# *The impact of polling places on voting*

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## 1. Introduction

Efforts to increase voter participation have largely focused on designing more efficient and convenient ways to bring voters to the polls on and before Election Day or reduce the burden of voter registration (Burden et al 2014; Leighley and Nagler 2015). An underappreciated determinant of voter participation is the attributes of location at which we vote. The location, staffing, and operation of polling places may have an independent effect on voter turnout. The accessibility of polling places, the time it takes to check-in and to vote, and the experiences voters have with poll workers and the polling place environment can deter, obstruct and prevent persons from voting. Drawing on a nationwide study of polling places attributes in the 2016 and 2018 elections, we estimate the effects of a wide range of polling places attributes on the voter turnout. We organize these polling place attributes into contemporaneous attributes expected to impact turnout in the immediate election and downstream attributes expected to impact turnout only in future elections.

Our current analysis finds significant relationships between turnout in the contemporaneous 2016 election and two important polling place attributes observed in 2016 polling places. First, the visibility the polling place (visible address, name, signs and flags) is associated with a 4 percentage point increase in turnout. Second, a high quality interior of the polling place (rated "excellent" by observers) was associated with a 2.5 percentage point increase in turnout. However, other attributes expected to have a contemporaneous impact, based on past research and/or theory, did not show evidence of significant relationships. Further, examining 2018 turnout reveals no support for expected downstream impacts of any polling place attributes. In sum, we find important effects from polling place attributes for scholars, election

administrators, and policy-makers to ensure polling places do not deter voters, while also suggesting that many aspects of polling places may not have significant impact on turnout - although these attributes often have important impacts on voter confidence in elections.

Our paper proceeds in the following manner. In section 2, we review previous research on polling place influence on voter participation. We identify those factors that influence contemporaneous and downstream voter turnout. In section 3, we offer an explanation of polling place effects on voting that differentiates between contemporaneous and long-term effects. In section 4, we present cross sectional and panel research designs for testing our hypotheses. We present our findings in section 5 and discuss their implications for election administration in section 6.

## 2. Previous research

Previous research has identified several attributes of polling places and their operation that influence voter turnout. These attributes include the location of a polling place and its physical attributes, polling place operations (e.g., line length, waiting times), staffing (i.e., number, quality and performance of poll workers), equipment set-up, privacy, and demographic composition of the area served by the polling place.

### 2.1 Polling place lines and time to vote

Two key elements of polling place operations that effect voter turnout are line length to check in to vote and time to vote. Barreto et al (2009) report voter turnout is significant lower in Los Angeles polling places with longer lines and check-in times. Similarly Stein et al (2019) found significantly higher rates of persons leaving the check-in line at polling places with longer lines and waiting times to check-in to vote. The time to vote has a negative effect on the likelihood a voter will vote at that polling place or leave the line before checking in to vote.

These effects are exacerbated in minority polling places where voters are likely to lack the identification (i.e., driver's license) required to vote, further lengthening lines and wait times (Stein et al 2019).

### 2.2 Poll workers

Poll workers and their performance influences voter attitudes about the voting process (Panagopoulos 2017; Burden and Milyo 2015; Claasen, Magelby, Monson and Patterson 2008, 2013; Hall, Monson and Patterson 2007, 2009; Atkeson and Saunders 2007). These attitudes are, in turn, likely to influence voter turnout. Barreto et al (2009) and Stein et al (2019) show that the absolute and relative number of poll workers (i.e., voters per worker) has a significant negative effect on voter turnout and a significant positive effect on the number of voters who leave the line before checking in to vote. An adequate number of persons to check in and assist voters can indirectly effect line lengths and waiting times that depress voter participation.

Social interactions have a significant impact on voting behavior (Sinclair 2012; Rolfe 2012). Barreto et al (2009) point out that voters' experience of voting may be influenced by knowing the poll workers at their polling place. Voters' social connections to poll workers might have a positive influence on turnout for some voters via a sense of social accountability (Funk 2010; Gerber, Huber, Doherty and Dowling 2016). However, a sense of alienation among those who observe social connections between poll workers and other voters may be turned off from participating.

### 2.3 Polling place setup

Barreto et al (2009) identify interior quality of polling places may impact voters' experiment and thence their future likelihood of voting. They report the quality of interior

polling places was significantly lower in non-white than white polling places but also independently related to voter turnout.

Although ballot privacy (or secrecy) is a core principle of modern elections, many Americans have significant concerns about it (Gerber, Huber, Doherty and Dowling 2013). A study conducted by the Los Angeles County Registrar-Recorder and County Clerk's Office found prospective voters were concerned about privacy when conducting their ballot and this concern would alter their intention to vote (LA County Registrar-Recorder 2010). Communication from election officials to educate and reassure prospective voters about ballot privacy increases turnout (Gerber, Huber, Doherty, Dowling and Hill 2013; Gerber, Huber, Fang and Gooch 2018). The LA County study identified two areas where voters have concerns about ballot privacy: when marking the ballot and when casting the ballot.[1]

The use of electronic equipment  for voters to cast their ballots (i.e., direct electronic recording voting devices) has an independent effect on the time to vote which can affect the likelihood of voting (Hanmer et al 2010; Herrnson et al 2011; Spencer and Markovits 2010; Stewart 2011).   Furthermore, voters' level of satisfaction and comfort with different methods of casting a ballot may influence their decision to return to the polls in subsequent elections.

2.4 *Polling place type*

Where we vote can shape whether and how we cast a ballot.  Barreto et al (2009) have shown polling place locations in lower socio-economic neighborhoods, at facilities that are older, with less parking, limited access by public transit and in higher crime areas depress voter turnout, independent of the voter's socio-economic attributes. The nature of the polling place, whether it's a church, school, government building, private business or private residence can shape whether and how (i.e., vote choices) a person chooses to vote. Rutchick (2010) LaBouff

(2014), and Berger, Meredith and Wheeler (2008) have shown that voting in churches is related

to voter choices about same-sex marriage, anti-abortion and other related referenda on social

issues. Berger, Meredith and Wheeler (2008) also find a relationship between voting in schools

and support for school funding measures.

2.5 *Polling place location*

Turnout is related to polling place location in two ways. First, turnout is related to the

distance of the polling place from a voter's residence.  Second, turnout is related to the stability

of polling place locations from election to election.

Several researchers (Dyck and Gimpel 2005; Gibson et al 2013; Gimpel and Schuknecht

2003; Cantoni 2015; Brady and McNulty 2011; Newman, Johnson and Lown 2014) have shown

the distance and travel time between a voter's residence and their designated polling place has a

significant and negative effect on their likelihood to vote.[2]  Cantoni (2015) reports that a .25 mile

increase in the distance to a polling place reduces the number of ballots cast by 2%-5% over

Presidential, mid-term Congressional and municipal elections.  Moreover, the depressing effect

of distance to a polling place and voter turnout is enhanced three-fold in high racial/ethnic

minority communities over non-minority communities. Gibson et al (2013) compute a distance

measure with an imputed wage measure for each voter to estimate the opportunity costs of voting

and find it is highly predictive of voting. The authors report, "small increases in the opportunity

costs of voting can have large effects in reducing voter turnout (2013:517)."

Higher turnout in Presidential elections may result in increasing the number of polling

places compared to lower turnout mid-term Congressional, state and local elections. Many

jurisdictions, however, are limited by law in how they change the number, location, staffing and

equipping of polling places across elections. When polling places can change, reducing in the

number and location of polling places depress voter turnout (Brady and McNulty 2011; McNulty et al 2009). Brady and McNulty (2011) report that consolidating voting locations in Los Angeles, California reduced voter turnout by 3%, due in part to voters who did not know about the change or relocation of their Election Day polling place. Barreto et al report that polling place stability has a significant effect on voter turnout, independent of the racial and ethnic makeup of the polling place's electorate and other traits of polling place operations, and quality (2009:454). *[Note: Data collection about changes in polling places between 2016 and 2018 is on-going and will be included in a future iteration of this paper.]*

2.6 *Demographics*

Some past research has shown the demographics of polling places voters have an independent influence on turnout and condition on the impact polling place attributes and operations have on voter turnout. Pettigrew (2017) finds that even when controlling for shifts in turnout and income, there is a strong relationship between race and wait time, specifically for African American voters. Barreto et al (2009) and Mebane (2004) similarly found that the quality of polling place locations tended to be 'lower' in low-income and minority communities, a condition they found to depress voter turnout. Stewart (2010) tested the effect of race/ethnicity at the individual and aggregate level. On the individual level, African American and Hispanic voters surveyed were found to have waited longer on average to vote than white voters. On the aggregate level, zip codes with greater than 75% non-white populations waited more than twice as long as zip codes with less than 25% non-white populations. Stein et al (2019a) find that recent adoption of photographic voter ID requirements to have a disparate effect on the time to check-in among white and non-white majority polling places. In majority white polling places

scanning a voter's driver's license speeds up the check-in process. In majority non-white

polling places a voter ID requirement slows down the check-in process.

However, recent evidence from a larger national data fails to support some earlier

findings about how demography is related to polling place attributes. Stein's et al (2019a) cross

jurisdictional nation study of polling place attributes and operations failed to identify any

evidence that accessibility to polling places, their quality, or practices varied by race, ethnicity or

the socio-economic makeup of the persons who voted using a national sample of polling places.

In summary, we expect that polling places have consequential effects on the likelihood

that registered voters will vote. In separate studies, distance, location characteristics, line

lengths, time to check-in and vote, equipment and set-up, poll workers and their performance all

have been shown to significantly shape whether a person votes on or before Election Day. There

is mixed evidence to suggest that the socio-economic and racial traits of voters interact with the

polling place attributes and operations to effect voter turnout. We assess all of these factors

together using a large national dataset to replicate and compare the relative magnitude of

impacts.

## 3 *Explaining polling place effects on voter turnout*

We divide attributes of polling places into two categories: contemporaneous and

downstream. The distinction between contemporaneous and downstream polling place attributes

has consequences for how we explain the relationship between these attributes and voter turnout.

Contemporaneous attributes of a polling place are learned before voting. We expect

contemporaneous attributes to influence voting behavior in the election where they are present in

the polling place. Downstream attributes of a polling place are learned only by going through

the voting process. We label these "downstream" attributes because we expect them to have

effect primarily in subsequent voting behavior. We expect little relationship to voting in the contemporaneous election, largely because voters are too far into the process (too many sunk costs) for these attributes to deter completion of voting in the contemporaneous election. Though we do not expect downstream attributes to influence contemporaneous voting, we do expect contemporaneous attributes to shape future voting behavior along with downstream attributes.

Contemporaneous attributes are information a potential voter has or obtains prior to voting at the polling place. Many attributes with contemporaneous relationship to voting are exterior to the polling place. Information about polling place exterior attributes can be acquired through routine life experience in a community, obtaining information from others who have experience at the polling site, or even online searches for the location of the polling place. Knowing where a polling place is located may itself deter someone from voting. Its distance from home (or work), access (e.g., hard to find), location in an unfamiliar or 'undesirable' area, or the type of building is unappealing may be sufficient reason not to vote. The skeptical but venturesome voter may come upon their designated polling place, only to find that parking is scarce or the line waiting to check too long. Long lines and waiting times lead some voters to renege or leave the line before checking-in to vote.

The attributes with contemporaneous relationship to voting also include interior characteristics of the polling place that a citizen may know from daily life in the community, without visiting the polling place on Election Day. These contemporaneous interior attributes include the quality of the building's interior (e.g. size, cleanliness, etc.). These interior attributes are learned when a citizen visits or hears from others about the polling place when it is used for reasons other than voting (e.g. school events, church services, classes at community centers).

Persons who cast a ballot at their polling place experience additional attributes of the polling place, including interactions with poll workers, the set-up of the voting process, using voting machines, and the time it takes to vote. These attributes are unlikely to deter (encourage) someone from voting due to the incurred sunk costs. Having entered the polling place, the voter has already borne the costs of finding and traveling to the polling place, of waiting to check in to vote, etc.; thus, they are unlikely to leave the polling place after such an effort.[3] Persons who check-in to vote but have a negative experience with poll workers, lack of privacy, difficulty using voting equipment or other negative experiences are thus likely to complete the voting process in the contemporaneous election but less likely to return in the future. In short, these attributes can shape future intentions to vote even if they have no immediate effect.

Cross sectional designs of polling place effects on voting are suited to detect the relationship between contemporaneous attributes of polling places and voter turnout. A time-series design is needed for testing the relationship of downstream polling place traits and voting in subsequent elections.

## 4   *Research design, measures and data*

Previous studies of polling place effects on voting behavior have relied on limited data. Most studies have used cross sectional studies within a single jurisdiction (i.e., a county). In some instances, multiple jurisdictions have been studied but only in single elections. Only a small number of researchers have used a research design in which polling places are studied over time (Burden, Canon, Mayer, Moynihan and Neiheisel 2017; Brady and McNulty 2011; McNulty et al 2009). Studying polling places across multiple states and jurisdictions allows us to apportion the variance in turnout to jurisdiction effects that might be omitted and unobserved in studies of just one voting jurisdiction. Accurately attributing the source of variation in turnout

is important to identifying where policy interventions might be taken to enhance the quality and performance of polling places. Examining voting behavior over time is necessary to observe long-term as well as contemporaneous effects on voting behavior.

*4.1 Research design*

Our test of polling place effects on voting participation draws on a unique panel of polling places in the 2016 and 2018 federal elections that collected data on polling places practices, operations and attributes. In 2016, research teams recruited from local colleges and universities located in 24 election jurisdictions and 19 states across the U.S. Researchers in ten jurisdictions across 10 states used the same research protocol for the November 6, 2018 mid-term Congressional election.

Within jurisdictions, polling places were selected randomly by participating faculty.[4] The unit of random sampling was the polling place rather than physical location, since multiple polling places may be physically located in a single facility. In some cases, multiple polling places were selected at a single location.[5]

A common set of protocols was used across all jurisdictions participating in the data collection in each election.[6] At the polling place for a specific voting district (i.e., precinct), research teams recorded data on line length, number of people in line, number of people reneging (leaving the line), time to complete each step of the voting process, and – most important to the current analysis – a survey about the exterior, interior, and operations of each polling place. After observation, we appended Census data on the demographics of the voting district as well voter registration and turnout data in the 2016 and 2018 elections.

The protocol for observing polling place attributes and operations were based on previous research (Stewart 2015; Herron and Smith 2016; Spencer and Markovits 2010; Barreto et al.

2009). Pairs of student-researchers were assigned to observe Election Day polling places for two-hour periods.[7]  Researchers were tasked with collecting several pieces of information about voters' experience including length of lines, time waiting to vote and time to cast a ballot.  The same researcher was also responsible for counting the number of persons who left the queue after entering the line, which is termed "reneging" in the queuing literature.  The second researcher observed individual voters as they navigated the various tasks associated with voting, checking in, casting the ballot, and scanning the ballot.  Individual voters were chosen to be observed in the following way.  Upon arriving at the polling place, the second researcher would follow the first person they observed checking-in to vote.  Once that person had finished voting (i.e., scanned their ballot or left the electronic voting machine), the researcher would then identify the next person in the check-in line, and repeat the process.  The second researcher generally recorded the amount of time (down to the second) it took these voters to check-in, mark their ballot, and scan their ballot (if applicable). This form is available from the project website.[8] The factors contributing to wait time and lines are examined in Stein et al (2019a; 2019b).

Each research team was also responsible for filling out a form that described the physical characteristics of the polling place they visited.  This form is based on Barreto et al's (2009) study of polling places with additions based on other research about polling place characteristics (PCEA 2013; Alvarez, Atkeson and Hall 2013; Berger, Meredith and Wheeler 2008; Brady and McNulty 2011; Kropf and Kimball 2013, Schur and Adya 2013; Spencer and Markovits 2010; LA County Registrar-Recorder 2010).  This form recorded information about the approach to the polling place (e.g. visibility, ease of parking), exterior polling place characteristics (e.g. quality of the building,), interior polling place characteristics (e.g. quality of facility, ease of finding voting area), polling place operations (e.g. number of poll workers, working machines and

scanners), and observations about voter-poll worker interactions. The form is available in the Supplemental Materials.

*4.2 Measures from polling place observation*

As discussed above, we divide polling place attributes into those expected to have a contemporaneous impact on voting and those expected to have only a downstream impact on voting. Table 1 reports the measures used in our analyses, whether each measure is expected to have a contemporaneous or only a downstream impact, and the expected direction of the relationship between this factor and turnout.

Additional measures were included in the attribute survey, but are not included in the analysis due to constancy within jurisdictions based on state statutes or regulations. Among the notable items not included is whether a photo ID was asked for when checking in to vote. Barreto et al's study of polling places (2009) identified this as an important attribute of polling place operations that negatively impacts turnout, although the broader research on the negative relationship of voter ID laws and turnout is not fully conclusive. However, some of our jurisdictions are in states that require photographic identification in order to vote. Consequently, this is not a discretionary action on the part of either poll workers or local election officials. Less controversially, we did not include items like whether poll workers distributed "I Voted" stickers because this is similarly non-discretionary within jurisdictions. We also did not include measures where there was severe item non-response (e.g. enforcement of electioneering ban; whether voters received assistance in casting a ballot) and/or lack of confidence in data (e.g. distance estimates from parking to polling place entrance) and/or substantive duplication with included variables (e.g. types of interior amenities captured by interior quality rating).

**Table 1.** Polling Place Attributes

| Attribute | Coding | Expected Direction |
|---|---|---|
| *Contemporaneous Polling Place Attributes* | | |
| Polling place visibility, at least one of the following: | (1=Yes to one or more, 0=none) | + |
|     The polling place address in clear sight | | |
|     The polling place name in clear sight | | |
|     The polling place was readily visible from street | | |
|     Flags, banners or signs made polling place visible | | |
| Quality of polling place exterior (Poor – Excellent) | (1= excellent, 0=less than excellent) | + |
| Ease of finding parking (V. difficult - V. easy) | (1= V. easy, 0=less than v. easy) | |
| Polling place line length | (avg. persons in line) | |
| Polling location is in a school | (1=Yes, 0=No) | ? |
| Polling location is in a church[9] | (1=Yes, 0=No) | ? |
| Voter to poll worker ratio | (registered voters/ poll workers) | ? |
| *Downstream Polling Place Attributes* | | |
| Quality of polling place interior (Poor – Excellent) | (1= excellent, 0=less than excellent) | + |
| Polling place is well marked to find polling location inside building | (1=Yes, 0=No) | + |
| Did any poll worker appear to live nearby? | (1=Yes, 0=No) | + |
| Voting booths set up well for privacy? | (1=Yes, 0=No) | + |
| Were voters able to cast ballots in private? | (1=Yes, 0=No) | + |
| Whether all voting machines or scanners were working | (1=Yes, 0=No) | + |
| Whether poll workers appeared to live nearby | (1=Yes, 0=No) | ? |
| Did all voting machines/ballot scanners appear to be working? | (1=Yes, 0=No) | + |
| Use of electronic voting machines (DREs) | (1=Yes, 0=No) | ? |
| Average total time to cast ballot | (minutes) | - |

*3.3 Measures from voter registration databases*

Following observation of polling places in each election, we used the enhanced voter registration files from *Catalist LLC*, a commercial provider of voting data used in many studies of voting behavior, to append demographic and voting behavior information. Catalist collects

public records of individual level voter registration and voter turnout data as well as Census information.

Catalist geocodes the registration address of each registered voter and appends Census data from the smallest available Census unit for each voter. We take the mean value of these Census data for all registered voters in each polling place. We calculate the mean Census value for each polling place for the following characteristics related to voting behavior: percent of Census unit that is Black, Hispanic, other non-white, over age 65, has a 4 year college degree, income below poverty level, renter (vs. homeowner), and mean income. These polling place aggregate data characterize the demographic composition of the area served by the polling place, an important distinction from individual voter characteristics or aggregate characteristics of registered or participating voters.

For each polling place, Catalist provided data on the number of registered voters and number of voters who cast a ballot in the 2016 and 2018 elections respectively. For comparability, we include all registered voters since the definitions of active and inactive registration status (and application of those definitions) may vary across states and jurisdictions. In states where available, Catalist also provided the number of ballots cast on Election Day (i.e., at the observed polling place) or before Election Day (i.e., at early voting locations or by mail). For the polling places observed in 2016, we assess the voting behavior of people registered to vote prior to that election.

We also assess voting behavior in 2018 for polling places observed in 2016 to attempt to identify downstream effects. For this analysis, we examine the 2018 turnout of people who voted in 2016 because non-voters did not experience the polling place in 2016 that we posit shapes downstream voting behavior.[10] Nonetheless, this analysis is likely to understate downstream

effects since only a small proportion of registered voters experienced their polling place for the first time in 2016 – the polling place would be novel on only if the location changed or for newly registered voters. We include records that were removed from official voter rolls between 2016 and 2018 because removal from the official voter rolls is correlated with non-voting under the purge procedures of the National Voter Registration Act of 1993 (Catalist retains these records in a "dropped" status in their dataset).

3.4 *Data*

The research consortium collected timing, line and attribute survey data for 603 polling places in 2016 and 450 polling places in 2018. A panel of polling places observed in both 2016 and 2018 will allow future investigation of the impact of changes over time [*quantity TBD*].

Unfortunately, the data collection did not produce complete records for each polling place. Researcher access to polling places was restricted in some jurisdictions, so full data is not available. Matching observed polling places to the Catalist precinct codes also led to loss of data.[11] In 2016, 409 polling places were matched to Catalist data for demographics. Finally, compliance from student researchers in completing all items on the attributed survey was less than perfect, causing further loss of cases. Therefore, we have complete observations for 307 polling places in 2016. [*Note: Compilation, cleaning and matching of 2018 data is still underway. Results will be added in future iterations of the paper*].

4. *Analysis*

We use regression to assess the relationship between polling place attributes and voting behavior. The independent variables in each analysis is the list of polling place attributes in Table 1 plus the Census demographics for the area served by the polling place. The dependent variables are measures of turnout from the Catalist voter registration and vote history data.

All analyses use fixed effects for each jurisdiction (i.e. county or township). These fixed effects for jurisdiction help account for many factors beyond the scope of our data collection that are likely to influence turnout. These factors include ballot composition, electoral competition, election administration practices (e.g. allowing pre-Election Day voting), political culture, and more.

4.1 *Contemporaneous Turnout*

Table 2 reports the relationship between polling place attributes and turnout in the contemporaneous election. The first two columns report the 2016 turnout among the polling places observed in the 2016 election. [*Note: The analysis of 2018 turnout among polling places observed in the 2018 election will be added to Table 2 in a future iteration of the paper.*]

[*Table 2*]

Since jurisdictions may change precinct boundaries (or names) between elections, we are wary of misleading matches and all too aware of failed matches between the observed polling places and the voting data from Catalist. For this paper, we have applied preliminary checks on data quality. We dropped polling places from our analysis where the data indicated turnout exceeded 100% as clearly implausible (N=19). In the Tables below, we present analysis of a) "All Data" which is all complete observations (N=307), and b) "Cleaned Data", a subset of All Data, which removes polling places with suspicious levels of turnout (N=244). For the moment, we use a crude operationalization of questionable data quality by eliminating the bottom 10% of turnout (below 56%) and the top 10% of turnout (coincidentally, above 90%). Future work will apply more rigorous data hygiene and curing to identify problematic observations and correct data. However, the two analyses produce substantively similar results, suggesting removing suspicious data is reducing noise in the data without distorting the signal.

In the 2016 election, only two contemporaneous polling place attributes have a significant relationship with polling place turnout rates (using the Cleaned Data): exterior visibility of the polling place and interior quality of the polling place. The exterior visibility of the polling place (visible name, address, and/or signs identifying the facility) is associated with a 4.2 percentage point increase in turnout (p=0.036; All Data: 4.8 percentage points; p=0.145). An "excellent" rating of the interior of the polling place (73% of observed precincts) is associated with a 2.6 percentage point increase in turnout (p=0.023; All Data: 2.4 percentage points; p=0.126). None of the other attributes hypothesized to have a contemporaneous effect approached statistical significant. As expected, none of the downstream attributes had a contemporaneous relationship with turnout. The demographic characteristics of the area served by the polling place had strong relationships to turnout as expected from prior research.

4.2 *Contemporaneous Method of Voting*

Table 3 separates the turnout in Table 2 by whether ballots were cast at the polling place on Election Day or prior to Election Day using early in-person or mail ballots.[12] Since only voters who appear at the polling place would be exposed to or consider polling place attributes, the polling place voting in 2016 (two left columns) should be identical to the overall turnout results in Table 2 and there should be no relationship between polling place attributes and the pre-Election Day voting (two right columns). This pattern largely appears in Table 3. The polling place voting rates show much the same relationships as Table 2. Interior polling place quality does not reach statistical significance in the Cleaned Data subset, but does in All Data. For pre-Election Day voting, there no relationship to polling place attributes – except an anomalous relationship to privacy of polling place set up. We have no explanation for the anomaly except statistical chance, but wait on further data work before focusing on it.

[*Table 3*]

4.3 *Downstream Turnout*

Table 4 reports the relationships between polling place attributes observed in the 2016 General election and turnout in the 2018 General Election. The dependent variable is 2018 turnout among persons who voted in the 2016 General Election. We use 2016 voters rather than all 2016 registrants as the denominator for the turnout rate because non-voters cannot have experienced the downstream polling place attributes in 2016 precincts. Contrary to expectations, Table 4 reports no significant relationship between 2018 turnout and any 2016 polling place attributes. Thus, there is no support for the hypothesized long-term impact of polling places on turnout.

[*Table 4*]

The Census demographic variables seem to have a weaker relationship to this downstream turnout measure than contemporaneous turnout, but this is likely due to the inclusion of 2016 turnout as an independent variable absorbing a portion of the demographic driven variation in turnout.

5. *Discussion*

Using a novel national dataset of polling places across the U.S., we tested expectations about the impact of a wide range of polling place attributes on voter turnout. Based on when and how persons encounter different polling place attributes, we organized polling place attributes into contemporaneous attributes expected to impact voting behavior in the immediate election and future elections versus downstream attributes expected to only impact future voting behavior.

is associated with a 4 percentage point increase in turnout. Second with a 2.5 percentage point increase in turnout.

Our current analysis finds only a two significant relationships between turnout in the contemporaneous 2016 election and polling place attributes observed in 2016 polling places. Most polling place attributes expected to have a contemporaneous impact, based on past research and/or theory did not show evidence of significant relationships. Only the visibility the polling place (visible address, name, signs and flags), and a high quality interior of the polling place (rated "excellent" by observers) were significantly associated with higher voter turnout in 2016. Both polling attributes were associated with a 4 percent and 2.5 point increase in turnout, respectively.

Further, examining 2018 turnout reveals no support for expected downstream impacts of any polling place attributes. In sum, we find important effects from polling place attributes for scholars, election administrators, and policy-makers to ensure polling places do not deter voters, while also suggesting that many aspects of polling places may not have significant impact on turnout -although these attributes often have important impacts on voter confidence in elections.

We end with the caveat that this paper in an early iteration of the analysis. We have a good deal of data work to identify and correct problems matching data from multiple sources to be fully confident in the quality and maximize the number of available cases.

**Table 2:** Polling Place Attributes and Turnout in 2016 General Election (standard error)

| | All data | Cleaned Data |
|---|---|---|
| Exterior Visibility | 4.819 | 4.158** |
| | (3.294) | (1.967) |
| Parking: Very easy | 0.239 | 0.630 |
| | (1.342) | (0.945) |
| Ext. Quality: Excellent | -0.588 | -0.671 |
| | (1.586) | (1.130) |
| Line Count-10 min avg | -0.023 | -0.016 |
| | (0.029) | (0.024) |
| Bldg = Church | -0.814 | 0.636 |
| | (1.403) | (0.926) |
| Bldg = School | -0.302 | 0.549 |
| | (1.278) | (0.845) |
| Voters per pollworker | 0.005 | 0.003 |
| | (0.005) | (0.003) |
| Pollworker lives nearby | 0.207 | 0.206 |
| | (1.255) | (0.830) |
| Int. Quality: Excellent | 2.442 | 2.587** |
| | (1.590) | (1.131) |
| Visibility (interior) | -1.361 | 0.720 |
| | (1.952) | (1.278) |
| Privacy of location set up | 0.295 | 0.338 |
| | (1.330) | (0.899) |
| Privacy when casting ballot | -0.790 | -0.992 |
| | (1.169) | (0.791) |
| Electronic Voting Machines | -1.151 | 1.510 |
| | (4.194) | (2.686) |
| All voting machines working | 2.388 | 1.470 |
| | (2.088) | (1.346) |
| Time: Full Duration | 0.203 | 0.053 |
| | (0.176) | (0.111) |
| % Black - Census | -0.062** | -0.032 |
| | (0.029) | (0.022) |
| % Hispanic - Census | -0.180** | -0.181** |
| | (0.080) | (0.076) |
| % Other - Census | -0.085 | -0.077 |
| | (0.168) | (0.112) |
| % Over 65 y/o - Census | 0.123 | 0.140** |
| | (0.075) | (0.051) |
| % College Degree - Census | 0.379*** | 0.248*** |
| | (0.048) | (0.035) |
| Mean Income (in $1000) - Census | -0.083* | -0.016 |
| | (0.035) | (0.025) |
| % Below Poverty Level - Census | -0.274*** | -0.245*** |
| | (0.068) | (0.055) |
| % Renter - Census | -0.127*** | -0.041 |
| | (0.032) | (0.024) |
| Constant | 63.036*** | 61.122*** |
| | (6.169) | (3.946) |
| Observations | 307 | 244 |
| Adjusted $R^2$ | 0.620 | 0.658 |

Note: Standard errors in parentheses. $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$. Models include fixed effects for each jurisdiction (county or township). Coefficients for Census variables are change of one percentage point in demographic composition. Cleaned data removes polling locations with turnout below 10th percentile (56%) and above 90th percentile (90%). Future iterations will use more rigorous data hygiene process.

**Table 3:** Polling Place Attributes and Vote Method in 2016 General Election (standard error)

| | Polling Place | | Pre-Election Day | |
| --- | --- | --- | --- | --- |
| | All Data | Cleaned Data | All Data | Cleaned Data |
| Exterior Visibility | 4.731 | 3.853* | 0.088 | 0.305 |
| | (2.805) | (1.839) | (1.701) | (1.190) |
| Parking: Very easy | 0.763 | 1.428 | -0.524 | -0.797 |
| | (1.143) | (0.883) | (0.693) | (0.572) |
| Ext. Quality: Excellent | -1.752 | -0.813 | 1.164 | 0.143 |
| | (1.351) | (1.057) | (0.819) | (0.684) |
| Line Count-10 min avg | -0.016 | -0.004 | -0.008 | -0.012 |
| | (0.024) | (0.022) | (0.015) | (0.014) |
| Bldg = Church | -1.203 | -0.176 | 0.389 | 0.812 |
| | (1.195) | (0.866) | (0.724) | (0.561) |
| Bldg = School | -0.286 | 0.240 | -0.017 | 0.309 |
| | (1.088) | (0.790) | (0.660) | (0.512) |
| Voters per pollworker | 0.003 | 0.004 | 0.003 | -0.001 |
| | (0.004) | (0.003) | (0.002) | (0.002) |
| Pollworker lives nearby | -0.102 | 0.557 | 0.309 | -0.351 |
| | (1.069) | (0.776) | (0.648) | (0.503) |
| Int. Quality: Excellent | 3.122* | 1.731 | -0.680 | 0.856 |
| | (1.355) | (1.058) | (0.821) | (0.685) |
| Visibility (interior) | -1.652 | 0.369 | 0.291 | 0.352 |
| | (1.662) | (1.195) | (1.008) | (0.773) |
| Privacy of location set up | -0.514 | 0.336 | 0.809 | 0.002 |
| | (1.133) | (0.840) | (0.687) | (0.544) |
| Privacy when casting ballot | -0.322 | -0.038 | -0.468 | -0.954* |
| | (0.995) | (0.739) | (0.603) | (0.479) |
| Electronic Voting Machines | -2.130 | 0.702 | 0.980 | 0.809 |
| | (3.572) | (2.511) | (2.166) | (1.626) |
| All voting machines working | 2.501 | 1.459 | -0.113 | 0.012 |
| | (1.778) | (1.258) | (1.078) | (0.815) |
| Time: Full Duration | 0.180 | 0.007 | 0.022 | 0.046 |
| | (0.150) | (0.104) | (0.091) | (0.067) |
| % Black - Census | -0.061* | -0.029 | -0.001 | -0.003 |
| | (0.025) | (0.021) | (0.015) | (0.013) |
| % Hispanic - Census | 0.037 | 0.073 | -0.217*** | -0.254*** |
| | (0.068) | (0.071) | (0.041) | (0.046) |
| % Other - Census | -0.016 | -0.091 | -0.069 | 0.014 |
| | (0.143) | (0.105) | (0.087) | (0.068) |
| % Over 65 y/o - Census | 0.114 | 0.133** | 0.009 | 0.007 |
| | (0.064) | (0.047) | (0.039) | (0.031) |
| % College Degree - Census | 0.249*** | 0.201*** | 0.130*** | 0.048* |
| | (0.041) | (0.033) | (0.025) | (0.021) |
| Mean Income (in $1000) - Census | -0.060* | -0.028 | -0.023 | 0.012 |
| | (0.030) | (0.023) | (0.018) | (0.015) |
| % Below Poverty Level - Census | -0.193** | -0.215*** | -0.081* | -0.030 |
| | (0.058) | (0.051) | (0.035) | (0.033) |
| % Renter - Census | -0.152*** | -0.085*** | 0.025 | 0.044** |
| | (0.028) | (0.022) | (0.017) | (0.014) |
| Constant | 54.364*** | 52.080*** | 8.672** | 9.041*** |
| | (5.254) | (3.689) | (3.185) | (2.388) |
| Observations | 307 | 244 | 307 | 244 |
| Adjusted $R^2$ | 0.871 | 0.933 | 0.918 | 0.963 |

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Models include fixed effects for each jurisdiction (county or township). Method of voting from Catalist vote history data. Coefficients for Census variables are change of one percentage point in demographic composition. Cleaned data removes polling locations with turnout below 10th percentile (56%) and above 90th percentile (90%). Future iterations will use more rigorous data hygiene process.

**Table 4:** Polling Place Attributes and Turnout in 2018 General Election among 2016 Voters

| | All Data | Cleaned Data |
|---|---|---|
| Exterior Visibility | -1.816 | -1.154 |
| | (1.620) | (1.382) |
| Parking: Very easy | -0.440 | -0.473 |
| | (0.658) | (0.658) |
| Ext. Quality: Excellent | -0.168 | -1.463 |
| | (0.777) | (0.787) |
| Line Count-10 min avg | -0.007 | -0.010 |
| | (0.014) | (0.016) |
| Bldg = Church | 0.121 | 0.850 |
| | (0.688) | (0.645) |
| Bldg = School | -0.451 | 0.536 |
| | (0.626) | (0.588) |
| Voters per pollworker | -0.002 | -0.004 |
| | (0.002) | (0.002) |
| Pollworker lives nearby | -0.125 | -0.647 |
| | (0.615) | (0.577) |
| Int. Quality: Excellent | -0.795 | 0.817 |
| | (0.783) | (0.797) |
| Visibility (interior) | -0.048 | -0.008 |
| | (0.957) | (0.889) |
| Privacy of location set up | 0.002 | -0.651 |
| | (0.651) | (0.625) |
| Privacy when casting ballot | 0.438 | 0.495 |
| | (0.573) | (0.552) |
| Electronic Voting Machines | 1.062 | 1.304 |
| | (2.055) | (1.869) |
| All voting machines working | 0.468 | 0.202 |
| | (1.025) | (0.938) |
| Time: Full Duration | -0.016 | -0.015 |
| | (0.087) | (0.077) |
| % Black - Census | 0.053*** | 0.004 |
| | (0.014) | (0.016) |
| % Hispanic - Census | 0.072 | 0.011 |
| | (0.040) | (0.053) |
| % Other - Census | -0.172* | -0.166* |
| | (0.082) | (0.078) |
| % Over 65 y/o - Census | 0.054 | 0.046 |
| | (0.037) | (0.036) |
| % College Degree - Census | 0.133*** | 0.107*** |
| | (0.026) | (0.027) |
| Mean Income (in $1000) - Census | -0.041* | -0.025 |
| | (0.017) | (0.017) |
| % Below Poverty Level - Census | -0.111** | -0.047 |
| | (0.034) | (0.040) |
| % Renter - Census | -0.104*** | -0.124*** |
| | (0.016) | (0.017) |
| % Voted G16 among Reg16 | 0.364*** | 0.243*** |
| | (0.030) | (0.049) |
| Constant | 49.854*** | 60.506*** |
| | (3.568) | (4.053) |
| Observations | 307 | 244 |
| Adjusted $R^2$ | 0.772 | 0.702 |

Note: Standard errors in parentheses. $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$. Models include fixed effects for each jurisdiction (county or township). Coefficients for Census variables are change of one percentage point in demographic composition. Cleaned data removes polling locations with turnout below 10th percentile (56%) and above 90th percentile (90%). Future iterations will use more rigorous data hygiene process.

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**Endnotes**

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[1] Use of paper ballots, as in LA County, creates a clearer distinction between the marking and cast phases of voting than electronic machines. Nonetheless, we treat the distinction as meaningful.

[2] Distance from available polling places is also negatively related to the likelihood to vote when voters have a choice from among different polling places at which to vote, as in Election Day vote centers (Stein and Vonnahme 2008; 2012a; 2012b) and in-person early voting (Dyck and Gimpel 2005).

[3] Two exceptions are: 1) persons who check in to vote but are in the incorrect location or fail to have proper identification needed to vote.  These persons might choose to leave the polling place not casting a ballot or provisional ballot; 2) persons who leave due to excessive line length/wait time.

[4] Details of random selection procedure are available at https://sites.google.com/view/pollresearch2018/home

[5] There were instances where local conditions necessitated deviating from random selection, most often due to difficulty traveling to voting location or wanting to observe campus voting locations.  When such circumstances occurred, the teams were instructed to ensure that selection did not constitute sampling on the dependent variable (e.g. not selecting locations expected to have problems or lines).

[6] The jurisdictions that comprise the dataset for this paper constitute a sample of convenience, because they depend on who responded to the call to participate in the study.  The obvious bias induced by this sampling method, compared to drawing a representative sample of voters or polling places, is that jurisdictions without a college or university are unlikely to be included in the study. However, as the list of jurisdictions in Table 1 makes clear, the jurisdictions that were in the study were distributed geographically and across urban, suburban, and rural locations. Thus, while not representative, the collection of precincts is varied enough that important empirical insights can perhaps be gleaned from the data. The jurisdictions studied closely approximate the demographic makeup of the 2016 electorate (Appendix).

[7] Practical scheduling constraints of undergraduates often meant that researchers only spent one hour at polling places.

[8] Materials available at https://sites.google.com/view/pollresearch2016/home

[9] We use the Christian term "church" because all of the religious buildings in our sample were affiliated with Christian denominations. If a form indicated the polling place was both a church and school (e.g. a religious school), it was coded only as a religious institution. This coding decision is based on policy debates about the appropriateness of placing polling places in religiously affiliated buildings as well as research about the effects of religious buildings on voting behavior.

[10] We acknowledge that casting a ballot in 2016 does not mean voters did so in a polling place. We are working on obtaining data about vote method to refine this analysis.

[11] Additional hand curing of the match process may result in including additional polling places (i.e., correcting formatting, abbreviations, misspellings, etc).

[12] Some states do not distinguish method of voting in the publicly available vote history, but these states require an excuse to vote absentee so the share of pre-Election Day ballots is very small. The coding of voting method in the Catalist data does not distinguish polling place and Election Day vote centers, so there may be measurement error of true polling voting in jurisdictions using EDVCs in Texas and Indiana.