority (Black, Hispanic, Asian)	0.116	0.320	0	1
Minority*VBM	0.0482	0.214	0	1
Voter Demographic Characteristics				
Democrat	0.307	0.461	0	1
Republican	0.353	0.478	0	1
Independent	0.328	0.470	0	1
Other Party	0.0113	0.106	0	1
Female	0.516	0.500	0	1
Age	47.14	16.35	18	99
Panel Characteristics	**N**			
Voters	709,199			
Observations	2,394,500			
Elections	4			

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