Utah 2016: Evidence for the positive turnout effects of "Vote At Home" (also known as Vote By Mail) in participating counties

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Executive Summary

In the 2016 general election, twenty-one counties in Utah administered voting entirely by mail, while eight counties administered traditional polling place-based voting. Using vote propensity scores to control for voters' pre-existing differences in likelihood to vote, we show that the advent of vote-by-mail increased turnout by 5-7 points. Low-propensity voters, including young voters, showed the greatest increase in turnout in vote-by-mail counties relative to their counterparts in non-vote-by-mail counties. We find similar results by zooming in on specific geographic areas within Utah where vote-by-mail counties are bordered by non-vote-by-mail counties, with magnitudes of 4-9 points of increased turnout. In one mountaintop community that happened to be bisected by a county line, the increase in turnout due to vote-by-mail may have been as high as 12.5 points.

1. Background

1.1 About Vote At Home / Vote By Mail

In the 2016 election and various previous elections, three states have conducted their by mail: Colorado, Oregon, and Washington. In other states, certain jurisdictions have also conducted elections by mail even if the state as a whole has not. These Vote At Home programs, often called Universal Vote By Mail or simply Vote By Mail (VBM), all have their own particular variations.[1] Colorado, for example, offers a large number of drop-off locations where voters can return their ballot instead of mailing it in; Oregon requires ballots be received by 8pm on Election Day, whereas Washington merely requires ballots to be postmarked by Election Day.

The key unifying factor in all VBM jurisdictions is that the state or local elections administrators are charged with ensuring that every registered voter receives a ballot in the mail in advance of the election. This is also what distinguishes VBM programs from absentee balloting, for which voters must make a conscious choice and take active steps to receive their ballot by mail.

1.2 Recent Research

Various studies have attempted to quantify the effect of moving to a VBM system. Probably the strongest evidence comes from a 2013 study by Alan Gerber, Gregory Huber, and Seth Hill in the journal Political Science Research and Methods.[2] This study of voter turnout in Washington State took advantage of the fact that VBM implementation there was staggered across a few election cycles, with some counties choosing to adopt VBM earlier than others. Gerber, Huber, and Hill found

[1] In the three statewide systems currently in use -- Oregon, Colorado, and Washington -- the trend toward offering dropsites and voting centers has resulted in most ballots actually being returned in person, rather than returned via direct mail. Hence, the moniker "Vote at Home" -- where the vast majority of ballots are actually marked -- is in some way more precise. However, most people (including Utah voters) know this system as "Vote by Mail," so this more familiar term will be used throughout this report.

[2] Gerber, A., Huber, G., & Hill, S. (2013). Identifying the Effect of All-Mail Elections on Turnout: Staggered Reform in the Evergreen State. Political Science Research and Methods, 1(1), 91-116. doi:10.1017/psrm.2013.5

that implementing VBM increased voter turnout by two to four percentage points overall, and that the greatest effects were seen in low-propensity voters.

Other evidence has been indicative, though not conclusive. For instance, a previous study by Pantheon Analytics examined turnout in Colorado in 2014, the first year the state implemented VBM.[3] Using each voter's modeled vote propensity score, we found that low-propensity voters in Colorado dramatically overperformed their expected turnout, even as similar voters elsewhere in the country slightly underperformed. The Colorado voters who were predicted to turn out at a rate of 10%, for instance, turned out at a rate of 31% instead. While it is possible that other factors contributed to this pattern, the advent of Colorado's vote-by-mail was certainly the most logical explanation. Still, without any sort of control group, it was not possible to rule out other explanations.

1.3 Utah Overview

In 2016, twenty-one of Utah's twenty-nine counties conducted the general election by mail, while the remaining eight counties continued to use traditional polling place-based voting. (Ten of those twenty-one counties had implemented VBM in the 2014 midterm election as well.) Voter turnout in 2016 in the VBM counties was 8.7 points higher than in the non-VBM counties. This surface-level comparison is not enough, however, to determine whether the voting method caused higher turnout. Indeed, analysis of the voters in the twenty-one VBM counties shows that they also had turned out in greater numbers in previous elections, though the gaps were smaller than in 2016.

Figure 1.3.1: Turnout differences for counties grouped by 2016 vote method

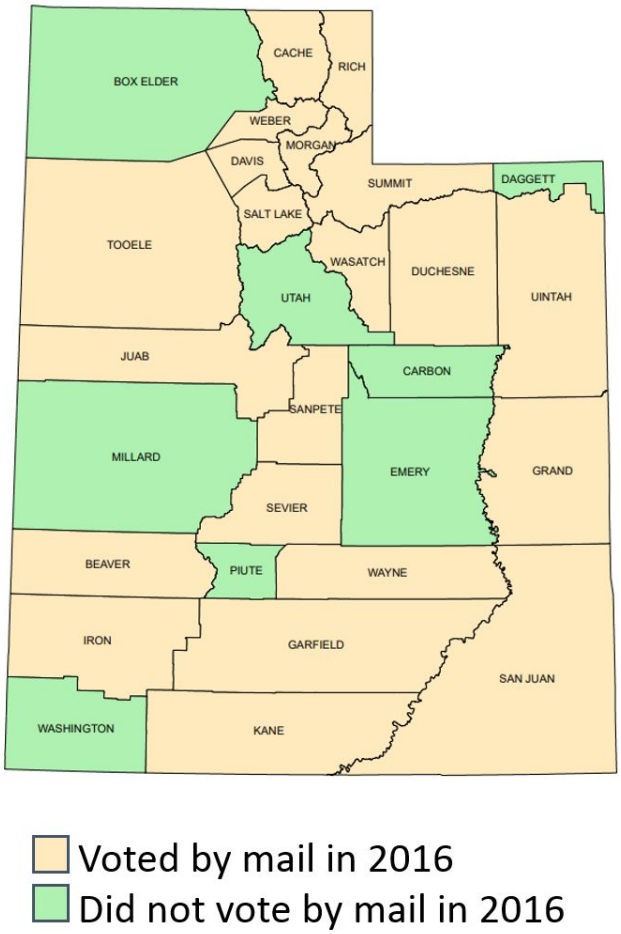
Turnout	Non-VBM County	VBM County	Difference
2016 General	67.4%	76.1%	8.7%
2014 General	31.8%	37.7%	5.8%
2012 General	58.4%	61.6%	3.2%
2010 General	34.8%	38.1%	3.3%

Note: these turnout figures are calculated using voters present on the 2016 voter file; turnout percentages may differ slightly from actual turnout in those years.

[3] https://docs.wixstatic.com/ugd/ef45f5_e8b1a125bf7644c9bab0572a7062a960.pdf

Unlike Washington State, where the first counties to adopt VBM were entirely rural, Utah has not seen a strong urban-rural divide in adoption. Salt Lake County, which is Utah's largest and most metropolitan, debuted its VBM program in 2015 for municipal elections; 2016 was its first general election for VBM. Utah's second most populous county, Utah County (containing Provo and Orem), did not adopt VBM until 2017, and thus was in the non-VBM category for the 2016 election. Some of Utah's most rural counties adopted VBM in 2014 or 2016, but other rural counties still use polling place voting today. With the exception of three contiguous counties in the center of Utah, the eight counties that did not vote by mail in 2016 were relatively well distributed geographically around the state.

Figure 1.3.2: Utah counties in 2016



The fact that not all counties in Utah adopted VBM makes Utah an especially good state for studying the turnout effects of adopting all-mail elections. While the non-adopter counties aren't perfect controls for the adopter counties, they provide a good comparison group -- especially when pre-existing differences in vote propensity are controlled for.

2. Methodology and Descriptive Statistics

2.1 Methods

Most of the analyses in this report use a difference-in-difference method to compare 2016 turnout among voters from VBM counties versus voters from non-VBM counties. In all analyses, we exploit the unique features of a voter turnout model to help us adjust for pre-existing differences in vote propensity. Instead of directly comparing turnout in VBM counties versus non-VBM counties, we instead compare expected turnout versus actual turnout within both categories -- and then compare those differences to each other.

If the turnout model is reasonably accurate for pre-VBM conditions, and if all-mail voting does indeed increase turnout, then we hypothesize that we will see turnout in VBM counties significantly outpace the turnout scores in those counties. In the non-VBM counties, on the other hand, we hypothesize that actual turnout will be fairly close to the levels predicted by the turnout model scores.

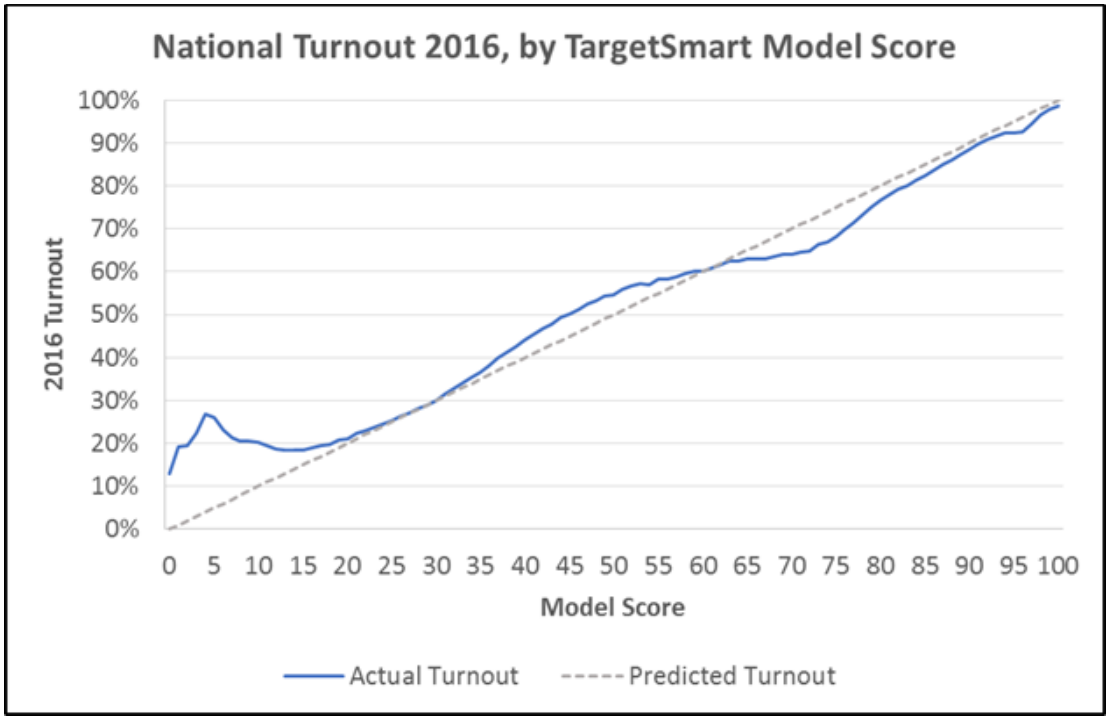
In addition to difference-in-difference analysis, we also use regression analysis to provide further controls beyond what the turnout model offers. In particular, regression analysis allows us to control for local differences that can affect turnout (for example, a hotly contested school district levy). In a presidential year these local quirks tend to be muted because so many more people vote anyway. But it is a worthwhile exercise, and a good check on the difference-in-difference analysis.

2.2 About the Turnout Model

Turnout models, also called vote propensity models or voter turnout scores, are a method that political campaigns use to predict how likely someone is to vote in a given election. For instance, a person with a turnout score of 60 would be understood by a campaign to have around a 60% chance of voting. If, after the election, 60% of the people with a score of 60 actually voted (and 61% of people with scores of 61 actually voted, etc), then the model would be considered highly accurate. While models rarely end up being spot-on in all cases, they can still be quite useful for post-election analysis so long as the plot of expected turnout versus actual turnout is reasonably close to a diagonal line.

The 2016 turnout score used in this report was developed by the voter data vendor TargetSmart prior to the 2016 election. Like most turnout models, TargetSmart generated its 2016 vote propensity score by using data from a similar previous election to train and validate a model.

Figure 2.2.1: Predicted versus actual turnout by turnout score in United States



As figure 2.2.1 shows, the TargetSmart model validated fairly well nationally. Though the model significantly underpredicted turnout among those with scores under 15, these voters represented only around 2% of the national total (and less than 1% of voters in Utah). Elsewhere in the turnout spectrum, the TargetSmart model made slight underpredictions for voters with mid-range scores and very slight overpredictions for voters with higher scores. But in general we would classify this model as fairly accurate predictor of actual turnout.

The most important variables in any turnout model are those relating to each person's vote history. The number of general elections, primary elections, and municipal elections that a person voted in will generally be a part of the model, along with dummy variables for specific elections and a measure of how long a person has been registered. Turnout models also incorporate demographic variables, such as age, marital status, race (if known), income, education, and other factors that may be known about each voter. TargetSmart confirmed that their model incorporated all of these many variables, though the exact formula is proprietary.

Importantly for these analyses, the turnout model did not make any adjustments to account for what might happen with the advent of VBM in some of Utah's counties. If, as we hypothesize, VBM has a positive effect on turnout, the 2016 turnout model would have had no way of anticipating this. This is because, with some exceptions, the vast majority of the vote history data for Utah's voters comes from elections in which VBM was not the standard.[4]

Using the turnout model as a control confers certain advantages relative to previous studies of vote-by-mail. For instance, in the 2013 Washington study, one of the analyses involved running a regression that used age, sex, and participation

[4] If VBM affected 2014 turnout in the 10 counties that adopted VBM in 2014, then the 2016 turnout scores of people in those counties would reflect those effects somewhat. For example, someone who voted in 2014 would likely have a higher turnout score in 2016 because people who vote in midterms typically also vote in presidentials. However, since turnout scores incorporate information from a large number of previous elections as well as demographic factors, there is a limited extent to which the 2016 turnout score could have "baked in" the effects of 2014 VBM adoption. Even in the 2014 adopter counties, the 2016 model largely could not anticipate the effects of using a VBM system in 2016.

in two prior elections as control variables. A turnout model incorporates all these variables and more.

No turnout model is perfect, and there were probably other hidden sources of error in the TargetSmart model (aside from its blindness to VBM implementation). For instance, perhaps the independent presidential candidate and Utah native Evan McMullin brought certain voters out of the woodwork who would not have otherwise voted. The model would not have been able to anticipate this, and therefore would have given these voters lower scores than they perhaps deserved. But importantly for our analyses, many of the model's hidden sources of error would likely apply in all counties within Utah. McMullin was on the ballot for everyone in the state. Likewise, Donald Trump's rhetoric and other national news stories would be heard by voters statewide, though certainly there could be geographic variation in responsiveness to those messages. However, even if there are slightly uneven geographical distributions of the people affected by hidden modeling errors, it is unlikely that the unevenness would coincide exactly with the twenty-one counties that voted by mail versus the eight that did not.

2.3 Descriptive Statistics

The post-2016 Utah voter file, as transmitted by TargetSmart, contains 1,519,404 records for voters who were registered to vote before Election Day 2016, of whom 1,118,880 cast a ballot. These figures exclude voters with registration dates after Election Day 2016, some of whom voted provisionally in the 2016 election. All 1,519,404 had been assigned a turnout score prior to the election, so all are included in the analyses in this report.

Descriptive statistics of these 1.5 million voters are represented below and in Appendix I, with breakouts for the VBM and non-VBM counties. There are small variations between the VBM and non-VBM counties in the distributions of age, race, income, and partisanship; these distributions can be found in Appendix I. Most relevantly, there were small variations in the pre-existing distribution of high-propensity and low-propensity voters within the two sets of counties. These various distributional differences are exactly why the two sets of counties cannot be compared without adequate controls.

Figure 2.3.1: Registered voter populations for VBM and non-VBM counties, 2016

Registered Voters In Utah, 2016	Total Voters	Percent of State
Non-VBM Counties	427,380	28%
VBM Counties	1,092,024	72%
Counties that started VBM in 2014	300,526	20%
Counties that started VBM in 2016	791,498	52%

Figure 2.3.2: Turnout score distribution for Utah registered voters, 2016

Turnout Score	Non-VBM Counties	VBM Counties	Total
Range: 0-10	0.1%	0.1%	0.1%
Range: 10-20	2.6%	2.3%	2.4%
Range: 20-30	7.1%	6.1%	6.4%
Range: 30-40	7.8%	6.8%	7.1%
Range: 40-50	8.8%	8.0%	8.2%
Range: 50-60	9.1%	8.6%	8.7%
Range: 60-70	9.4%	9.7%	9.6%
Range: 70-80	11.4%	12.4%	12.1%
Range: 80-90	11.4%	12.3%	12.0%
Range: 90-100	32.4%	33.8%	33.4%
Total	100.0%	100.0%	100.0%

3. Statewide Results

3.1 Difference-in-difference results by turnout score

By performing a simple difference-in-difference analysis using turnout scores and actual turnout, we see that counties with all-mail voting had seven points of additional voter turnout relative to polling place counties, after adjusting for pre-existing differences in expected turnout.

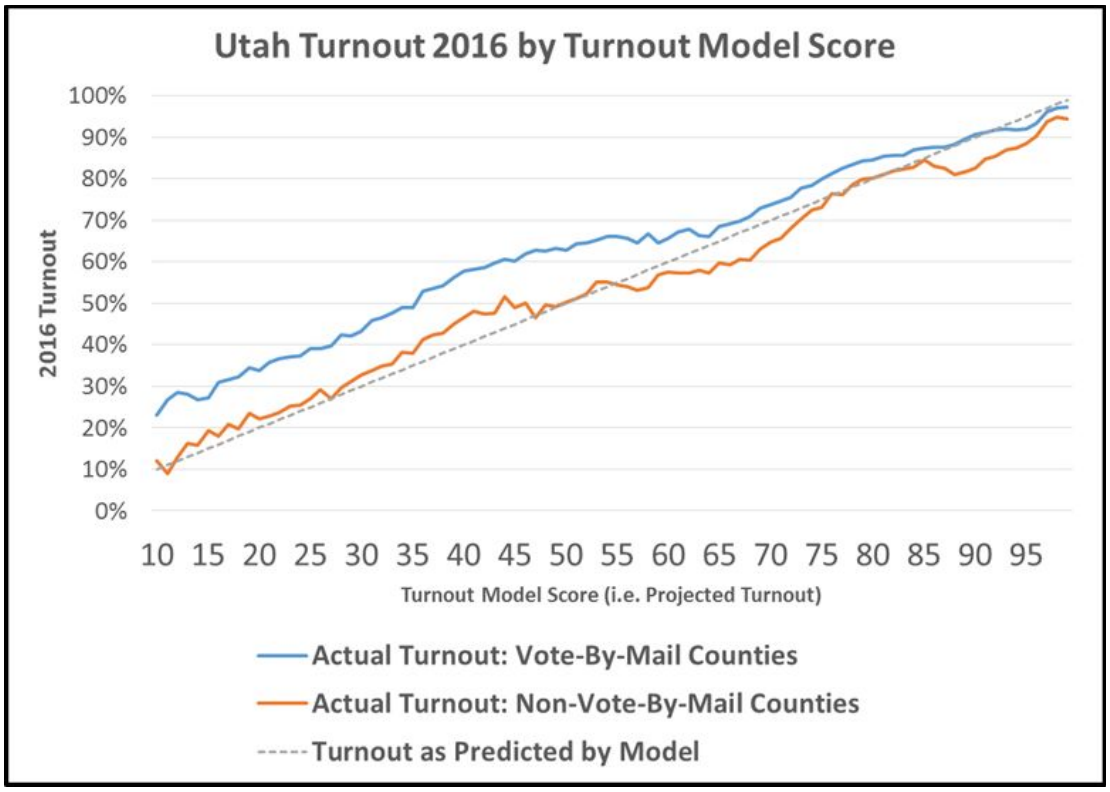
Figure 3.1.1: Predicted versus actual turnout in VBM and non-VBM counties

2016 Turnout	Non-VBM Counties	VBM Counties
Predicted Turnout	69.1%	70.9%
Actual Turnout	67.4%	76.1%
Difference (Actual - Predicted)	-1.8%	5.2%
Difference-in-Difference	7.0%	

Residents of VBM counties nearly universally overperformed their turnout model scores, whereas in non-VBM counties the predicted turnout was closer to actual turnout for most score ranges. Consider, for example, the voters with a turnout score of 50 (i.e. a projected turnout of 50%). As Figure 3.2.1 shows, in the counties using traditional polling places almost exactly 50% of this cohort actually voted, but in the counties that conducted election by mail 63% of this cohort voted.

Figure 3.1.2 demonstrates that the turnout model scores were not perfectly accurate predictors for voters from either type of county. No turnout model has ever been entirely error-free. But since almost all of the potential sources of error in the turnout model would apply equally to voters in VBM and non-VBM counties, it is reasonable to believe that the difference in election administration methods is responsible for most of the turnout gap. Our attempts to rule out other explanations are explored in sections 3.2 and 3.3.

Figure 3.1.2: Predicted versus actual turnout by turnout score, Utah[5]



As with Gerber, Huber, and Hill's study of Washington, the positive turnout effect of living in one of Utah's VBM counties was especially pronounced among low-propensity and mid-propensity voters. It is important to remember that cohorts with lower scores inherently have more room to grow than cohorts with higher scores. Still, it is notable that the pattern in Utah is similar to both the strong evidence from Washington and the observational data from Colorado.

3.2 Randomization inference

To provide context to experimental results, researchers sometimes employ a method called randomization inference. In this method, units that were randomly assigned to treatment and control groups are re-randomized thousands of times to see what the results would look like with different treatment-control

[5] Scores under 10 are excluded from this graph because there were so few voters with these scores.

assignments. As Professor Donald Green writes: "Against the backdrop of all possible random assignments, is the actual experimental result unusual? How unusual is it?"[6]

Of course, the assignment of Utah's counties to the VBM and non-VBM condition in 2016 was notably *not* random. The eight counties that retained the traditional polling place voting method could have underlying reasons for doing so. Still, running randomization inference analysis can provide useful context to the magnitude of the results. If we randomly chose eight counties and compared them to the remaining twenty-one, how often would we see turnout differences as extreme as what we actually observed in preceding pages?

To answer this, we ran 10,000 simulations. In each simulation we chose a random set of eight of Utah's counties to compare to the remaining twenty-one. We once again employed a difference-in-difference metric, comparing predicted versus actual turnout in 2016 for each of the two randomly chosen sets of counties, then comparing those two differences to each other.

In 96.8% of simulations, the difference-in-difference for 2016 turnout (predicted vs. actual) was lower than the seven point difference actually observed in Utah in 2016. In other words, only 3.2% of the time could choosing a random set of eight of Utah's counties produce a result as extreme as that seen in the 2016 non-VBM versus VBM counties. This tends to reinforce the idea that voting method, and not simple random chance, is the major driver of the turnout differences we observed.

3.3 Regression Analysis

Regression is another way to estimate the turnout effects of living in a Vote By Mail county. We included the turnout score as a control in the regression, to account for pre-existing differences at the individual level. We also included in precinct level fixed effects variables to control for community level differences that might not be captured in the individual turnout scores. For estimating average effect sizes we use Ordinary Least Squares regression. While we are estimating a binary outcome

[6] https://egap.org/methods-guides/10-things-randomization-inference

(voting or non-voting) and OLS can theoretically lead to results that are less than zero or greater than one, it also directly calculates the effect size of the VBM variable, making OLS attractive for getting a quick read on the relationships between variables. Logistic regression, which is more appropriate for a binary outcome variable, does not directly calculate an effect size because the equations are transformed. We have performed both types of regression analysis. Coefficients reported under the logit condition require additional calculation and do not imply an average effect size.

Figure 3.2.1: Regression analysis results

Type	OLS			Logit	
Outcome	2016 General Vote			2016 General Vote	
Vote By Mail County	0.05379*** (0.00903)	0.05379*** (0.00903)	0.07373*** (0.0007099)	0.4522*** (0.004463)	0.4435*** (0.004468)
Turnout Score	0.007696*** (0.00003427)	0.007657*** (0.00003524)	0.007899*** (0.00001294)	0.04289*** (0.00008618)	0.0423*** (0.00008754)
Precinct FE Included?	Y	Y	N	N	N
Vote Absentee or Mail in 2012	NA	0.01624*** (0.001237)	NA	NA	0.2969*** (0.008495)
Clustered Standard Errors?	Y	Y	N	N	N

Standard Errors reported in parentheses below
*** = p <.01

With both types of model we see a significant and positive association between voting in 2016 and living in a vote-by-mail county. The effect size in the OLS model, around 5.4 points, is slightly lower than the seven point difference seen in the difference-in-difference analysis, but is in the same order of magnitude. Notably, when precinct-level fixed effects are not included in the regression, the coefficient for vote-by-mail counties rises to 7.4 points. This suggests that there are indeed precinct-level differences that can explain a portion of the gap between the VBM counties and the non-VBM counties -- but that the majority of the gap is indeed explainable by the difference in voting method.

We also ran the models using prior absentee voting status as an additional control. Though these voters were a relatively small portion of the voter file (about 10%),

we theorized that they might have markedly different reactions to the advent of vote-by-mail since they were already used to voting by mail. While this variable was predictive, it also did not markedly change the coefficient for VBM status. Section 3.6 explores these prior-absentee voters further.

3.4 Demographic Comparisons

We have already observed that the positive turnout effects of using a vote-by-mail system appear unequally distributed across the vote propensity spectrum. In this section we again use difference-in-difference analysis, this time to determine whether these effects are unequally distributed across different demographic groups. Once again, we use turnout scores as a touchstone, comparing predicted turnout to actual turnout for each group, and then comparing those differences across the VBM and non-VBM counties.

Figure 3.4.1: Difference-in-difference analysis of age and gender groups

	Non-VBM Counties			VBM Counties			Difference
Age and Gender	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	In Difference
Unknown	63.2%	61.4%	-1.9%	64.8%	70.3%	5.4%	7.3%
18-24 F	58.2%	56.2%	-1.9%	58.3%	63.9%	5.6%	7.5%
18-24 M	55.4%	52.4%	-3.0%	55.2%	59.8%	4.5%	7.6%
25-34 F	56.5%	53.0%	-3.5%	59.5%	66.6%	7.1%	10.7%
25-34 M	53.0%	50.5%	-2.6%	55.3%	62.4%	7.1%	9.7%
35-49 F	72.2%	69.8%	-2.4%	72.5%	76.6%	4.2%	6.6%
35-49 M	69.0%	66.4%	-2.6%	69.4%	74.2%	4.8%	7.4%
50-64 F	78.8%	78.0%	-0.9%	79.7%	84.5%	4.8%	5.7%
50-64 M	77.5%	76.7%	-0.8%	77.7%	82.9%	5.1%	5.9%
65-79 F	83.3%	83.5%	0.2%	84.8%	89.3%	4.5%	4.3%
65-79 M	82.3%	83.6%	1.3%	84.3%	89.6%	5.2%	3.9%
80+ F	74.8%	70.8%	-3.9%	77.4%	81.5%	4.1%	8.0%
80+ M	78.0%	76.8%	-1.2%	80.3%	84.9%	4.6%	5.9%

Younger cohorts, particularly Millennials in the 25-34 age range, showed the greatest overperformance in VBM counties relative to their turnout scores. Interestingly, women in the 80+ age cohort also showed somewhat higher levels of responsiveness; the advent of vote-by-mail increased their turnout by as much as eight points. It is possible that a universal vote-by-mail system was a welcome change for older voters with less mobility. For younger voters who historically vote

at lower rates, receiving a ballot in the mail may be a much-needed prompt for civic participation.

Figure 3.4.2: Difference-in-difference analysis by race

Race	Non-VBM Counties			VBM Counties			Difference In Difference
	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	
Asian	58.5%	57.2%	-1.3%	59.5%	66.7%	7.2%	8.6%
Black	68.5%	58.3%	-10.2%	72.2%	71.9%	-0.3%	9.8%
Hispanic	55.6%	57.9%	2.3%	57.8%	66.2%	8.4%	6.1%
Other/Unknown	64.8%	61.7%	-3.1%	65.9%	71.4%	5.6%	8.7%
White	70.1%	68.2%	-1.9%	72.3%	77.3%	5.0%	6.9%

All racial groups turned out at higher rates when they were in VBM counties. Whites, making up 88% of Utah's voters, slightly underperformed their turnout scores in non-VBM counties but overperformed in VBM counties.

Black voters are less than one half of one percent of voters in Utah, both in VBM and non-VBM counties. Thus, it is important to remember the small sample size. Black voters in Utah showed the greatest difference-in-difference, with significant underperformance relative to their turnout scores in non-VBM counties and very close to expected turnout in VBM counties. Other researchers have noted that Black turnout fell nationally in 2016, relative to previous elections.[7] After 20 years of increasing Black turnout, including the Obama era, it is possible that some regression to the mean was inevitable in 2016. It is likely that the turnout model scores for Black voters did not anticipate this regression. It is notable, therefore, that the advent of vote-by-mail appears to have almost fully compensated for this modeling error.

Hispanic turnout, meanwhile, showed the lowest difference-in-difference. In VBM counties Hispanics overperformed their turnout scores to a greater degree than any other racial group. However, unlike all other racial groups, Hispanics also overperformed their turnout scores in non-VBM counties. It is possible that the model did not adequately anticipate Hispanic enthusiasm for voting in 2016. This enthusiasm would also explain the smaller marginal effects of vote-by-mail.

[7]http://www.pewresearch.org/fact-tank/2017/05/12/black-voter-turnout-fell-in-2016-even-as-a-record-number-of-americans-cast-ballots/

Figure 3.4.3: Difference-in-difference analysis by household income

Household Income	Non-VBM Counties			VBM Counties			Difference In Difference
	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	
Unknown Inc.	55.8%	49.6%	-6.1%	58.5%	62.0%	3.5%	9.6%
<$30k	74.7%	74.6%	-0.1%	74.0%	79.1%	5.1%	5.2%
$30k-$50k	73.9%	73.5%	-0.4%	74.9%	80.2%	5.3%	5.7%
$50k-$75k	71.6%	71.7%	0.1%	72.1%	77.8%	5.7%	5.6%
$75k-$100k	74.1%	73.1%	-1.0%	74.7%	80.1%	5.4%	6.5%
$100k+	74.8%	73.5%	-1.3%	76.4%	83.0%	6.6%	7.9%

Higher-income households showed a larger difference-in-difference than lower-income households. It is important to note, however, that 22% of Utahns did not have an estimated household income appended to their voter file record by TargetSmart. Typically, this happens when less information is known about a voter. Younger voters, newly registered voters, and people who have moved recently often fall into this "unknown" category. Since this category actually had the largest difference-in-difference, it makes the results for households with known income somewhat less conclusive.

3.5 Partisanship Comparisons

There are various ways to look at a voter's partisanship. The most obvious method is to look at party registration; in Utah most voters are either Republican or unaffiliated. Political campaigns tend to use a more textured method of examining partisanship, modeling voters on a scale of zero to one hundred with zero being the most Republican and one hundred being the most Democratic.

Figure 3.4.4: Difference-in-difference analysis by party registration

Party Affiliation	Non-VBM Counties			VBM Counties			Difference In Difference
	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	
Democrat	65.3%	65.9%	0.6%	68.8%	76.9%	8.0%	7.4%
Green	53.5%	43.5%	-10.0%	63.2%	66.2%	3.0%	13.0%
Libertarian	57.2%	57.4%	0.2%	58.5%	66.3%	7.8%	7.6%
No Party	60.7%	57.4%	-3.3%	64.5%	69.5%	5.0%	8.3%
Other	61.2%	60.9%	-0.3%	62.3%	67.3%	5.0%	5.3%
Republican	75.2%	74.0%	-1.3%	78.2%	82.7%	4.5%	5.8%

Green Party members showed the greatest difference-in-difference, but this result is not particularly consequential as Greens are only one tenth of one percent of Utahns. Democrats appear to be somewhat more responsive to the turnout effects of vote-by-mail than Republicans, though they also had more room to grow; Democrats had turnout scores that were around 10 points lower on average than Republicans. Perhaps of greater interest to party operatives hoping to woo new voters: unaffiliated voters overperformed by 5 points in VBM counties but underperformed by 3.3 points in non-VBM counties.

Figure 3.4.5: Difference-in-difference analysis by partisanship score

Partisanship Score	Non-VBM Counties			VBM Counties			Difference In Difference
	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	
0-10	75.0%	71.3%	-3.8%	79.6%	82.7%	3.1%	6.8%
10-20	74.3%	73.6%	-0.8%	77.7%	82.0%	4.4%	5.1%
20-30	69.0%	68.4%	-0.6%	72.6%	77.6%	5.0%	5.5%
30-40	64.1%	62.7%	-1.4%	68.1%	73.6%	5.5%	7.0%
40-50	60.4%	58.6%	-1.8%	66.1%	71.5%	5.4%	7.3%
50-60	56.4%	53.9%	-2.5%	64.7%	70.2%	5.5%	8.0%
60-70	54.2%	51.9%	-2.3%	63.8%	69.7%	5.9%	8.1%
70-80	57.0%	54.9%	-2.1%	63.2%	69.3%	6.1%	8.2%
80-90	62.6%	60.7%	-1.9%	63.1%	70.1%	7.0%	8.9%
90-100	65.4%	61.9%	-3.5%	68.9%	76.0%	7.1%	10.7%

Utah's relatively small number of strongly Democratic voters showed the greatest overperformance in VBM counties relative to their turnout scores. The results were not purely monotonic, however. The much larger number of Utah voters with the most conservative partisanship scores (in the 0-10 range) showed average levels of overperformance.

3.6 Previous Vote Methods

Prior to the 2014 and 2016 elections, relatively few Utahns voted by absentee ballot. Whereas 70% of Coloradans were already voting absentee prior to Colorado's adoption of vote-by-mail, this was not the case with Utah. Of the registered voters present on the 2016 Utah voter file, only around 10% had cast their 2012 ballot by mail.

It is logical to hypothesize that this small group of prior-absentee voters would show fewer VBM-related treatment effects in 2016. After all, the voting experience did not really change for these voters who were already used to receiving ballots in the mail. However, Figure 3.6.1 below shows that the 2012 absentee voters had similar behavior patterns in 2016 as those who had voted at the polling place in 2012.

Figure 3.6.1: Difference-in-difference for 2016 turnout, by 2012 vote method

2012 Vote Method	Non-VBM Counties			VBM Counties			Difference In Difference
	Expected 2016 Turnout	Actual 2016 Turnout	Difference	Expected 2016 Turnout	Actual 2016 Turnout	Difference	
Did Not Vote	50.7%	50.4%	-0.3%	52.6%	60.4%	7.8%	8.1%
Polling Place	81.8%	79.0%	-2.9%	81.5%	85.1%	3.6%	6.4%
Mail/Absentee	85.1%	82.6%	-2.5%	85.4%	89.3%	3.9%	6.5%

Regardless of prior absentee status, people who had voted in 2012 underperformed their turnout score in the non-VBM counties but overperformed in the VBM counties, with similar margins for both groups.

There is no clear explanation for this result. Why would a universal vote-by-mail system cause higher turnout among people who were already receiving mailed ballots previously? According to a state elections administration official, in previous years if a voter wished to vote absentee they could choose either to sign up for permanent absentee status or to receive absentee ballots until a specific end date. If most previous absentee voters chose the latter option, then perhaps the advent of VBM was a boon to those whose absentee status had expired.

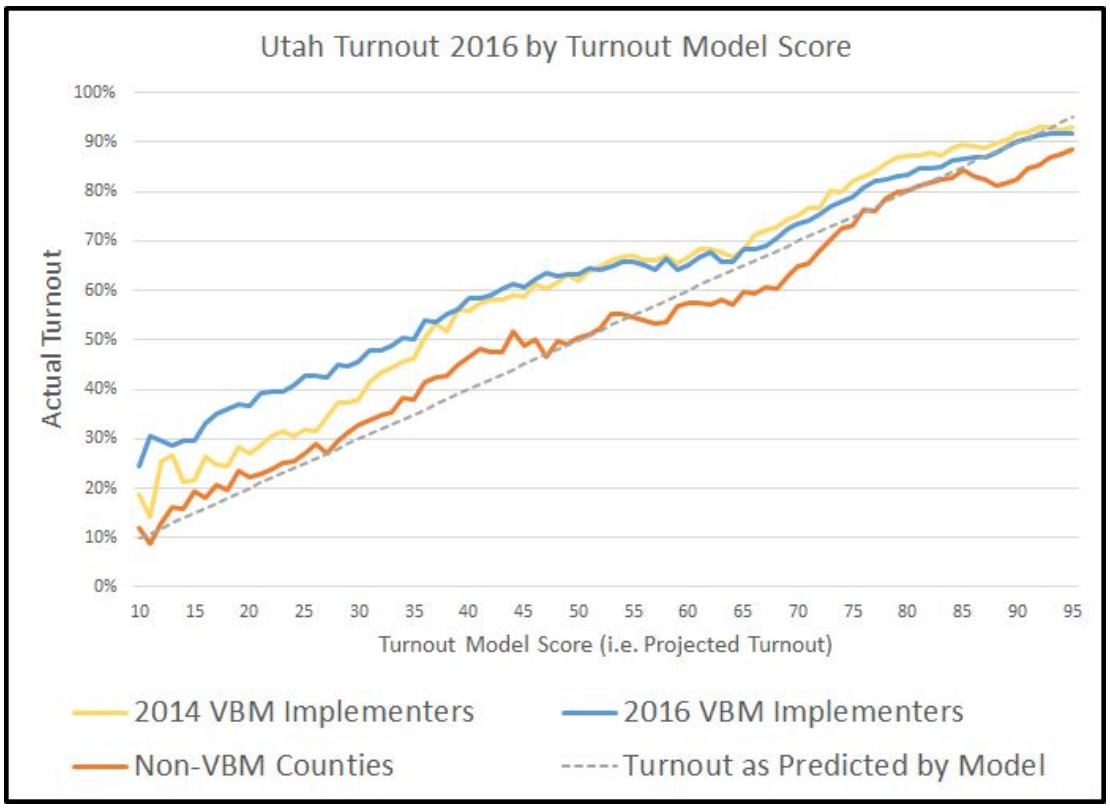
3.7 Counties that implemented vote-by-mail in 2014

Ten counties implemented vote-by-mail in the 2014 elections. If we believe that all-mail elections boost turnout, then more people in the these 2014 implementer counties would have voted in 2014. This would then be reflected in those voters' turnout scores in 2016. In essence, some of the turnout effects of vote-by-mail would be "baked in" to the expectations of the 2016 model. We would therefore hypothesize that people from the 2014 VBM implementer counties should

outperform their turnout score by a *smaller degree* than people from counties who implemented VBM in 2016.

This hypothesis proved mostly correct upon performing an expanded difference-in-difference analysis. Especially at the lower end of the vote propensity spectrum, the 2014 implementer counties outperformed their turnout scores by a greater degree than the non-VBM counties, but by a lesser degree than the counties that were implementing vote-by-mail for the first time in 2016.

Figure 3.7.1: Predicted versus actual turnout by turnout score and county type



4. Border Analysis

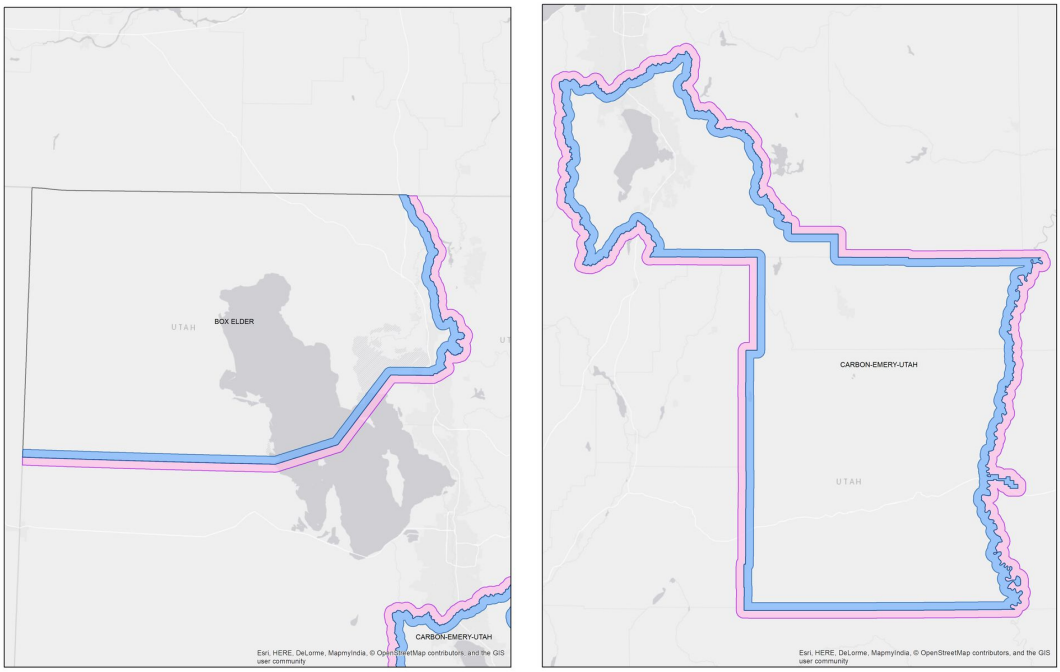
The statewide analysis in this report is compelling on its own. But as an exercise to eliminate additional potential sources of unknown error, we conducted analyses focusing just on voters living near the borders between VBM and non-VBM

counties. This method is based on the theory that voters who live near each other are more alike than voters who live several counties away.

4.1 Counties

Of the eight counties that did *not* use vote-by-mail in 2016, four were very rural and had only small numbers of voters living within a two-mile border zone on either side of their county lines. Of the remaining four counties, three were geographically continuous in the center of the state: Utah, Carbon, and Emery. These three counties were treated as a single unit, with a two-mile border zone drawn around the inside and outside of the perimeter. The final county, Box Elder, was analyzed separately, again with a two-mile border zone drawn on either side of its border with other Utah counties.

Figure 4.1.1: Border Analysis Zones for Box Elder, Utah-Carbon-Emery Counties



Voters in these two-mile zones were analyzed using the same difference-in-difference method seen above in the statewide analysis. Pre-existing demographic and vote propensity differences for voters in these regions are

enumerated in Appendix II. These differences are similar to those seen in the statewide analysis.

4.2 Difference-in-difference results for Utah-Carbon-Emery

Once again, we see turnout in the the vote-by-mail areas outpacing turnout in their non-vote-by-mail counterparts, even after controlling for preexisting differences in predicted turnout.

4.2.1 Analysis for 2-mile border zone inside and outside of Box Elder County

2016 Turnout	Non-VBM Side	VBM Side
Predicted Turnout	68.2%	75.5%
Actual Turnout	69.4%	80.4%
Difference (Actual - Predicted)	1.1%	4.9%
Difference-in-Difference	3.8%	
N	*4,832*	*6,163*

4.2.1 Analysis for 2-mile border zone inside and outside of Utah-Carbon-Emery

2016 Turnout	Non-VBM Side	VBM Side
Predicted Turnout	66.6%	72.2%
Actual Turnout	65.1%	80.0%
Difference (Actual - Predicted)	-1.5%	7.8%
Difference-in-Difference	9.3%	
N	*8,932*	*14,376*

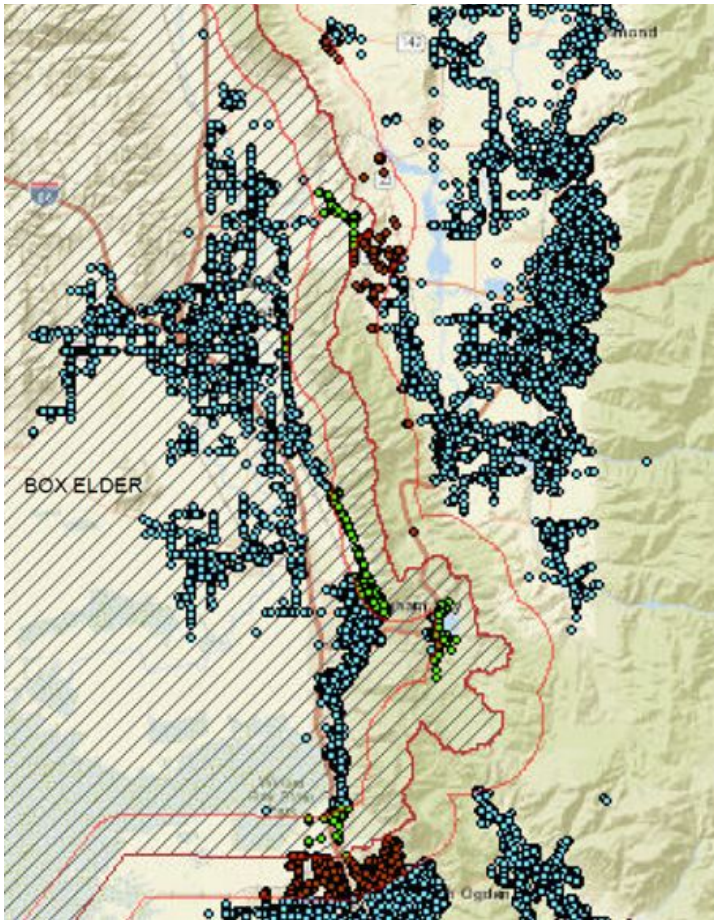
The turnout gaps were notably different in the two regions of analysis. The difference-in-difference for border-region Box Elder County residents versus their neighbors over the county line was 3.8 points. The figure was 9.3 points for the Utah-Carbon-Emery county conglomeration and its neighbors. This could point to

differing effects of vote-by-mail depending on geopolitical factors. Or there may be other hidden factors at work.

4.3 Caveats

Though border analysis is intended to weed out some of the the influence of voters' hidden differences (and hidden model errors) that could affect statewide analysis, it is possible that border analysis introduces its own sources of error. A close view of the Box Elder County border region shows a common issue we observed. Each dot is a voter; green dots are in the two-mile border zone within Box Elder County, whereas red dots are in the two-mile border zone just outside the county. (Blue dots are voters who were not part of the border analysis.)

4.2.1 Box Elder County border zone close view



The county line only rarely separates contiguous communities of voters. Because the population is not at all evenly distributed, border analysis sometimes has the effect of comparing, for example, voters from the north side of one county to voters in the southern part of its neighbor county. Thus, it is possible that residents who have self-selected into these geographically disparate communities are not, in fact, closer analogues to each other than they would be to other Utahns around the state.

5. Community Spotlight: Suncrest

There are few cohesive communities in Utah that truly straddle the line between a VBM county and a non-VBM county. But after scanning through a plotted map of Utah's voters we were able to identify a particular community of interest. Suncrest is a mountaintop housing development in the city of Draper that sits on the line between Salt Lake County and Utah County. In 2016, Salt Lake County was a vote-by-mail county, while Utah County stuck with polling place voting.

Though the two sides of Suncrest have certain underlying differences, the community's relative homogeneity and isolation make it an interesting case for analysis. It is reasonable to expect that Suncrest's residents on either side of the county line are more similar to each other than they are to Utahns farther away.

5.1 About Suncrest

As an enclave of Draper, Utah, the planned housing community of Suncrest began construction in 2001.[8] Located on Traverse Ridge overlooking both Salt Lake City and the Provo-Orem areas, Suncrest is within commuter distance of both metropolitan areas and yet is slightly isolated from other nearby housing developments.

[8] http://www.suncrestoa.com/Home/26245

Figure 5.1.1: Google Map with Suncrest highlighted

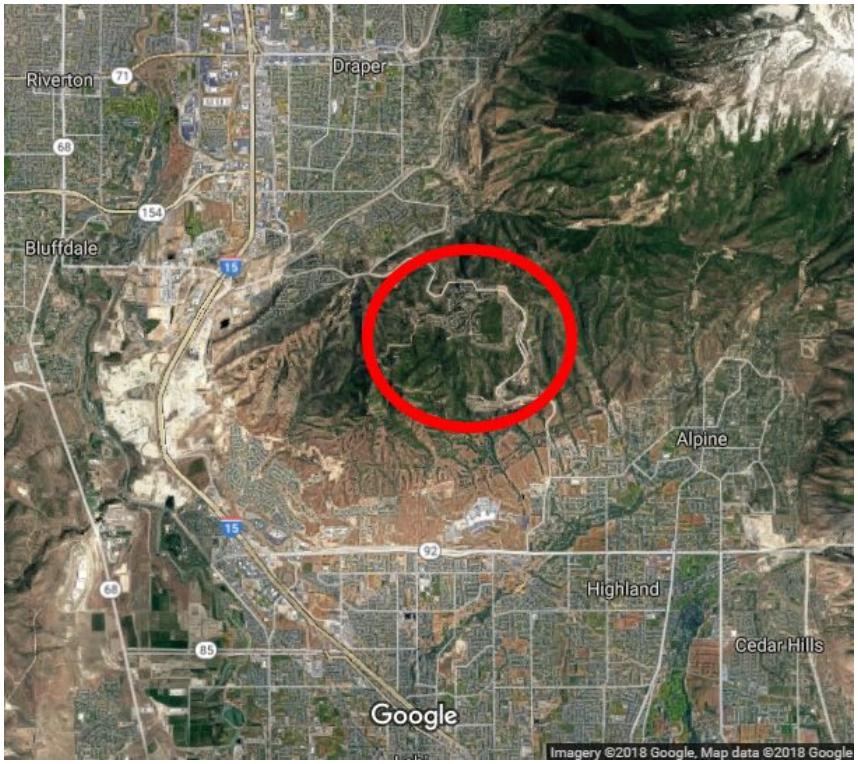


Figure 5.1.2: Section of Suncrest with county line outlined in red

Suncrest has one Mormon church and one restaurant. The Suncrest Homeowner Association manages the community's cable and internet services, as well as amenities such as a community pool, gym, parks, and hiking trails. The Homeowner Association administers several annual events for the community.

Both sides of Suncrest -- the Salt Lake County side and the Utah County side -- have a mix of moderately expensive and very expensive houses.[9] Both sides of the community are around 90% white. The Salt Lake County side skews slightly younger, and the Utah County side has slightly more unaffiliated voters, but the differences are not pronounced.

Of course, the county line that divides Suncrest necessarily creates some differences. Notably, two sides of the community are in different school districts. It is possible that this or other county-related administrative differences -- property tax structures, for instance -- may incentivize Suncrest residents to self-select into one side of the community versus the other.

Historical differences in turnout can also be observed between one side of the community and the other. On the Utah County side of Suncrest, voters have turned out at lower rates even in elections where both sides were using the traditional polling place method.

Figure 5.1.1: Turnout differences among Suncrest voters on the 2016 voter file

Election	Utah County Side	Salt Lake County Side
2016 General	63.1%	80.9%
2014 General	20.5%	35.5%
2012 General	46.8%	53.3%
2010 General	20.9%	33.9%

These pre-existing differences mean that we cannot wholly attribute 2016's 18-point turnout gap between the two sides of Suncrest to the fact that Salt Lake

[9]https://www.zillow.com/homes/for_sale/Draper-UT/42464_rid/1-_beds/globalrelevanceex_sort/40.496178,-111.808634,40.461119,-111.867257_rect/13_zm/

County conducted their election by mail. Difference-in-difference analysis will again provide us a method of controlling for these pre-existing differences.

5.2 Suncrest Results

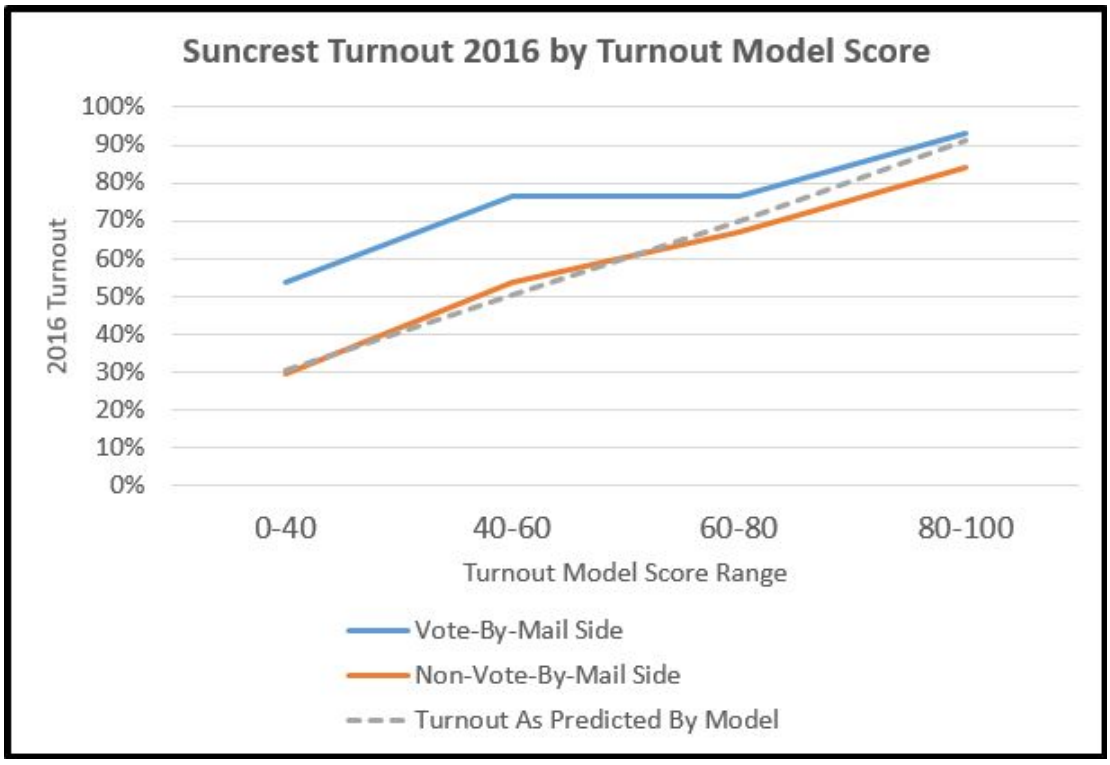
After using turnout scores to control for differing vote propensities on either side of the county line, our difference-in-difference analysis finds that turnout on the Salt Lake County (VBM) side of Suncrest was 12.5 points higher than on the Utah County (non-VBM) side.

Figure 5.2.1: Difference-in-difference analysis of Suncrest turnout, 2016

2016 Turnout	Non-VBM Side	VBM Side
Predicted Turnout	65.7%	71.0%
Actual Turnout	63.1%	80.9%
Difference (Actual - Predicted)	-2.6%	10.0%
Difference-in-Difference	12.5%	
N	*1,540*	*829*

Once again, the biggest differences in turnout are among low-propensity and mid-propensity voters. But even high-propensity voters overperformed their turnout score on the VBM side of Suncrest, while they underperformed on the non-VBM side.

Figure 5.2.2: Expected vs actual turnout in Suncrest, by turnout score cohort



In addition to this difference-in-difference analysis, we ran simple OLS and Logit regressions on the voters of Suncrest, using turnout score as a control and county as the key independent variable. Once again, we find that living in the vote-by-mail area is associated with significantly higher turnout; the coefficient for VBM status in the OLS regression was .138, the equivalent to a 13.8 point increase in turnout -- similar in magnitude to the 12.5 point gap seen in the difference-in-difference analysis. Appendix III contains the full results for this regression analysis.

The advent of vote-by-mail appears to have had a more pronounced effect in Suncrest versus other parts of Utah. Why? We can speculate that distance to polling locations may have played an important role. On the Utah County side of Suncrest, voters had to drive five to ten minutes down the hill toward the Provo-Orem area to get to their polling location. This may seem like only a small inconvenience, but it could have deterred some voters -- particularly those

Suncrest residents whose commutes took them toward the Salt Lake City area, rather than Provo.

On the Salt Lake County side of Suncrest, however, the polling location before the advent of VBM was literally in the heart of Suncrest; voters voted at the community center that houses the Homeowners Association, pool, and other facilities. Many of the Salt Lake County voters were within walking distance of this location, and most would have needed to drive past it en route to either Salt Lake City or Provo. Then, of course, voting became even more convenient for these Suncrest residents with the advent of vote-by-mail.

These differences in distance to the polling locations could explain both the higher turnout on the Salt Lake County side of Suncrest in previous years, as well as the larger-than-average gap with the Utah County side in 2016. Relative to their Utah County neighbors, the Suncrest residents of Salt Lake County went from having a more convenient voting location (the community center) to the *most* convenient voting location (their own homes), whereas the Utah County voters still had to drive outside of their community to vote.

6. Discussion

The analysis in this report provides strong evidence that moving to a vote-by-mail system increased turnout in Utah in 2016. By using a turnout model to control for individual-level differences in vote propensity, we remove many of the confounding factors that would muddle the conclusions drawn from raw results alone. Whether using difference-in-difference or regression analysis, we find that the magnitude of the increase in turnout was in the five- to seven-point range, though this varied by location.

Even if the true effect size of vote-by-mail is at the lower end of the results seen in this paper, it is a relatively massive increase in turnout in a presidential year. When political campaigns and organizations run get-out-the-vote experiments, they are

thrilled to see an effect size of even one additional point of turnout. An additional five points of voter turnout -- or three points, or seven, or twelve and a half -- is an enormous victory for civic participation.

7. Future Research

Because some counties in Utah implemented vote-by-mail in 2014, similar analyses could be performed using the 2014 Utah voter file and the midterm turnout score that was generated prior to the 2014 election. Understanding the turnout effects of VBM systems in midterm elections versus presidential elections would provide important texture to the existing research.

In either 2014 or 2016, it would also be interesting to analyze the effects on voters who are (or were) farther away from their polling locations than others. Perhaps voters who live great distances from their polling places benefit more from vote-by-mail systems than voters who are already quite close to the polls.

Finally, there are other states in the US that may be able to provide new avenues for similar research. Certain small municipalities in Minnesota, for instance, have opted for all-mail elections. And as other cities and counties adopt vote-by-mail, research should be undertaken to examine the effects.

Appendix I -- Descriptive Statistics for Utah

Age distribution for Utah registered voters, 2016

Age	Non-VBM Counties	VBM Counties	Total
18-24	9.9%	9.5%	9.6%
25-34	22.0%	19.5%	20.2%
35-49	27.5%	27.8%	27.7%
50-64	20.3%	23.6%	22.7%
65+	20.2%	19.6%	19.7%
Total	100.0%	100.0%	100.0%

Race distribution for Utah registered voters, 2016

Race	Non-VBM Counties	VBM Counties	Total
Asian	1.2%	1.9%	1.7%
Black	0.4%	0.4%	0.4%
Hispanic	4.3%	5.9%	5.4%
Other/Unknown	3.8%	5.0%	4.7%
White	90.3%	86.8%	87.8%
Total	100.0%	100.0%	100.0%

Income distribution for Utah registered voters, 2016

Household Income	Non-VBM Counties	VBM Counties	Total
Unknown Income	21.6%	23.8%	22.0%
<$30k	13.1%	10.4%	12.6%
$30k-$50k	12.7%	10.6%	12.3%
$50k-$75k	24.5%	20.9%	23.8%
$75k-$100k	13.7%	17.1%	14.3%
$100k+	14.4%	17.2%	15.0%
Total	100.0%	100.0%	100.0%

Party affiliation distribution for Utah registered voters, 2016

Party Affiliation	Non-VBM Counties	VBM Counties	Total
Democrat	6.6%	13.4%	11.5%
Green	0.0%	0.1%	0.1%
Libertarian	0.9%	0.8%	0.9%
No Party	33.7%	40.4%	38.5%
Other	2.6%	2.3%	2.4%
Republican	56.1%	43.0%	46.7%
Total	100.0%	100.0%	100.0%

Partisanship score distribution for Utah registered voters, 2016

Partisanship Score	Non-VBM Counties	VBM Counties	Total
Range: 0-10	22.1%	15.0%	17.0%
Range: 10-20	27.1%	18.3%	20.8%
Range: 20-30	17.8%	12.4%	13.9%
Range: 30-40	11.5%	8.7%	9.5%
Range: 40-50	7.4%	7.3%	7.3%
Range: 50-60	4.2%	6.3%	5.7%
Range: 60-70	2.7%	6.2%	5.2%
Range: 70-80	2.0%	6.7%	5.3%
Range: 80-90	2.7%	7.9%	6.5%
Range: 90-100	2.5%	11.2%	8.8%
Total	100.0%	100.0%	100.0%

Appendix II -- Descriptive Statistics for Border Analysis Regions

Race

	Box Elder - Inside	Box Elder - Outside		Carbon-Emery-Utah - Inside	Carbon-Emery-Utah - Outside
Asian	0.7%	0.7%		1.6%	2.0%
Black	0.5%	0.3%		0.3%	0.3%
Hispanic	4.1%	2.5%		4.0%	3.5%
Other/Unknown	2.7%	3.5%		3.8%	4.9%
White	91.9%	93.0%		90.4%	89.4%

Age

	Box Elder - Inside	Box Elder - Outside		Carbon-Emery-Utah - Inside	Carbon-Emery-Utah - Outside
	0.0%			0.0%	0.0%
18-24	8.3%	9.2%		6.7%	10.4%
25-34	16.7%	13.5%		23.3%	16.0%
35-49	24.6%	30.5%		44.8%	36.6%
50-64	26.3%	27.4%		15.6%	23.7%
65-79	17.1%	15.2%		7.9%	11.1%
80+	6.9%	4.2%		1.8%	2.2%

Party Affiliation

	Box Elder - Inside	Box Elder - Outside		Carbon-Emery-Utah - Inside	Carbon-Emery-Utah - Outside
Democrat	4.9%	5.6%		6.7%	9.5%
Green		0.0%		0.0%	0.0%
Libertarian	0.6%	0.6%		1.4%	1.0%
No Party	34.3%	35.3%		36.2%	35.1%
Other	1.6%	1.5%		2.8%	2.2%
Republican	58.6%	57.0%		53.0%	52.1%

Turnout Score Range

	Box Elder - Inside	Box Elder - Outside		Carbon-Emery-Utah - Inside	Carbon-Emery-Utah - Outside
.00	0.1%	0.0%		0.2%	0.0%
10.00	3.5%	1.0%		2.9%	1.0%
20.00	9.0%	4.6%		7.3%	4.2%
30.00	7.1%	4.7%		8.2%	6.2%
40.00	8.8%	6.2%		9.3%	8.4%
50.00	8.3%	7.9%		10.9%	9.3%
60.00	8.1%	9.5%		11.8%	10.9%
70.00	12.0%	12.8%		11.2%	13.3%
80.00	10.4%	13.7%		11.6%	14.9%
90.00	32.9%	39.6%		26.7%	31.7%

Vote History

Turnout	Box Elder - Inside	Box Elder - Outside		Carbon-Emery-Utah - Inside	Carbon-Emery-Utah - Outside		Whole State
2016 General	69.4%	80.4%		65.1%	80.0%		73.6%
2014 General	34.3%	33.3%		25.0%	34.8%		36.0%
2012 General	62.0%	67.5%		52.9%	60.0%		60.7%
2010 General	40.4%	40.2%		25.7%	36.9%		37.2%
2015 Municipal	21.7%	28.4%		19.9%	33.0%		26.8%
2008 Presidential Primary	21.0%	20.6%		14.1%	20.6%		22.6%

Appendix III -- Suncrest

Age

Age	Non-UVBM	UVBM
18-24	6.9%	7.8%
25-34	14.9%	18.7%
35-49	45.2%	42.1%
50-64	23.2%	22.0%
65+	9.8%	9.4%

Party Affiliation

	Non-UVBM	UVBM
Democrat	10.3%	11.9%
Libertarian	1.6%	1.7%
No Party	41.5%	34.9%
Other	3.2%	3.9%
Republican	43.4%	47.6%

Regression Results

	Regression Results				
		OLS	OLS	Logit	Logit
	Intercept	0.128348***	0.1007768	-1.952676***	-2.13477***
	Turnout Score	0.007657***	0.0074351***	0.039374***	0.038436**
	VBM	0.137659***	0.14159***	0.818307	0.853535***
Controls incl?	Age/Gender	N	Y	N	Y
	Race	N	Y	N	Y