Ballot Rejections and Ballot Curing in Washington State

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Abstract

November 2020 was the first time in US history that a plurality of voters cast absentee or mail ballots. The dramatic rise of mail voting in response to the COVID-19 pandemic has led to increased attention on the potential benefits and limitations of conducting elections by mail. One of the main drawbacks to vote-by-mail policies is that states usually reject a much larger percentage of mail ballots than they do ballots cast in-person. This paper uses 27 ballot "matchback" files from the state of Washington to examine, for the first time, the patterns in a state's challenged and cured ballots. We find that younger voters, voters of color, inexperienced voters, and male voters all have substantially elevated rates of ballot rejections. These patterns are driven by disparities in signature-based ballot *challenges*, rather than differences in rates of ballot *curing* or any other part of the process. Additionally, we examine the amount of time between ballot challenges and ballot cures, geographic variation in rejection rates, and discuss potential policy interventions to reduce disparities and lower rejection rates overall.

*Foot and Cao contributed equally to this paper, and are co-first authors. Foot contributed to the collection and analysis of the data, and to the writing of the paper. Cao conducted the analyses and interpretation of the results, and writing of the paper. Lee contributed to the collection and analysis of the data, and the drafting of the paper. Manson contributed to the collection and analysis of the data, and writing of the paper. Alvarez contributed to the collection of the data, interpretation of the analysis, and writing of the paper. Gronke contributed to the collection of the data, interpretation of the analysis, and writing of the paper. We thank former Washington Secretary of State Kim Wyman and her team for providing access to the data we use in this paper, and for answering our questions about the data and election administration in Washington.

1 Introduction

At the time of this writing, eight states (California, Colorado, Hawaii, Nevada, Oregon, Utah, Vermont, and Washington) will have a full vote by mail system in place for the upcoming federal elections in 2022, where ballots are sent to all eligible and registered citizens on the rolls for every election, and fourteen additional states[1] Twenty-six states plus the District of Columbia no longer require an excuse for requesting an absentee ballot, and sixteen states retain a requirement for some sort of excuse to receive an absentee ballot.[2] The proportion of voters reporting that they had cast an "absentee" or "by mail" ballot increased over the past quarter-century, from just under 8% in 1996 and rose to over 21% of ballots cast in 2016.

The COVID-19 pandemic upended virtually every aspect of American life, including elections. Voting by mail one of the major issues ahead of the 2020 general election. Because the long lines and crowded buildings that are typical of in-person voting in the US now had the potential to become so-called "superspreader" events, election administrators scrambled to expand access to mail voting. Such changes were widespread: an analysis by the New York Times in August 2020 found that thirty-two states had made changes to their mail and absentee voting systems in response to the pandemic. These changes ranged from allowing voters to cite concerns about COVID-19 as an accepted reason for requesting an absentee ballot[3] to sending mail ballots to every voter[4](Love et al., 2020). These institutional changes in combination with individual voters' concerns about safety in the pandemic bore out in greatly increased rates of voting by mail in November 2020. The percentage of ballots cast by mail doubled from 21% in 2016 to nearly 45% in 2020. **CHECK THESE NUMBERS**

It remains to be seen to what extent, if any, the gains made by vote-by-mail in 2020

[1]States with a local option for full vote by mail elections are Idaho, Montana, Wyoming, North Dakota, Minnesota, Nebraska, Kansas, Missouri, Arizona, New Mexico, Alaska, Florida, Maryland, and New Jersey.

[2]Source: National Conference of State Legislature's "Voting Outside the Polling Place" report Table 1, https://www.ncsl.org/research/elections-and-campaigns/vopp-table-1-states-with-no-excuse-absentee-voting.aspx, accessed May 26, 2023.

[3]E.g. New Hampshire, West Virginia, and Kentucky.

[4]E.g. Vermont, California, and New Jersey.

will translate into a long-term increase in the proportion of ballots cast by mail. It does appears likely that without the pandemic (and without many of the temporary policies that were implemented in its wake) vote-by-mail rates will return to the previous slow yet steady growth trend established in the past two decades. And is also is clear that many of the charges of fraud and malfeasance that were directed at vote by mail systems were unfounded(Qiu, 2021).

Regardless of the specific trajectory, it is clear that some sort of voting by mail has a permanent place in the American election ecosystem. Our interest in this paper is in the equity and access implications of the voting by mail system. Our specific analytical interest in this paper is whether the signature verification and cure processes show any evidence of a disparate impact on subgroups of eligible voters, particularly among groups with less experience with the vote by mail system and with a shorter history of verifiable signatures in the state system. This may include younger citizens, citizens who only recently moved to Washington state, and citizens whose eligibility was recently established or restored. We also wish to examine whether groups in the population who in the past have been shown to be disadvantaged by administrative procedures which include some level of discretion and leeway by elections officials and their staffs.

Our analysis draws on a unique data set provided by the State of Washington. The data provided track the status of every ballot received by the state over the period from October 21st to November 24th, and for ballots under challenge, the reason for the challenge is given. This period begins four days after ballots were mailed to voters and ends on the day that the state finalized their election results. Ballots that are challenged are listed as such in the file as are ballots that have been accepted. A challenged ballot that is cured moves from being marked 'challenged' to being marked 'accepted', and if the ballot is not accepted before November 24, it is rejected. These data provide a valuable window into equity, accessibility, and administrative decision making for a key link in the chain of mail voting, and it is important to understand how these processes work as voting by mail continues to expand

across states and among voters.

Our research findings demonstrate racial, ethnic, and age disparities in the signature verification and ballot curing processes for the November 2020 election in the State of Washington. We examine Washington not because its processes and procedures are particularly vulnerable to these discriminatory effects, but because as a state with a mature, well-designed, and by all indications well-functioning vote by mail system, it functions as a canary in a coal mine, indicating a potential disenfranchising effect of moving to more voting by mail. We close our paper by suggesting outreach and educational efforts, and changes in procedures, that may overcome these disparities.

2 VBM Ballot Rejections and Previous Research

Absentee balloting emerged during the Civil War as an administrative innovation to provide Union solders access to the ballot box(Keyssar, 2000). While the categories of valid excuses to be "absent" from the precinct polling place on Election Day ebbed and flowed over the next century, by 1960 absentee voting remained primarily an excuse-required system taken advantage of by uniformed personnel serving away from home (domestically of overseas). Four events over the next 20 years fundamentally altered and expanded the use of absentee balloting: the 1970 Voting Rights Act which mandated special registration of new residents within 30 days of the election, or the ability to cast an absentee ballot in their former state; the 1971 ratification of the twenty-sixth amendment which dramatically increased the number of 18-20 year olds who were now eligible to vote but were away from home at college; the 1975 passage of the Overseas Citizen Voting Act, which extended the right to cast an absentee ballot to citizens who lived abroad and did not have a legal domicile in the United States; and finally, in 1978, California's adoption of a "no-excuse" system for opting out of precinct place voting and receiving and returning a ballot by mail(Fortier, 2006).

Rates of absentee by-mail voting increased slowly, but inexorably, for the past twenty

years when we have high quality information on rates of Election Day, Early In-Person, and Voting by Mail. The United States Census's Current Population Survey began asking about mode of voting in 1996, and the rate of change between federal elections is shown in Figure 2. From 1996 to 2008, there was a somewhat higher rate of increase between midterm elections and presidential elections; this pattern reversed from 2008-2018. Overall, the rate of change was comparatively low and comparatively regular, averaging **need a percentage change here** rate between each cycle. The dramatic shift in 2020 highlights the enormous impact of COVID-19 on elections and on the rate of by mail voting. This rapid shift in vote by mail rates in states where many administrators and voters had not had previous experience with the procedures required to prepare, deliver, complete, sign, return, and tabulate by-mail ballots raised concerns about equity, access, and integrity. **Do we need a juicy citation or two here?**

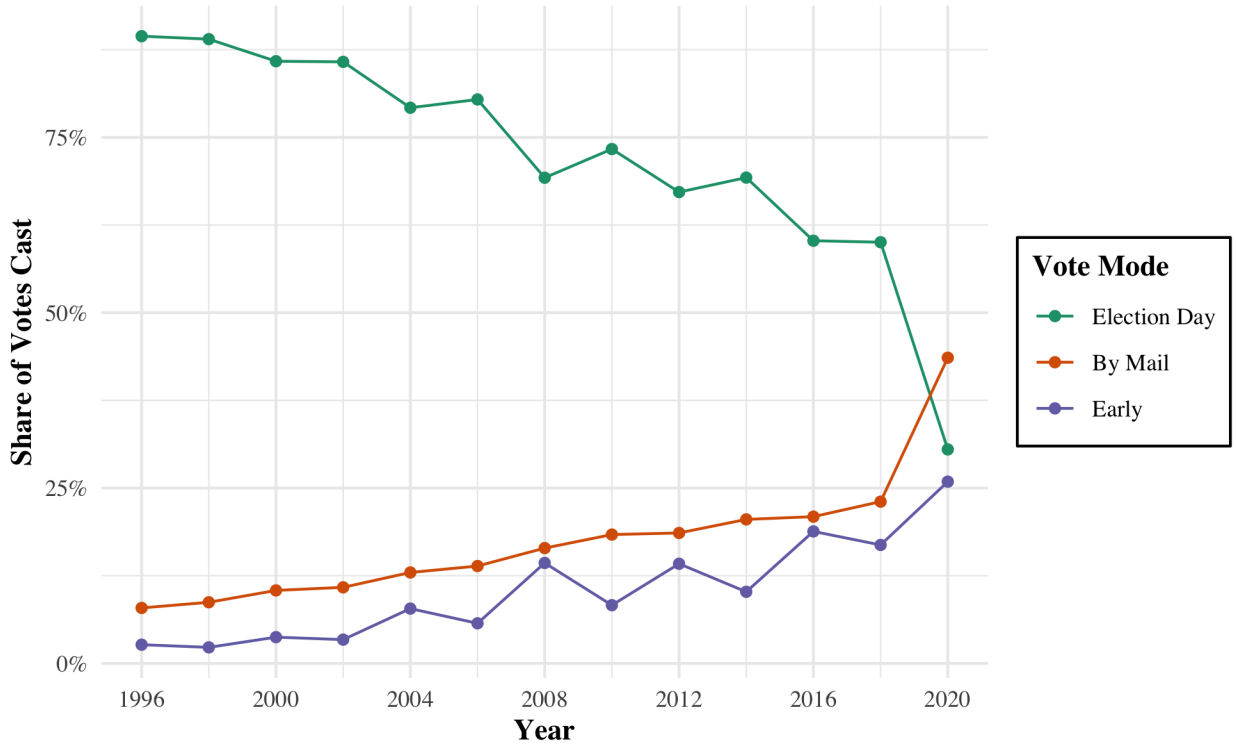

Figure 1: Vote Mode in the United States, 1996 - 2020

Our research focuses on one key link in the chain of voting for a vote by mail ballot–the

process of signature verification and curing. This process serves to connect the individual registrant to a validly cast ballot. While the specifics of the process vary, in general, a well-designed process, as summarized in CISA guidelines issued during the run-up to the November 2020 election, has a multi-tiered review system and curing process(Groiup, n.d.):

1. A signature on a ballot envelope is compared (digitally or manually) to one stored in the voter registration system

2. Signatures that **pass the initial review** result in the ballot envelope being separated from the ballot, in order to maintain the secrecy of the vote, the ballot moves through additional processing stages.

3. Ballots that are **rejected at initial review are subjected to additional review**, ideally using different technologies (i.e. computer then human; cursory human review to a more careful human review by more experienced staff; and drawing on where available additional examples of the signature (a history of signatures on previous ballots, on voter registration applications, and in other government databases such as at the DMV).

4. After these reviews, some ballots **remain "challenged"**, and in nineteen states, this initiates a **"cure" process** whereby the voter is notified that their signature did not match and are provided methods to correct or "cure" the mismatch.

There is already a large literature examining the impact vote-by-mail policies have on voter behavior, administrative efficiency, and record keeping. Much less examined, and the focus of this paper, is an aspect of mail voting that is generally not present in in-person voting systems - ballot rejections and the process by which challenged ballots can be fixed. Unlike in-person voting, where (for the most part) any cast ballot with legible selections is counted, mail ballots must satisfy certain conditions in order to be counted.

There is variation between states regarding what is required for a mail vote (or an absentee vote) to be counted, as well as in the process by which improperly marked ballots can be

"cured" and ultimately counted. This question took on new importance in 2020 because of concerns that large numbers of ballots might go uncounted as states tried to adapt to hastily implemented vote-by-mail policies and millions of voters cast their ballots by mail for the first time (Baringer et al., 2020; Wines, 2020). For instance, strictly enforced security envelope rules in Pennsylvania were identified as potentially leading to tens of thousands of ballots being thrown out over a minor mistake. Ultimately, this was avoided - in fact, an analysis by FiveThirtyEight found that rejection rates decreased between 2016 and 2020 declined in almost all states (Rakich, 2021).

Concerns about ballot rejection rates go beyond the overall rates of rejection. As with many aspects of electoral policy, there is reason to believe that the voters whose ballots are rejected differ, on average, from those whose ballots are counted (Acevedo et al., 2020). In particular, recent research in Florida and Georgia (using data from the 2016 and 2018 general elections) has found that younger voters, less experienced voters, and voters of color are most likely to have their ballots rejected (Baringer et al., 2020; Cottrell et al., 2020; Shino et al., 2021). Along these lines, a similar analysis on data from eight counties in Washington[5] by InvestigateWest found that young voters and voters with Hispanic surnames were particularly likely to be rejected (Borkholder, 2021). Measuring these disparities is informative, but to properly understand them, the process that leads to rejections must be studied. To date, there is no published work using data from any state to analysis the process through which ballots are challenged and potentially cured - this paper is intended to change that.

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3 VBM in Washington: A Process and Data Overview

Washington's election administration process has several properties that make the state an appealing candidate for studying the ballot rejection and curing process. One advantage is simply that the cure process in Washington is robust and well-established. Unlike Florida

[5]This is the only analysis of Washington's rejection data we know of.

(two days) or Georgia (three days), voters in Washington have 21 days to sign and return a cure statement. Having such a long period in which ballots can be cured gives us richer temporal patterns to study, and likely means that rates of ballot curing will be higher. Also helpful is that since Washington is a full vote-by-mail state, all voters are subject to a potential ballot challenge and there is no need to estimate a selection model for the probability that a voter will vote by mail, as Baringer et al. (2020) had to do in their analysis of ballot rejections in Florida.

In addition to these administrative factors, the data provided publicly by Washington is extremely high-quality and particularly conducive to an in-depth analysis of the challenge/cure process. For each ballot, the dates the ballot was received, challenged (if applicable), and cured (if applicable) are available along with the reason for the challenge. This information can be linked to each individual voter with their name, address, gender, and electoral history as provided by the statewide voter file. The richness of this data allows us to examine many questions which would be impossible to answer using data that only listed whether or not ballots were rejected, as previous work in Florida has done. For instance, we investigate the average time between the challenging and curing of ballots, the effectiveness of the telephone notification process, and the degree to which disparities in cure rates affect disparities in rejection rates. Answering these questions and others, we believe, will be an important asset as the need for effective and fair mail voting in the United States is increasingly recognized.

Citation we can use here: "Revised Code of Washington 29A.40.110: Processing incoming ballots." The code says "Personnel shall verify that the voter's signature on the ballot declaration is the same as the signature of that voter in the registration files of the county. Verification may be conducted by an automated verification system approved by the secretary of state."

Mail voting in Washington proceeds through a number of well-defined steps. We give an overview of this process below, using dates from the 2020 general election.

1. Ballots are mailed to all voters at least 18 days before the election. Specific date(s) may vary by county.
2. The voting period begins 18 days before Election Day (October 16th). Any ballots postmarked, that is received and processed by the U.S. Postal Service, by Election Day (November 3rd) and received before the canvassing board meets are considered on-time. Ballots postmarked after Election Day are rejected for being late.
3. Ballots received on time by the state are either accepted or challenged. If accepted, the vote will be counted with no further input from the voter. If challenged for a non-matching or missing signature, the cure process begins.
4. Voters with (signature) challenged ballots must be notified by first-class mail of the challenge on their ballot and be informed of the process to cure the ballot.
5. Voters whose ballots are received within three days of the canvassing board's meeting (but postmarked by election day) and voters who did not respond to the mail notification of their ballot challenge are contacted by phone, if possible.
6. Three weeks after the election (November 24th), the canvassing board meets and finalizes the election results. All challenged ballots which have not been cured by that date are not counted.

Do we need to close this section?

3.1 Data Overview: Rejection and Cures

Overview NEED A BETTER TITLE FOR THIS SECTION

Our analysis of the ballot rejection process in Washington is based on two sources of data provided by the state. The first is the state voter file containing each voter's name, address, gender, age, and history of electoral participation. The second is a series of 27 "matchback" files which were posted on each weekday (excluding Veterans Day) between October 21st and November 24th - the date at which election results were finalized and ballots could no longer be cured. Each file contains a record of every ballot received up to that date, with

information on the status of the ballot (i.e. whether or not it had been challenged) and, where applicable, the reason the ballot was challenged.

The November 2020 election, of course was unique in its national hyper-focus on mail voting and the U.S. Postal Service. Even in full-vote-by-mail Washington, there were effects that perturbed the usual patterns seen in ballot return data. This salience may have led voters in the state to be extra-vigilant that their mail ballot would be counted correctly. The 0.8% rate of ballot rejections seen in November 2020 is notably lower than in previous general elections, which never dipped below 1.1%, and only half as much as the 1.6% of ballots rejected in that year's primary (Wyman, 2021). It is possible that this vigilance led auditors in the state to scrutinize ballot materials more closely, but also likely that auditors, along with the state and other political actors, engaged in extra outreach to eligible voters to maximize ballot curing and minimize unresolved ballots.

NEED INTERPRETATION of Table 1

3.1.1 Total Rejected Ballots

Table 1: Final Status of Ballots

Ballot Status	Count	Percent
Accepted upon Reception	4,029,694	97.46%
Challenged and Cured	72,037	1.74%
Challenged, Never Cured	31,781	0.77%
Unresolved	1,319	0.03%

We look at the Challenged and Cured and Challenged, Never cured categories. Now need to transition to challenge reasons.

These figures include ballots that were challenged for any reason - not just signature-related ballot challenges. However, as Figure 3.1.1 shows, the two signature-related challenge reasons (non-matching signatures and missing signatures) account for 75.9% and 14.8% of rejected ballots, respectively. The next 7.8% of rejected ballots were challenged for being

received late, and all other challenge reasons account for the final 2.5% of rejected ballots.[6] It is worth noting that this pattern is markedly different from the causes of mail ballot rejections in previous elections, both in Washington and the country overall. Previous state elections saw that between 25% and 60% of all rejections were due to ballots arriving too late, while only 8% of rejections in November were for tardiness (Wyman, 2021). According to data collected after the 2018 midterm election by the U.S. Election Assistance Commission, non-matching and missing signatures accounted for only 15.8% and 13.0% (respectively) of rejected mail ballots, while late ballots represented 26.9% of rejected mail ballots. The most common reason for rejection in the United States, though, was "Other" - which can include missing or incomplete ballot certificates, missing security envelopes, and many other problems [**CITATION NEEDED**].

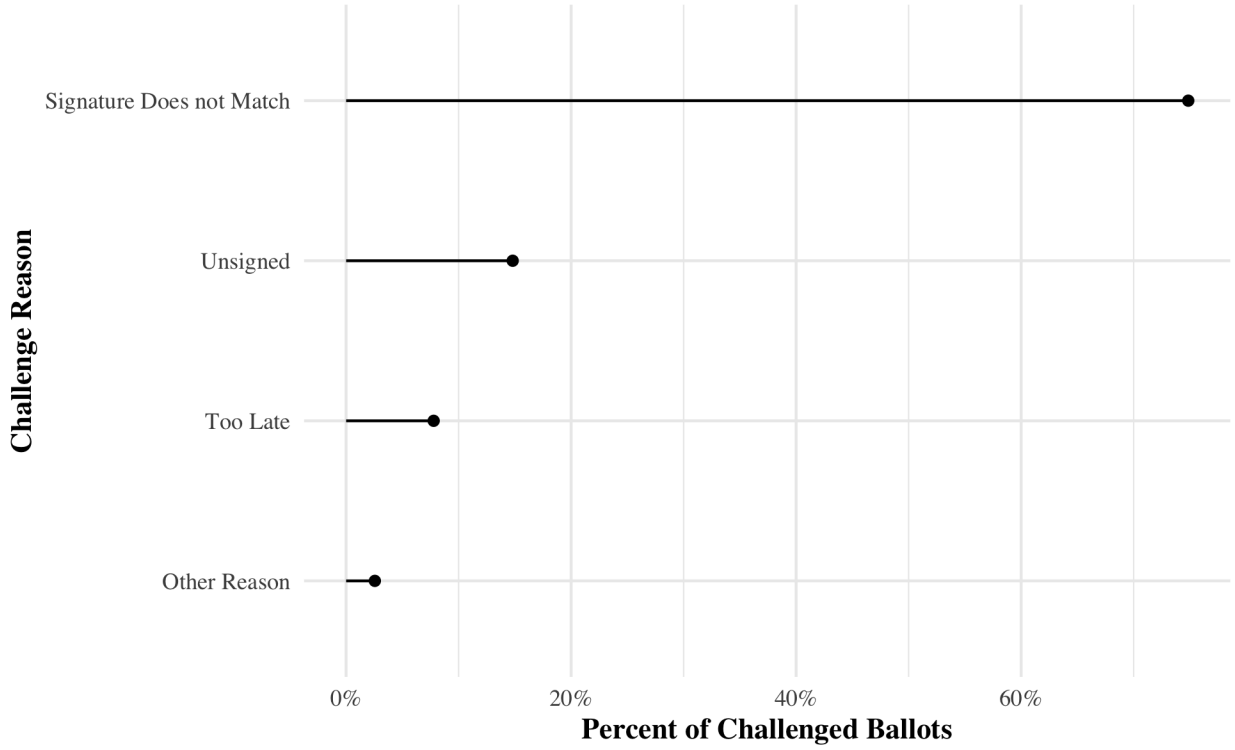

Figure 2: Most Common Reasons for Ballot Challenge

These differences are the result of many factors and there is no published work dealing

[6]The full list of challenge reasons and the percentage in each category is provided in Appendix Table 2.

with the varying causes of ballot rejections by state (**NEED TO CHECK CLAIM**). Seriously addressing this question is beyond the scope of our work, but there are a couple particular aspects of Washington's electoral system that are very likely to contribute to the over-representation of signature related ballot challenges. First, Washington accepts ballots up to two weeks after the election - far longer than most states - which likely means many fewer ballots are received after the deadline. What's the second?

Since ballots with non-matching/missing signatures and late ballots make up virtually all rejected ballots in Washington, we will restrict our analysis going forward to ballots rejected for one of these reasons.

3.2 The Temporal Nature of The Cure Process

Ballot rejections are a natural endpoint for study because they directly reflect which votes are counted and which are not. However, in a state such as Washington that has a robust system whereby challenged ballots can be cured, examining the challenge/cure/rejection process gives insight into important questions which cannot be adequately addressed through the study of rejection ballots alone. This is for a couple reasons.

First, at a basic level, rejected ballots are ballots that can be described as "challenged uncured" ballots - or ballots which are subject to an initial challenge and then are not cured by the time the results are finalized. The fact that this is a two-step process has implications for studying any disparities (along age or race, say) that emerge in the pattern of rejected ballots. It could be that challenge rates are similar across groups and that differential cure rates are driving the disparities. If this were the case, policies intended to reduce disparities in rejection rates would need to primarily reduce the disparities in cure rates. Of course, if the opposite were true, effective policies would focus on reducing the rate of ballot challenges.

Second, the cure process takes place over multiple weeks, and therefore, it has a temporal component that has to be examined separately from the whether or not particular ballots were rejected or accepted.

3.2.1 Ballot Curing in Washington

Ballot curing in Washington follows a process outlined in Washington state law RCW 29A.60.165. When a ballot is

3.3 Ballot Challenges and Ballot Curing Over Time

Combine these two processes and we have a temporal process. We model the movement into these two distributions and the movement out.

Need to just quickly describe this last figure. Figure 3.3

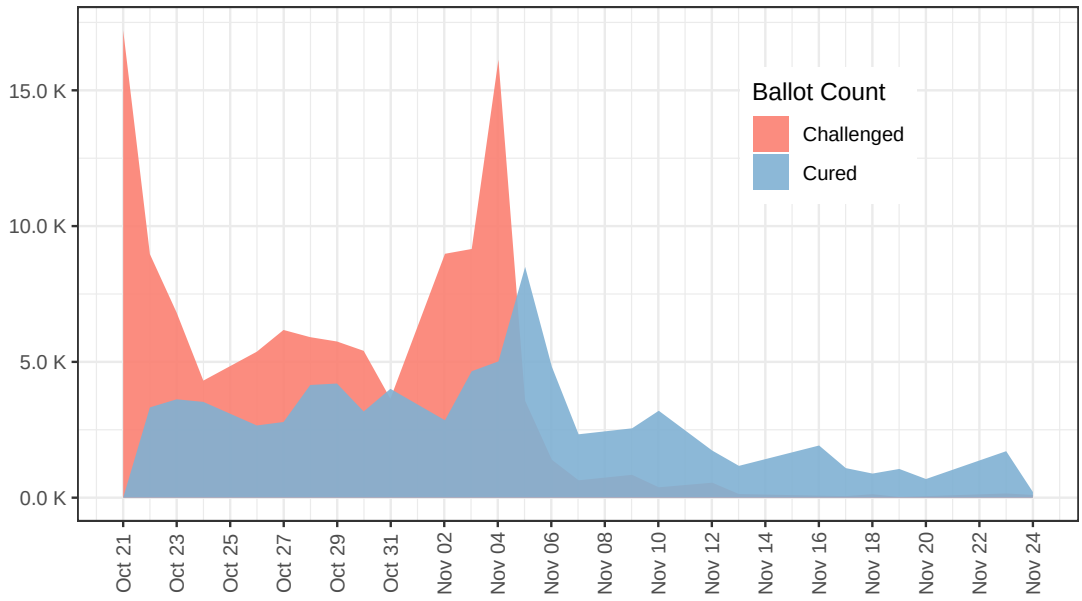

Figure 3: Daily Count of New Challenged & Cured Ballots

4 The Demography and Geography of Rejected Ballots

Voting rights have long been considered at the heart of civil rights in a democratic society [cite]. For this reason, any examination of the ballots which are submitted but not counted must pay particularly close attention to any group-level differences that arise in the rates at which this occurs. Previous research has identified several reasons that rates of ballot

rejection may be elevated among inexperienced voters, voters of color, and young voters (Acevedo et al., 2020; Smith, 2018). For this reason, we will focus our initial analysis of rejected ballots on disparities in rejection rates across these categories.

There are a number of theoretical reasons why these groups may experience higher rates of ballot rejection, with signature matching being potentially most problematic.

Our first look beyond administrative records is to see whether rejections vary by category of challenge, race, gender, age, and across counties.

4.1 Cure Rates By Categories

4.2 Cure Rates By Counties

Not quite sure what we're doing with the geographic figures. We have some concentration evident in the map; the figure shows the size. NEEDED?

5 Results

In this section, we use a multinomial logit model to study the effects of administrative and demographic factors on the outcomes of the curing process.

The multinomial logit model is defined as:

$$\ln \frac{\Pr(Y_i = \textit{Cured} \mid X_i)}{1 - \Pr(Y_i = \textit{Unchallenged} \mid X_i)} = \beta_1 X_i$$
$$\ln \frac{\Pr(Y_i = \textit{Rejected} \mid X_i)}{1 - \Pr(Y_i = \textit{Unchallenged} \mid X_i)} = \beta_2 X_i$$

The dependent variable Y_i is individual i's outcome of the curing process. It can be either *Cured* or *Rejected* for voters whose ballots were challenged, or *Unchallenged* for those whose ballots were accepted without going through the curing process. The covariates X_i include three parts: administrative factors such as return methods, the number of days to receive the ballot, and the number of days used to make the first decision; demographic attributes

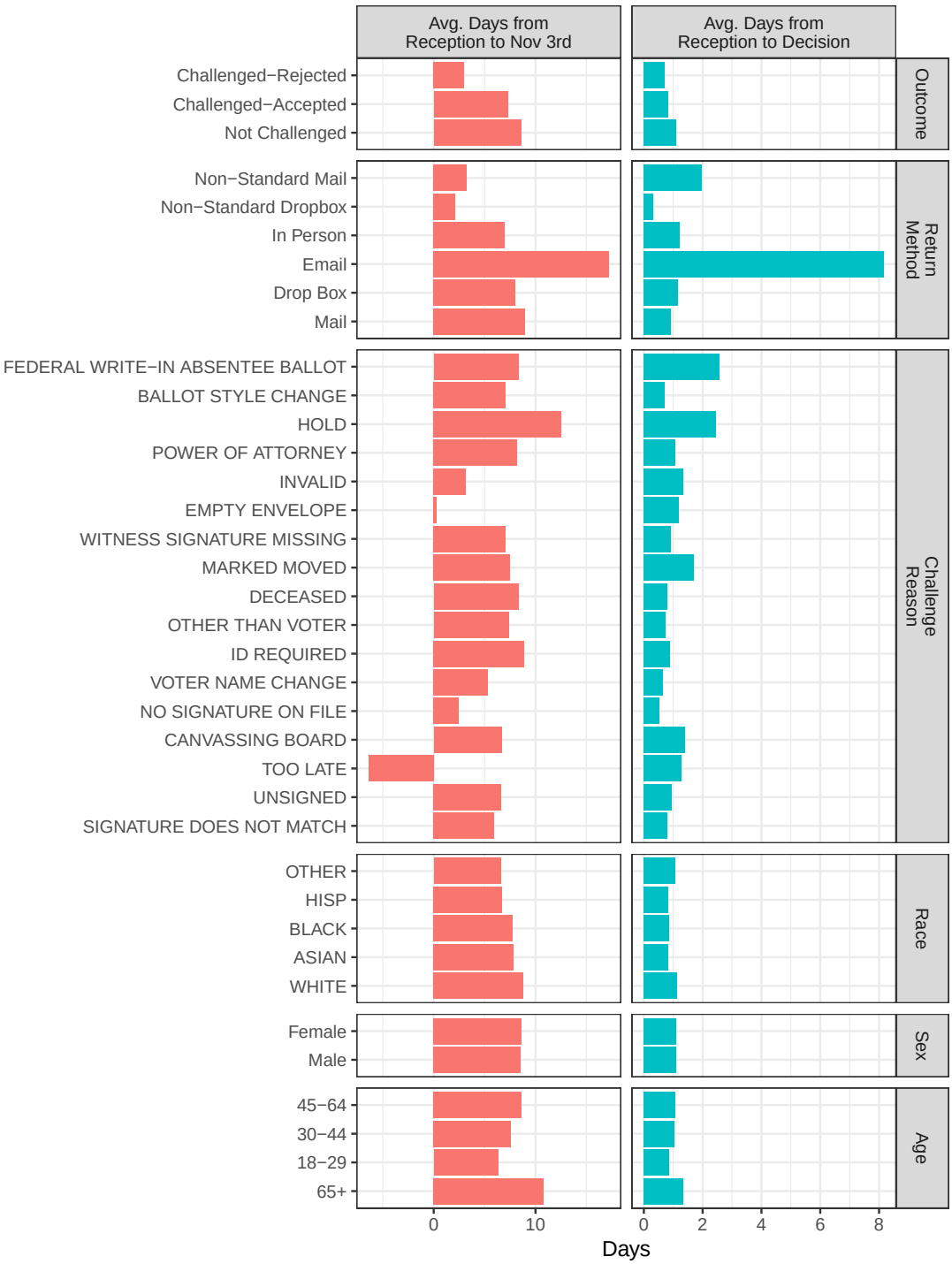

Figure 4: Reception Date & Processing Time by Challenge Category, Race/Ethnicity, and Age

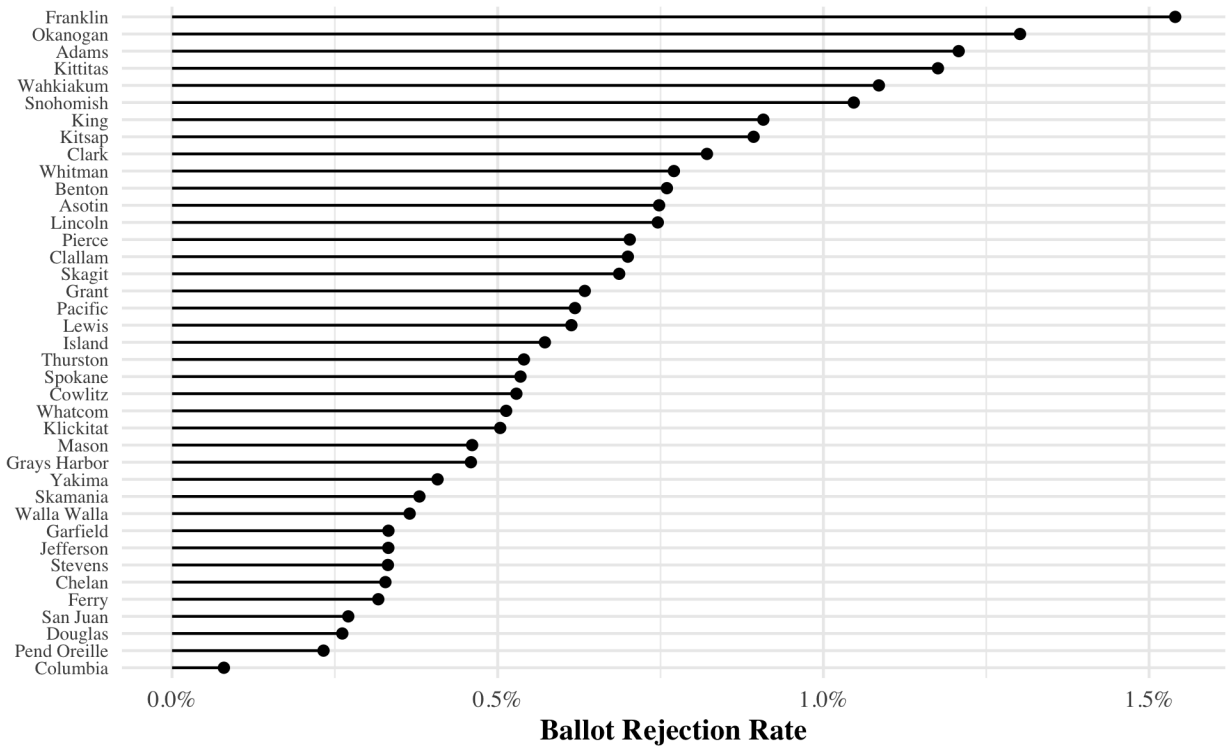

Figure 5: Ballot Rejection Rates, by County

such as race, gender, and age; and county-level group effects.

To be able to better interpret the results of the multinomial logit regression, instead of showing the estimates of the coefficients, we present average marginal effects in Figure 5. The average marginal effect shows that, if a covariate changes from the reference state to a target state, how much would it change the probability of resulting the specified outcome. Formally, average marginal effect for covariate k on outcome j can be written as:

$$AME_{j,k} = \frac{\sum_i ME_{i,j,k}}{N}$$

where N is the number of voter records, and marginal effect $ME_{i,j,k}$ is

$$ME_{i,j,k} = Pr(Y_i = j \mid X_i, X_{i,k} = 1) - Pr(Y_i = j \mid X_i, X_{i,k} = 0)$$

In Figure 5, we use shapes to distinguish the average marginal effects for different outcomes:

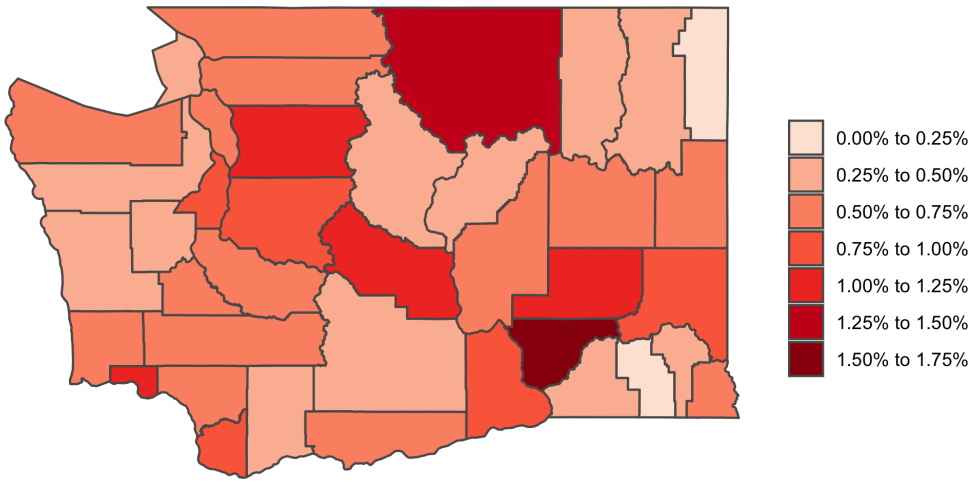

Figure 6: Ballot Rejection Rates, by County

green diamonds — *Cured*, red triangles — *Rejected*, and blue squares — *Unchallenged*.

We can derive three intriguing implications from Figure 5. First, the administrative factors (return methods) have larger effects than race and gender. Specifically, compared to those were returned by mail, ballots returned through non-standard drop boxes or emails are more likely to be challenged, while the ones returned in-person or through standard drop boxes are less likely to be challenged. In the curing process, all methods lead to an ease to cure the problematic ballots, especially the email ones. Moreover, the later the ballot was received by the election officials, or the longer it was used to make the first decision, the higher probability that the ballot would be challenged and have difficulty to be cured.

Second, there are differential challenge and rejection rates among different demographic groups. Compared to white voters, non-white voters are more likely to be challenged. Female voters' ballots are less likely to be challenged. Interestingly, age has the largest effects among demographic attributes. The results show a negative correlation between age and ballot challenge: younger voters tend to have their ballot challenged more often.

Last, the practice of signature verification varies considerably across counties. Compared to the reference county, King, many counties are not statistically different in terms of ballot

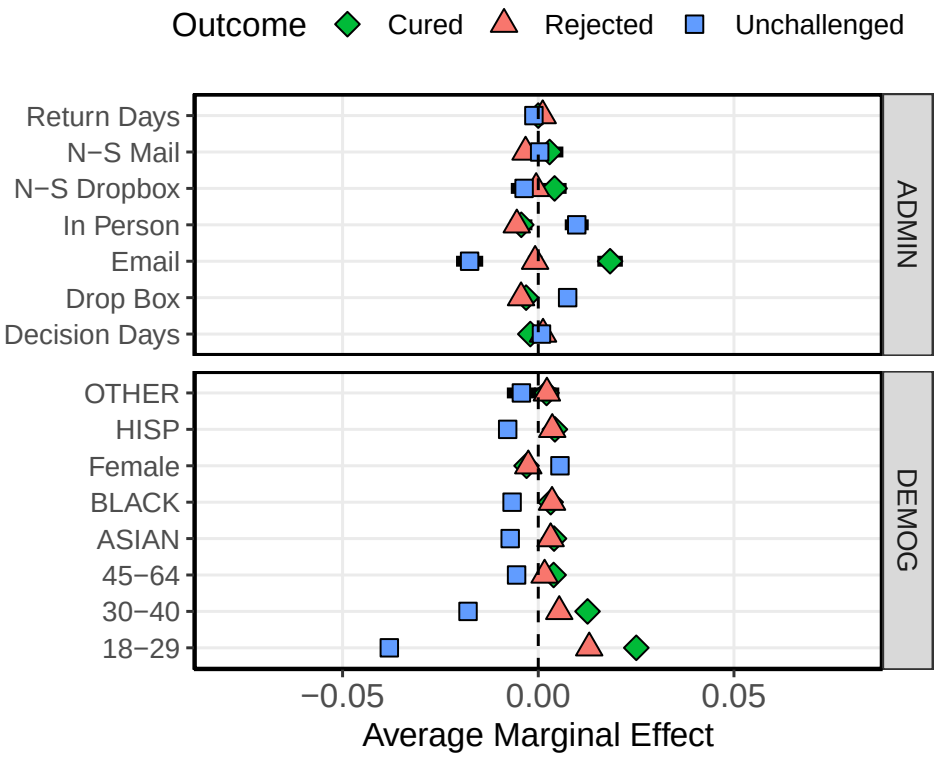

Figure 7: Multinomial Logit Regression: Unchallenged vs Cured vs Rejected Ballots (Demog & Admin)

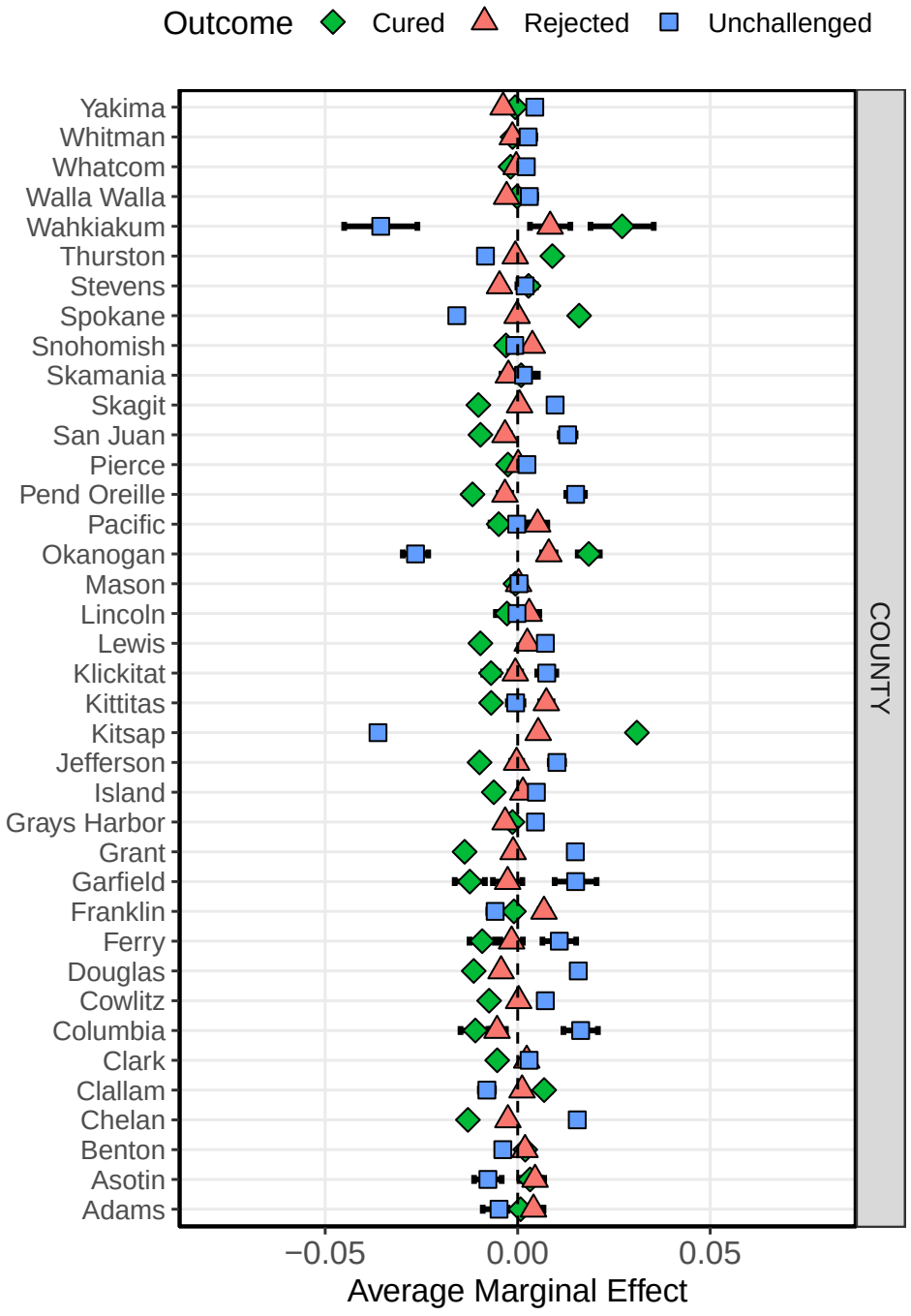

Figure 8: Multinomial Logit Regression: Unchallenged vs Cured vs Rejected Ballots (County)

challenges while in several other counties, e.g. Wahkiakum, Kitsap, Okanogan, and Spokane, the ballots are significantly more likely to be challenged. The county-level group effects of those counties even dominate their administrative and age effects.

6 Conclusion and Discussion

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ALL ANALYSIS and Supplementary Material

Table 2: Full Accounting of Ballot Challenges

Reason	Count	Percent
Signature Does not Match	23,826	74.86%
Unsigned	4,713	14.81%
Too Late	2,477	7.78%
ID Required	214	0.67%
Other than Voter	206	0.65%
Empty Envelope	114	0.36%
No Signature on File	113	0.36%
Witness Signature Missing	70	0.22%
Canvassing Board	33	0.10%
Deceased	19	0.06%
Review	17	0.05%
Marked Moved	12	0.04%
Voter Name Change	9	0.03%
Power of Attorney	4	0.01%
Invalid	1	0.00%
Ballot Style Change	1	0.00%

Table 3: Held Ballots

prop	sd
0.002	0.042

Table 4: Methods of Ballot Return

Return Method	n	prop
Drop Box	2075750	0.500291028021841
Mail	2000462	0.482145340478684
Email	29347	0.00707312576146307
In Person	21895	0.00527706711238743
Non-Standard Dropbox	11090	0.00267287847802588
Non-Standard Mail	10094	0.00243282555069371
Fax	447	0.000107734596905101

Table 5: Reviewed Ballots

prop	sd
0.009	0.096

Reason	Count	Percent
Signature Does not Match	23,826	74.86%
Unsigned	4,713	14.81%
Too Late	2,477	7.78%
ID Required	214	0.67%
Other than Voter	206	0.65%
Empty Envelope	114	0.36%
No Signature on File	113	0.36%
Witness Signature Missing	70	0.22%
Canvassing Board	33	0.10%
Deceased	19	0.06%
Review	17	0.05%
Marked Moved	12	0.04%
Voter Name Change	9	0.03%
Power of Attorney	4	0.01%
Invalid	1	0.00%
Ballot Style Change	1	0.00%

Ballot Status	Count	Percent
Accepted upon Reception	4,029,694	97.46%
Challenged and Cured	72,037	1.74%
Challenged, Never Cured	31,781	0.77%
Unresolved	1,319	0.03%

Race/Ethnicity	"wru" Prediction	ACS Estimate (CVAP)
White	79.0%	77.3%
Asian	6.0%	6.6%
Black	7.0%	3.5%
Hispanic	6.4%	7.3%
Other	1.6%	5.4%

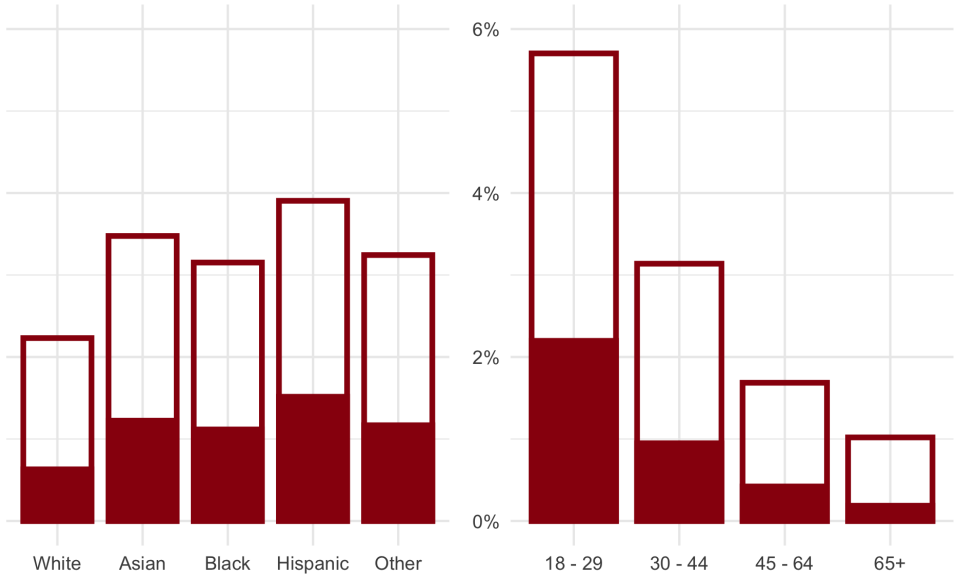

Figure 9: Ballot Challenge and Rejection Rates, by Demographic Group

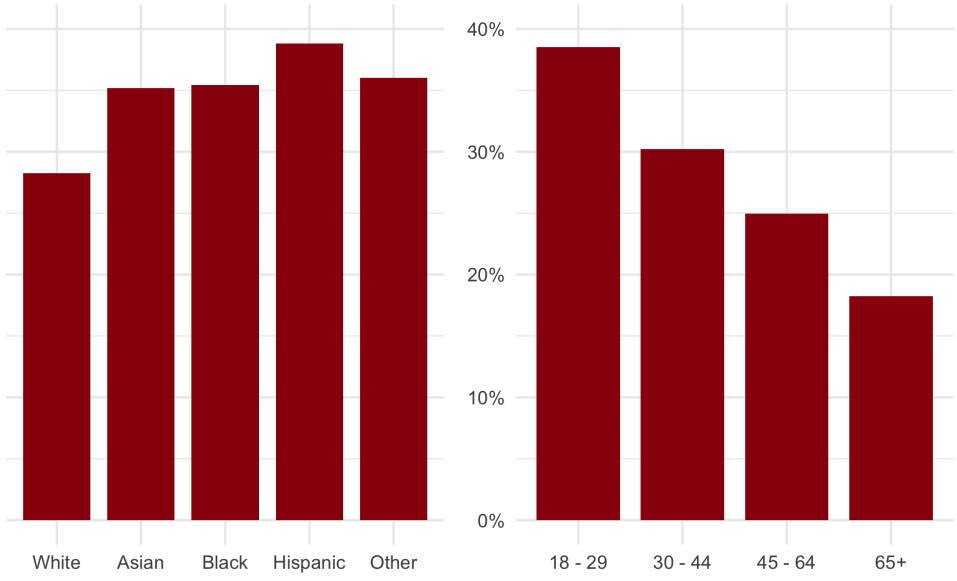

Figure 10: Rejection Rates Among Challenged Ballots, by Demographic Group

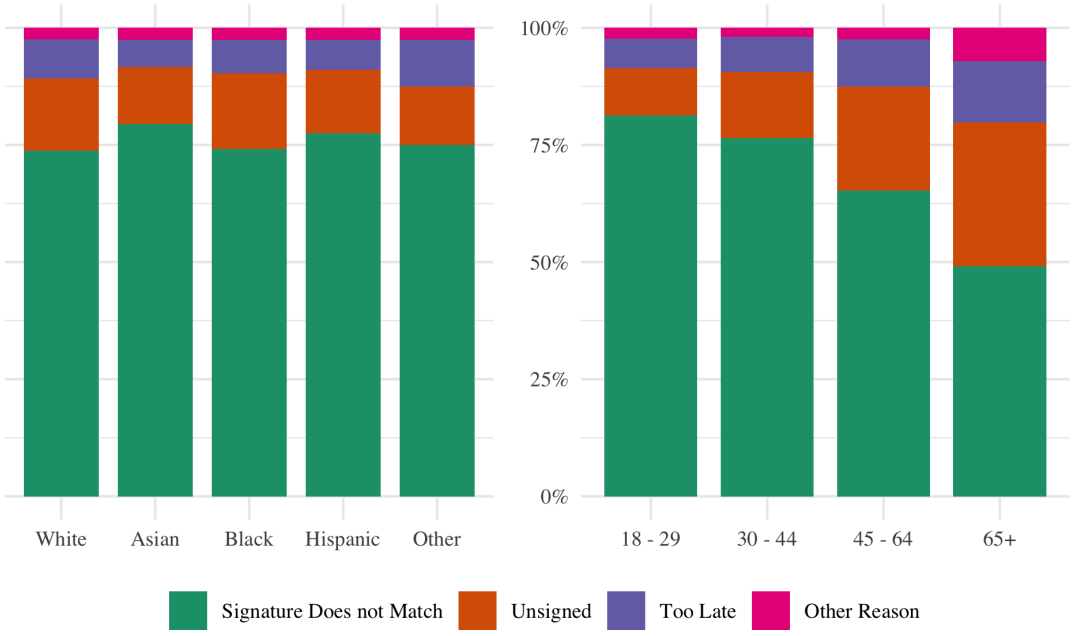

Figure 11: Prevalence of Reasons for Ballot Challenge, by Demographic Group

.1 Estimates of Voter Race and Ethnicity

In nearly any discussion of disparities related to electoral participation or access, variables related to race and ethnicity are desirable measures to examine. **NEED CITATIONS** Although a handful of predominantly Southern states make data on race or ethnicity available within their public voter files, most states, including Washington, do not provide any information of this type. However, the important role that race plays in the academic research and popular discourse about voting rights has lead to the development of a number of techniques to estimate the race or ethnicity of voters using other sources of information found in the voter file. Such techniques often leverage US Census data such as the Spanish or Asian surname list as in Barreto et al. (2004). More sophisticated approaches such as Greiner and Quinn (2010) combine individual level information with ecological data to produce estimates of race.

In this paper, we apply a Bayesian version of this approach outlined by Imai and Khanna (2016) and implemented in their R package `wru`. This technique uses surname analysis alongside Census demographics at a chosen Census geography (e.g. Census blocks, Census tracts, or counties) to produce a vector of probabilities that the voter falls into one of five racial/ethnic categories: Black, White, Asian, Hispanic/Latino, and Other. Although the voter file includes county, better estimates can be constructed if a more granular geography is used. To accomplish this, we geocoded the addresses present in the voter file to assign each voter to their Census Tract.

Any form of surname analysis comes with caveats. One is that it is more difficult to distinguish between Black and White Americans on the basis of surname since the surnames common among Black Americans are typically similar to the surnames common among White Americans (Grumbach & Sahn, 2020). Additionally, because surnames are usually passed down patrilinearly, Americans who fall into more than one racial group will usually be assessed only on the basis of their father's surname.

Beyond these general concerns, the Bayesian method implemented by Imai and Khanna

relies on an independence assumption to generate the probabilities. The assumption requires that surname and geography are conditionally independent given race, meaning that, if a voter's race is known, no information about where the voter lives is given by the surname. Although there are specific cases in which this assumption is unlikely to hold, empirical assessment finds that it is generally plausible, and validation of the algorithm on voter files containing race finds that it performs well (Grumbach & Sahn, 2020; Imai & Khanna, 2016).

As the table shows, there are some differences between the population of Washington as estimated by the Census Bureau in 2019 and the breakdown of our estimates based on voter surname and location. Notably, 7% of voters are predicted to be Black, higher than the 3.5% of Washington's voting age population as estimated by the ACS. Additionally, 1.6% of voters were predicted as 'Other', a lower proportion that the 5.4% reported by the ACS.

Table 6: Summary of Logit Models for Rejection and Challenge Reasons

	Dependent variable:			
	Ballot Rejected	Non-matching Signature	Unsigned	Late
	(1)	(2)	(3)	(4)
Asian	0.328***	0.390***	0.105*	0.065
	(0.021)	(0.024)	(0.060)	(0.082)
Black	0.403***	0.384***	0.518***	0.314***
	(0.022)	(0.026)	(0.056)	(0.083)
Hispanic	0.289***	0.292***	0.324***	0.140**
	(0.019)	(0.021)	(0.050)	(0.072)
Other	0.104	−0.017	0.322	0.584**
	(0.091)	(0.110)	(0.225)	(0.260)
Age: 18 - 29	1.290***	1.778***	0.211***	0.641***
	(0.025)	(0.035)	(0.051)	(0.075)
Age: 30 - 44	0.672***	1.102***	−0.087*	0.190**
	(0.026)	(0.035)	(0.051)	(0.075)
Age: 45 - 64	0.192***	0.468***	−0.116**	−0.011
	(0.027)	(0.037)	(0.050)	(0.076)
Elections since 2017: 4-6	−1.462***	−1.487***	−1.417***	−1.266***
	(0.019)	(0.022)	(0.046)	(0.060)
Elections since 2017: 7+	−2.761***	−2.877***	−2.570***	−2.620***
	(0.034)	(0.044)	(0.068)	(0.103)
Male	0.332***	0.330***	0.533***	0.022
	(0.012)	(0.013)	(0.030)	(0.041)
Constant	−5.052***	−5.748***	−6.386***	−6.979***
	(0.025)	(0.034)	(0.048)	(0.071)
Observations	4,083,716	4,075,832	4,057,124	4,054,922
Log Likelihood	−162,621	−126,237	−33,771	−19,317
Akaike Inf. Crit.	325,264	252,496	67,565	38,657

Notes: *p<0.1; **p<0.05; ***p<0.01

Table 7: Multinomial Logit Models for Ballot Rejection and Challenge Reasons (AMEs)

	Ballot Status (base outcome: Accepted upon Reception)			
	Challenge Never Cured	Non-matching Signature	Unsigned	Late
	(1)	(2)	(3)	(4)
Male	0.002***	0.002***	0.001***	0.00001
	(0.0001)	(0.0001)	(0.00003)	(0.00002)
Age: 18-29	0.010***	0.009***	0.0002***	0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.00004)
Age: 30-44	0.004***	0.004***	−0.0001*	0.0001**
	(0.0001)	(0.0001)	(0.0001)	(0.00004)
Age: 45-64	0.001***	0.001***	−0.0001**	−0.00001
	(0.0001)	(0.0001)	(0.0001)	(0.00004)
Asian	0.003***	0.002***	0.0001	0.00003
	(0.0002)	(0.0002)	(0.0001)	(0.00005)
Black	0.003***	0.002***	0.001***	0.0002***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Hispanic	0.002***	0.002***	0.0004***	0.0001*
	(0.0002)	(0.0001)	(0.0001)	(0.00005)
Other	0.001	−0.0001	0.0003	0.0005*
	(0.001)	(0.001)	(0.0003)	(0.0003)
Elections since 2017: 4-6	−0.010***	−0.008***	−0.002***	−0.001***
	(0.0001)	(0.0001)	(0.00005)	(0.00003)
Elections since 2017: 7+	−0.013***	−0.009***	−0.002***	−0.001***
	(0.0001)	(0.0001)	(0.00004)	(0.00003)
Constant	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	4,083,716	4,083,716	4,083,716	4,083,716

Note: *p<0.1; **p<0.05; ***p<0.01

Table 8: Comparison of Race Estimation on Voter File to Census Data

Race/Ethnicity	"wru" Prediction	ACS Estimate (CVAP)
White	79.0%	77.3%
Asian	6.0%	6.6%
Black	7.0%	3.5%
Hispanic	6.4%	7.3%
Other	1.6%	5.4%