Waiting to vote safely: How Covid-19 safety measures shaped in-person voter wait times during the 2020 election

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Abstract

Objective: The aim of this article is to assess the impact of Covid-19 safety measures on voter wait times during the 2020 U.S. election.

Methods: Multinomial logistic regression models predicting voter wait times contingent on the presence of Covid safety measures: poll workers wearing face coverings, protective barriers separating voters and workers, voters and booths socially distanced, hand sanitizer, single-use ballot marking pens, and cleaning voting booths between voters, as well as an additive index of these measures.

Results: Findings suggest Covid-safety measures significantly affected voter wait times. Effects vary by Covid safety feature, with face coverings, barriers, social distancing, and cleaning booths increasing voter wait times (typically around 10–30 min), single-use pens decreasing voter wait times, and hand sanitizer having no effect. Results are further confirmed using an additive index.

Conclusion: Covid safety features likely increased voter wait times during the 2020 U.S. election, potentially accounting for a portion of the increased voter wait time, compared to previous elections.

As the Coronavirus disease (2019) pandemic carried into the 2020 U.S. November election, state and local election jurisdictions took tremendous steps toward increasing safe voter access. Many states increased absentee and mail voting access, while others outfitted their polling places with face masks, protective barriers, and socially distanced voting (National Governor’s Association 2020; Sam, Eckman, and Shanton 2020). Though more Americans cast their ballot by mail or absentee voting methods in 2020 than any year before, just over 60 percent of those who voted did so in person at their local polling place through early
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or Election Day voting. This is compared to nearly 70 percent to 80 percent in recent elections (Election Assistance Commission 2021). Despite this decrease in in-person voting and a trend of decreasing voter wait times over the previous three presidential elections, voters who cast their ballot in person faced longer wait times than in previous years. In-person voters in 2020 were twice as likely to face 30+ min wait times than in 2016, with many encountering wait times not seen since 2008 (Persily and Stewart 2021; Stewart 2021). How can it be that election administrators had fewer in-person voters to process yet voters still had to wait longer to cast their ballot? This study argues that the implementation of Covid safety protocols at the polling place made it more difficult for voters to traverse the voting process, and as such, resulted in longer wait times.

Previous work has shown that factors that make registration/check-in and voting more difficult, or that decrease the number of polling workers or machines available, can significantly increase voter wait times (Spencer and Markovits 2010; Stein et al. 2020). Considering the use of Covid safety protocols like face masks, socially distanced voting, and cleaning voting booths between voters, it is likely that their implementation hindered the voting process. Face coverings decrease communication effectiveness by muffling speech and hiding facial cues (Saunders, Jackson, and Visram 2021), potentially leading to mishearing, confusion, having to repeat instructions, and incidences at the voting booth. Social distancing voters, workers, and booths limit the number of people, workers, and machines that can fit in the voting place, hindering how quickly people can be checked in and vote. Last, cleaning voting booths takes workers who could be checking in or assisting voters and puts them to work cleaning booths while also essentially closing down the booth while it is cleaned. Though these policies may make voting safer, they may also increase how long it takes to cast a ballot (National Governor’s Association 2020).

To examine whether Covid safety features impacted voter wait times during the 2020 U.S. presidential election, this study uses data from the 2020 Survey of the Performance of American Election (SPAE; Stewart 2021). The 2020 SPAE asks voters, among other questions, how long they waited to vote, and what Covid prevention policies they witnessed while voting. Using responses to these questions, this study investigates how six different safety features—poll workers wearing face coverings, erecting protective barriers, socially distanced voting, hand sanitizer, single-use ballot marking pens, and routine booth cleaning—impacted voter wait times. Results suggest that some Covid safety features do increase voter wait times. Specifically, poll workers wearing face coverings, protective barriers between voters and workers, socially distanced voting, and cleaning voting booths between voters significantly extended voting wait times. Voters who cast their ballot at a polling place with Covid safety features were more likely to experience a 10–30 min or 30+ min wait than voters in less Covid-safe places, while also less likely to report having no wait or waiting less than 10 min. At the same time, some evidence suggests that providing single-use ballot marking pens may slightly decrease waits, potentially due to greater availability of ballot marking utensils, while hand sanitizer availability has no significant effect. These results are further supported using an index of Covid safety measures with alternative coding schemes. Last, when compared to two other factors routinely found to influence voter wait times—poll worker and polling place performance, results suggest the impact of Covid safety measures on wait times is similar to that of poll worker performance but smaller than that of polling place performance.

The evidence presented in this study suggests that the use of Covid safety measures did impact voter wait times with moderate effects uncovered, though the effects vary with the measures administrators implemented to protect voters. Further, three of the policies investigated deal with airborne transmission (face coverings, protective barriers, and socially distanced voting), while the other three deal with surface transmission (hand sanitizer, single-use pens, and booth cleaning). Results suggest that those dealing with air transmission, which is the mode through which Covid is more highly passed, had some of the largest impacts on voter wait times, while those dealing with surface transmission had less time-depressing effects, no effects, or may help save time at the voting booth. Yet these results should not be interpreted to imply those safety features that hindered voter wait times should be removed. Rather, they should be investigated further to determine how they can be implemented without burdening the election process, and their use

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2 See https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html
should be guided by both their effects on voter wait times and related outcomes (e.g., evaluations of the voting process), as well as their efficacy in protecting voters. With that being said, future work should go beyond the voting experience evaluated here—voter wait times—and examine how these safety policies may go on to affect other voter experiences, such as how highly they rate their polling place, poll workers, and overall positive of their voting experience (e.g., Stein and Vonnahme 2012), as well as their likelihood of reneging in the voting line and of returning to vote the next year (e.g., Lamb 2021; Pettigrew 2021). Additionally, future work should examine how these effects may be different for different voters (e.g., whether face masks deter those with hearing difficulties to a greater extent). Last, these findings suggest that even seemingly innocuous changes to the administration of voting, such as poll workers wearing face coverings or providing single-use pens, can have significant effects on voter experiences.

Covid-19 and the 2020 U.S. elections

Covid significantly disrupted the administration of elections in the United States as voters’ concerns with casting a ballot during a health crisis worsened. Leading up to the election, roughly 70 percent of Americans said they were worried that they or a member of their family will catch Covid (Kamisar and Holzberg 2020). During the week of November 4, over half of the registered voters reported thinking the pandemic would continue worsening (Ballard 2020). Despite this worry, many Americans still intended to vote in person (Gramlich 2020). This mix of public concern with Covid, the risk of voting in person, and the desire to do so put elections administrators in a difficult position: how to safely protect in-person voters as they cast their ballots at polling places across the country. To facilitate in-person voting, federal, state, and local initiatives were undertaken with the aim of protecting voters as they cast their ballot (Sam, Eckman, and Shannon 2020).

Federally, the Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed into law, which directed $400 million in emergency funds to aid states in administering their elections. Nearly all states used this funding to, among other things, offset the costs of buying additional protective equipment like masks, face shields, protective barriers, and cleaning supplies (Election Assistance Commission 2020). States also enacted their own Covid prevention laws, such as New York that mandated masks at the polls but also said mask-less voters would not be turned away, and conversely states like Alabama that specifically outlawed masks being required (Healthy Elections Project 2020). Even absent state policies, and occasionally in the face of them, local jurisdictions have also implemented Covid safety measures like requiring masks or cleaning voting booths (Healthy Elections Project 2020; Sam, Eckman, and Shandon 2020). Even where not required, many individual poll workers and voters still decided to wear face coverings or use other safety measures. In Delaware, which encouraged voters to wear masks but stated no one would be turned away for not having one, a study of polling places and workers suggest that 88 percent of poll workers report that face coverings were available for them, and 70 percent said the same regarding coverings for voters (Leidman et al. 2020). Over 80 percent of respondents also reported high rates of mask-wearing among voters.

These changes to the way elections are conducted also tend to be a welcomed addition by the public. Sixty-five percent of Americans support sanitizing voting booths between voters, 74 percent approve of social distancing, and 79 percent favor voters wearing face masks; all even if doing so may increase the time it takes to vote (Douglas and Zilis 2020). Both voters and poll workers also report they would feel more comfortable working/waiting to vote in person if the polling place employed Covid safety measures than if they did not (Kousser et al. 2021), though preferences for which measures should be employed may differ by party (Kortum et al. 2020). These findings are not surprising given that many Americans are worried about contracting Covid (Kamisar and Holzberg 2020), support these measures in other public places outside of the voting booth (e.g., planes, buses, schools; Funk and Tyson 2021), think that these prevention measures are effective at curbing the coronavirus pandemic (Darling et al. 2021), and blame the underutilization of mitigation strategies for the continuation of the pandemic (Pew Research Center 2020).
Given the dangers of voting in person coupled with the high demand for in-person voting and support for Covid safety policies at the voting booth, many local polling places were outfitted with a myriad of Covid safety policies. According to a nationally representative sample of voters,\(^3\) 88.5 percent of voters saw poll workers wearing face coverings, 59.7 percent witnessed physical barriers separating workers from voters or voters from other voters, 79.3 percent experienced socially distanced voting (i.e., voters or booths spaced further apart), 75.2 percent were provided hand sanitizer, 44.2 percent were also provided single-use ballot marking pens, and 43.1 percent observed voting booths being routinely cleaned. These policies were put in place with the hopes of protecting voters, but as argued below, may have also increased wait times. As mentioned earlier, prior to 2020, the average voter wait time had been decreasing. In 2008, 16 percent of all in-person voters waited more than 30 min to vote. This decreased to 13 percent in 2012. By 2016, the frequency of long wait times had dropped to nearly half that of 8 years prior, with only 9 percent of voters waiting more than 30 min. However, in 2020, this rate shot up to 18 percent as nearly one in five voters waited more than half an hour to cast their ballots.

Though many of these changes may seem minor (e.g., poll workers wearing face coverings, providing single-use ballot marking pens), it is likely that they go on to affect voter wait times by burdening the voting and registration process (Spencer and Markovits 2010; Stein et al. 2020; Stewart and Ansolabehere 2015). Previous work has examined how reforming the voting process in light of the Covid pandemic affected turnout (e.g., Morris and Miller 2021); however, little work has examined how the changing election administration as a result of Covid affected voter’s ability to traverse the in-person voting process. This study seeks to examine how the administration of elections vis-à-vis Covid safety protocols affects how long a voter waited in line. Specifically, it investigates how the use of Covid safety measures—face coverings, protective barriers, socially distanced voting, hand sanitizer, single-use ballot pens, and routine cleaning voting booths—impacted how long a voter waited in line to cast their ballot. Though this is a study of how Covid policies impacted voter wait times, the implications of this study can extend past these small changes to other seemingly innocuous changes in election administration. That is, though this is a study of how Covid policies shaped in-person voter wait times, the findings exemplify how even minute changes to elections can impact voters as shown through the exogenous shocks to election administration caused by the Covid pandemic.

### The voting process, Covid-19 safety measures, and voter wait times

To cast a ballot in person, eligible citizens must arrive at their voting place, check in to vote, enter the voting line, cast their ballot, and finally leave the polling place. As such, the voting process is akin to a queuing system where a customer enters a line, waits for service(s), then leaves (Bipartisan Policy Center 2013; Spencer and Markovits 2010; Stein et al. 2020; Stewart and Ansolabehere 2015). In a queuing system, wait times are dependent on the “arrival rates of customers, the number of positions available to serve customers, and the amount of time it takes to serve a customer (Stein et al. 2020, 440).” In a similar manner, the time it takes to progress through the voting process depends on the arrival rate of voters, how many poll workers and machines are available to voters, how long it takes a worker to assist the voter, and the time it takes a voter to cast their ballot (Stewart and Ansolabehere 2015). Previous work suggests alterations to the administration of elections that affect these steps can change how long and whether citizens cast a ballot (Highton 2006; Lamb 2021; Spencer and Markovits 2010; Stein et al. 2008; Stein et al. 2020).

When polling places hire fewer workers, there are fewer personnel to check in voters or assist them with voting problems, causing backlogs at the polling place (Stein et al. 2020). If fewer voting machines are available, fewer voters can simultaneously cast their ballot, leading to longer lines and reduced turnout (Highton 2006). When voters have a harder time/run into problems at the voting booth, they may require assistance from poll workers and/or take more time to finalize their ballot (Spencer and Markovits 2010;

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\(^3\) Authors tabulation of the 2020 Survey of the Performance of American Elections (Stewart 2021).
Stein et al. 2020). These and other factors (e.g., ballot design and length; Stein et al. 2020) can have significant influences on how long it takes a voter to traverse the in-person voting process, potentially decreasing voter confidence in vote counts (King 2019), increasing the chances a voter reneges on their decision to vote while in line (Lamb 2021) or decides to abstain from voting the following year (Pettigrew 2021). Considering this previous work alongside the literal and figurative barriers erected by Covid safety measures suggests that these measures may hinder “the number of positions available to serve customers and the amount of time it takes to serve a customer,” and as such, increase wait times.

Considering one of the most salient Covid safety procedures, face masks and shields, it is likely that these impacted the ability of voters to traverse the voting process. Though only a handful of states mandated poll workers or voters wear face coverings, many strongly encouraged it and provided additional funds and masks to local election jurisdictions (Healthy Elections Project 2020). Further, workers and voters supported masks at the voting place (Kousser et al. 2021) and were already routinely wearing masks when they went out to other public places, such as to restaurants and businesses (Funk and Tyson 2021), suggesting they likely wore them at the polling place (Leidman et al. 2020). Though they may protect those at the polling place, these face coverings stifle conversation, particularly for non-transparent face masks (Saunders, Jackson, and Visram 2021). By blocking the transmission of speech, face coverings make it more difficult to hear what the worker or voter may be saying. This can cause workers to have to repeat instructions, workers/voters mishearing the other, and incidences in the voting booths due to voter confusion as a result of the miscommunication. As such, poll workers wearing face coverings may increase voter wait times.

Hypothesis 1: Individuals voting in polling places with poll workers wearing face coverings will face longer wait times than those voting in polling places without poll workers wearing face coverings.

Many election jurisdictions also erected safety barriers to separate voters from poll workers and voters from other voters at the ballot box. These safety barriers may be as simple as using plexiglass walls to using actual tables as barriers. Like face masks, these barriers separate individuals, potentially stifling speech and making it more difficult to communicate, particularly if they are not fully see-through. Further, they create obstacles in the voting process by forcing individuals to navigate around the barriers, potentially increasing line length. These factors may lead to protective barriers causing longer lines at voting places.

Hypothesis 2: Individuals voting in polling places with protective barriers will face longer wait times than those voting in polling places without protective barriers.

Beyond face masks and protective barriers, many state and local election officials encouraged and implemented social distancing protocols by spacing voters and voting booths 6 feet apart. In doing so, election workers were hoping to decrease the likelihood of Covid spreading through the air. However, these safety protocols also likely decreased the number of workers at the check-in station, the number of voting machines available, and the number of people who can be in a polling site at one time, all resulting in increased line lengths and wait times (Spencer and Markovits 2010; Stein et al. 2020; see also Highton 2006). By requiring voters remain 6 feet apart when in line, officials are also requiring poll workers working at a check-in booth to be 6 feet apart. Given space constraints, this may result in fewer poll workers being able to work at a check-in station or even fewer check-in stations at a polling site, leading to greater check-in times and longer lines/waits. In a similar fashion, social distancing voters and booths may also decrease the number of voting machines in a polling place, further increasing waits. Last, social distancing also means fewer voters allowed in a polling place at a time, as poll workers only allow a certain number of voters to enter the polling place simultaneously, potentially resulting in longer lines outside of polling places and fewer voters able to vote/be assisted at a time inside the polling place. Together, these factors that come about because of social distancing protocols may increase how long it takes a voter to complete the in-person voting process.

Hypothesis 3: Individuals voting in polling places with social distance protocols will face longer wait times than those voting in polling places without social distance protocols.

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4 It is worth mentioning that many polling places were set up in larger spaces such as schools, stadiums, and arenas, which better allow for social distanced voting without sacrificing additional space.
All previously discussed safety protocols aimed at reducing the spread of Covid through airborne transmission. However, Covid can also be spread through surface transmission, such as at the voting booth and through reusing the same ballot marking pen. One way to allow voters to safely access in-person voting methods is by providing them with hand sanitizer. In doing so, administrators are not only protecting voters but also potentially increasing the time it takes them to get through the voting line. As voters lather the sanitizer onto their hands and wring it in, they may take additional time that could be used checking in, casting their ballot, or leaving the voting booth.

Hypothesis 4: Individuals voting in polling places with hand sanitizer available will face longer wait times than those voting in polling places without hand sanitizer available.

Another way to reduce surface transmission of Covid is through removing the (potentially) infected surface. By providing single-use ballot marking pens, administrators are doing just that. Single-use ballot marking pens refer to instances where voters are provided with a pen to mark their ballots, and then that pen is typically kept or discarded by the voter, and the next voter gets a fresh, clean pen. Providing these pens may further burden election administrators and voters, as administrators must provide each new voter with a new ballot marking pen. Doing so can increase the costs of administering elections, diverting limited election resources from other aspects of the administration toward buying a plethora of pens. Additionally, poll workers may forget to provide the pen, or the voter may not hear the instructions to get their pen, forcing the voter to turn back once they get to the voting booth and realize there is not a pen waiting for them. Further, if polling places run out of single-use pens, this could cause further backlogs. As such, single-use pens may increase voter wait times.

Hypothesis 5: Individuals voting in polling places with single-use ballot marking pens will face longer wait times than those voting in polling places without single-use ballot marking pens.

Requiring poll workers to clean voting booths between each voter may also impede voting. By requiring a poll worker to clean a booth between voters, election administrators are having to utilize a resource they already tend to have too few of: poll workers (Burden and Milyo 2015). This decreases the available workers to work at check-in booths and assist citizens with registration and voting problems, a problem that may be further exacerbated due to there being nearly 16 percent fewer polling workers in 2020 than in previous years (Election Assistance Commission 2021). At the same time, there was less need for poll workers due to fewer in-person voters, and election officials reported less difficulty recruiting poll workers than in previous years, as well as an influx of workers recruited through other organizations that resulted in a surplus of workers in some areas. Yet it is also worth mentioning the flight of veteran and older poll workers leaving the election workforce, and last-minute worker shortages greatly hampered local election jurisdictions, while many election jurisdictions still lacked poll workers (Election Assistance Commission 2021). Additionally, purchasing proper cleaning equipment can further decrease election administration as funds that could be used for more equipment and personnel are diverted to routinely cleaning voting booths. Last, the actual cleaning of the booths can take more time, as poll workers must shut down voting booths between workers to clean them. Because of these increased constraints, it is likely that cleaning voting booths between voters hampers voter progression through the voting process.

Hypothesis 6: Individuals voting in polling places that clean voting booths between voters will face longer wait times than those voting in polling places that do not clean voting booths between voters.

These policies represent six of the most common prevention mechanisms employed (National Governors Association 2020). Yet these policies are not random, nor do they simply represent Covid safety policies. First, these policies can be delineated along Covid prevention mechanism lines. Three of the policies discussed here represent airborne transmission prevention policies, including face coverings, protective barriers, and socially distanced voting. The remaining three policies—hand sanitizer, single-use pens, and cleaning voting booths—are aimed at reducing surface transmission. Previous work has also suggested that Covid is more heavily transmitted by air than the surface. As such, when practitioners consider the results reported below, it is important to also consider the type of transmission prevention the policy is aimed at. Second, though this study explicitly examines Covid policies, these policies are merely examples of ways the election administration process can be hindered by administrative changes. Face coverings and protective barriers represent changes that can limit communication; those same barriers, as well as social
distancing policies, may reflect physical changes to polling place setup; and hand sanitizer, single-use pens, and cleaning voting booths denote changes to the voting process itself. As such, these policies reflect not only changes to the voting process caused by the Covid pandemic but categories of changes that affect specific aspects of the voting process.

DATA AND METHODS

Data on voter wait times and Covid safety measure usage come from the SPAE (Stewart 2021). The purpose of the SPAE is to further the understanding of voter experiences of the election process, such as voter wait times. The SPAE is a large scale, cross-state comparable survey that routinely asks questions regarding voter evaluations of their polling workers and places, how long they had to wait, and more. The survey is conducted online through YouGov, beginning the day after the November election. Data from these surveys have frequently been used for investigations about voter wait times and related outcomes (Burden and Milyo 2015; King 2017; King and Barnes 2019; Stewart and Ansolabhere 2015). Not only are respondents asked how long they waited, but they are also asked whether they witnessed any of the following Covid safety features being employed at their voting places: poll workers wearing face coverings, barriers separating voters from works or other voters, voters or booths spaced further apart, available hand sanitizer, single-use ballot marking pens, and poll workers cleaning booths between voters. Given its large size, cross-state comparability, being fielded directly after the election, regularly used to study voter experiences such as wait times, and its inclusion of whether the voter’s polling workers/place employed Covid safety measures, the SPAE represent an invaluable data set for investigating how Covid safety policies impacted in-person voting during the 2020 U.S. election.

To investigate how these policies impacted voter wait times, this study uses respondent responses to create a variable denoting voter wait times. Respondents were asked whether they had no wait, waited less than 10 min, waited 10–30 min, 30–60 min, or over 60 min. Because few voters reported wait times of more than 60 min (5.6 percent), these respondents were grouped with those answering their wait was 30–60 min to alleviate issues with small cell size and create more even categories, resulting in a category of whether the voter waited for more than 30 min. This coding comports with previous work (e.g., Persily and Stewart 2021) and is the benchmark suggested by the Presidential Commission on Election Administration (U.S. Presidential Commission on Election Administration 2014), with results robust to using the original coding. Roughly 31 percent of respondents reported no wait, 28 percent had a wait of less than 10 min, 23 percent had a 10–30-min wait, and 18 percent waited more than 30 min. These wait times are in contrast to only 9 percent of in-person voters waiting more than 30 min in 2016, 13 percent in 2012, and 16 percent in 2008 (Persily and Stewart 2021; Stewart 2021), demonstrating the long waits incurred during in-person voting for the 2020 election.

The presence of Covid safety features is measured using single indicators for whether each of the six aforementioned policies was witnessed by a voter (poll workers with face coverings, protective barriers erected, voters and booths spaced apart, hand sanitizer, single-use pens, and routinely cleaned voting booths), where 1 represents that safety mechanism was seen at the polling place and 0 represents it was not. Each of these indicators is then used to predict voter wait times in isolation (see Tables E1–E6 in Appendix E) and when controlling for all other indicators (reported below). As a further robustness check, an additive index is created summing the total number of safety protocols.

Summary statistics for all variables used in this study can be found in Appendix A. Question wording can be found in Appendix B. See also, the Survey of the Performance of American Elections on the Harvard dataverse (https://dataverse.harvard.edu/dataset.xhtml?persistentId =doi:10.7910/DVN/FSGX7Z).

Respondents were specifically asked about face masks and/or face coverings; about barriers separating voters from workers and/or separating voters from other voters; and about voters in line being spaced further apart and/or voting booths being spaced further apart. For model parsimony and text brevity, these are combined into three variables representing whether poll workers wore any face covering, whether any barriers were constructed, and whether any social distancing was witnessed. Results supported when using the original variables.

Cronbach’s alpha = 0.6027, mean = 3.94, standard deviation = 1.52, skewness = −0.47, kurtosis = 2.41. See Figure C1 in Appendix C for a histogram of the index.
The SPAE also provides a host of variables to control for alternative influences. Previous work suggests that voter wait times differ across demographic and political characteristics of the voter (Cottrell, Herron, and Smith 2021; Herron and Smith 2015; Lamb 2021; Pettigrew 2017) and of the administration of the voting place (Spencer and Markovits 2010; Stein et al. 2020). Demographically, the SPAE asks voters their age, race, ethnicity, gender, income, and education. Politically, the respondents are also asked to report their partisanship, ideology, political interest, and whether this is their first time voting. Administratively, the SPAE also includes questions over other factors that may affect voter wait times, such as poll worker and polling place evaluations, if they voted early or in person, if they were asked to show voter identifications (IDs), if they had any difficulties finding their polling place, and if they encountered issues with registration and voting. Because perceptions of Covid severity may influence voter perceptions of voting in person, also included are responses to a question asking how worried the voter is that they or their family will contract Covid.

There are other factors that may also affect wait times not captured in the SPAE. Turnout rates may be different in more politically competitive counties, leading to different wait times. As such, also included is a measure of competitiveness, defined as the presidential vote margin in the county (MIT Election Data and Science Lab 2021). Voter wait times may also be affected by how well state election administrations perform their jobs, and to control for this, the state level Election Performance Index is also included (Curiel 2020). Last, to capture state differences in the severity of Covid and their ability to confront Covid at the voting place, a measure of the total number of new Covid cases as a percent of the total population in the week leading up to the election is included, as is a per-capita measure of the funds states received through the CARES Act for assistance with elections (Election Assistance Commission 2020).

Though the dependent variable of voter wait times is categorical and has an “order” to its construction, the categories are not plentiful nor capturing evenly measured intervals, suggesting that ordinary least square and ordered logistic regression may not be the most appropriate modeling strategy (Long 1997). Additional analyses also confirm that the proportional odds assumption of ordered regression does not hold. As such, models are estimated using multinomial logistic regression, which relaxes the proportional odds assumption. To account for heterogeneity across subjects and spatial dependence between them, robust standard errors clustered by the state are employed. Results are similar under alternative specifications, including using ordered logistic or ordinary least squares regression and including state fixed effects (see Tables D1–D3 in Appendix D).

The effects of Covid-19 safety features on in-person voter wait times during the 2020 U.S. election

Before diving into the impacts of Covid safety features on in-person voting wait times, Table 1 displays the results of a multinomial logistic regression model predicting voter wait times without any safety measures included to form a baseline. As models are estimated using multinomial logistic regression, all coefficients must be interpreted in comparison to the omitted group of those experiencing no wait and in comparison to the reference group of the independent variable. Like previous works, the findings here suggest that

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8 Results pertaining to the effects of Covid safety policies on voter wait times are robust to including a variable denoting whether the state required voter IDs. The state level variable of whether the state has a voter ID law is statistically unrelated to voter wait times. This study opts to use the variable denoting whether the voter was asked for ID because its inclusion provides a better model fit, and it more accurately addresses differences in who is asked to provide ID (see Atkeson et al. 2010). In this sense, it is not just about whether the state has a voter ID law but who this law is enforced upon.

9 See https://www.nytimes.com/interactive/2021/us/covid-cases.html. Results robust to its omission.

10 It should be noted that states used the CARES funding for a myriad of election-related spending, including expanding mail/absentee voting capabilities and hiring new polling workers. Official data reporting and availability issues limit the ability of this study to control for spending on proper protective equipment (e.g., masks, booth cleaning supplies) specifically. However, regardless of how the money was spent, it likely went on to impact election administration in systematic ways that may mask the findings presented here (e.g., states that received more money per capita were able to buy more masks per worker or put more money into expanding absentee voting decreasing in-person voter line length), and as such, this study includes the CARES funding as an additional control variable. Results robust to its omission.
TABLE 1  Predicting voter wait times in the 2020 election without Covid-19 safety measures included

|                                    | <10 min wait | 10—30 min wait | >30 min wait |
|------------------------------------|--------------|----------------|--------------|
|                                    | b/se         | b/se           | b/se         |
| Worried About Covid                | 0.03         | 0.06           | 0.05         |
|                                    | (0.04)       | (0.05)         | (0.05)       |
| Poll Worker Eval.                  | −0.07        | −0.28***       | −0.34***     |
|                                    | (0.06)       | (0.05)         | (0.06)       |
| Poll Place Eval.                   | −0.59***     | −0.89***       | −1.17***     |
|                                    | (0.11)       | (0.11)         | (0.11)       |
| First Time Voter                   | 0.01         | −0.02          | 0.06         |
|                                    | (0.14)       | (0.17)         | (0.18)       |
| Voted Early                        | 0.12         | 0.37**         | 0.54**       |
|                                    | (0.11)       | (0.15)         | (0.23)       |
| Reg. Problems                      | −0.10        | 0.05           | −0.17        |
|                                    | (0.28)       | (0.25)         | (0.26)       |
| Voting Problems                    | 0.13         | −0.10          | −0.11        |
|                                    | (0.26)       | (0.33)         | (0.40)       |
| Difficulty Finding Polling Place   | 0.34***      | 0.70***        | 0.75***      |
|                                    | (0.10)       | (0.11)         | (0.13)       |
| Showed ID                          | 0.23*        | 0.52***        | 0.64***      |
|                                    | (0.13)       | (0.14)         | (0.21)       |
| Hispanic                           | 0.35***      | 0.20           | 0.09         |
|                                    | (0.15)       | (0.14)         | (0.18)       |
| Black                              | 0.24**       | 0.36***        | 0.62***      |
|                                    | (0.12)       | (0.08)         | (0.12)       |
| Other                              | 0.24         | 0.32**         | −0.00        |
|                                    | (0.18)       | (0.16)         | (0.18)       |
| Age                                | −0.01***     | −0.00          | −0.00        |
|                                    | (0.00)       | (0.00)         | (0.00)       |
| Income                             | 0.01         | 0.03**         | 0.05***      |
|                                    | (0.01)       | (0.01)         | (0.02)       |
| Education                          | −0.00        | −0.00          | 0.07**       |
|                                    | (0.03)       | (0.02)         | (0.03)       |
| Married                            | 0.08         | 0.05           | −0.03        |
|                                    | (0.07)       | (0.08)         | (0.07)       |
| Female                             | −0.14*       | −0.24***       | 0.01         |
|                                    | (0.08)       | (0.08)         | (0.11)       |
| Democrat                           | 0.22*        | 0.34***        | 0.33***      |
|                                    | (0.12)       | (0.11)         | (0.10)       |
| Republican                         | 0.13         | 0.15*          | 0.26**       |
|                                    | (0.08)       | (0.09)         | (0.10)       |
### Table 1 (Continued)

|                      | <10 min wait | 10—30 min wait | >30 min wait |
|----------------------|--------------|----------------|--------------|
|                      | b/se         | b/se           | b/se         |
| **Liberalism**       | −0.05        | −0.02          | −0.00        |
|                      | (0.03)       | (0.04)         | (0.05)       |
| **Political Interest**| −0.03        | −0.09          | 0.19         |
|                      | (0.08)       | (0.07)         | (0.12)       |
| **CARES Funding**    | −0.03        | −0.09          | −0.09        |
|                      | (0.05)       | (0.06)         | (0.12)       |
| **Covid Cases**      | −0.04        | −0.49**        | −1.29**      |
|                      | (0.21)       | (0.27)         | (0.52)       |
| **Pres. Vote Margin**| −0.14        | −0.46*         | −1.13***     |
|                      | (0.20)       | (0.24)         | (0.30)       |
| **Elect. Perf. Index**| −1.15**      | −0.49          | −0.98        |
|                      | (0.53)       | (0.78)         | (1.49)       |
| **Constant**         | 2.44***      | 2.16***        | 2.60*        |
|                      | (0.56)       | (0.72)         | (1.36)       |
| **Observations**     | 8482         | 8482           | 8482         |

Note: Results from multinomial logistic regression with robust standard errors clustered by state. Dependent variable: Self-reported voter wait time with the reference category of those reporting no wait. Elect. Perf. Index, election performance index; Eval., evaluation; ID, identification; Pres., presidential; Reg., registration.

*0.1, **0.05, ***0.01.

Voter wait times are heavily influenced by election administration, electoral reforms, and voter demographics (Pettigrew 2017; Spencer and Markovits 2010; Stein et al. 2020). Voters who rated their poll workers or polling place higher are less likely to report higher wait times than they are to report no wait, compared to those with lower-performing polling places and workers. Those who had more trouble finding their voting place were more likely to report longer waits than report no wait, compared to those who had an easier time locating where to cast their ballot. Voting reforms also appear to matter, as those who voted early or had to show a voter ID were more likely to say they waited longer than they are to say they had no wait, compared to those who voted on Election Day or did not show an ID. There is also evidence of racial and ethnic differences in wait times, with black and Hispanic voters more likely to cite waiting in line longer than having no wait, compared to white voters. Older voters may be less likely to experience longer waits than they are to experiencing shorter waits, compared to their younger counterparts, with the opposite being found for richer voters, compared to less well-off voters. Covid severity may have also decreased wait times, as those in areas with larger Covid positivity rates are less likely to report longer waits than no waits, compared to those in less Covid-prevalent areas, potentially as more voters decide to vote by mail or were too sick to vote. Independents were more likely to report shorter wait times than longer wait times, compared to their partisan counterparts, as were female respondents, compared to their male counterparts. Last, those voting in more electorally competitive counties or states with greater election administration were more likely to report shorter waits than longer waits, compared to their respective counterparts.

Next, to examine the impact of Covid safety features on voting wait times, Table 2 shows the results of two multinomial logistic regression models, with control variables included but omitted for space (see Tables C1 and C2 in Appendix C). One model regresses wait times on the separate indicators, the other on the index of indicators. The first two columns predict the impact of Covid indicators and the Covid safety index on the probability of the respondent answering they waited less than 10 min, compared to
# TABLE 2  Predicting voter wait times in the 2020 election with Covid-19 safety measures included

|                      | <10 min wait | 10–30 min wait | >30 min wait |
|----------------------|--------------|----------------|--------------|
|                      | b/se (1)     | b/se (2)       | b/se (3)     |
| **Face Coverings**   | −0.11        | 0.10           | 0.48**       |
|                      | (0.10)       | (0.11)         | (0.12)       |
| **Protective Barriers** | −0.05        | 0.19**         | 0.07         |
|                      | (0.06)       | (0.08)         | (0.11)       |
| **Socially Distanced** | 0.09         | 0.26***        | 0.19*        |
|                      | (0.08)       | (0.08)         | (0.11)       |
| **Sanitizer Available** | −0.12        | −0.03          | 0.01         |
|                      | (0.07)       | (0.11)         | (0.11)       |
| **Single-Use Pens**  | −0.04        | −0.20**        | −0.24**      |
|                      | (0.07)       | (0.09)         | (0.10)       |
| **Booths Cleaned**   | 0.23***      | 0.25***        | 0.21**       |
|                      | (0.07)       | (0.09)         | (0.10)       |
| **Covid Safety Index** | 0.01         | 0.09***        | 0.08**       |
|                      | (0.02)       | (0.03)         | (0.04)       |
| **Constant**         | 2.62***      | 2.42***        | 2.30*        |
|                      | (0.56)       | (0.56)         | (1.35)       |
|                      |              |                | (1.39)       |
| **Observations**     | 8482         | 8482           | 8482         |

**Note:** Results from multinomial logistic regression with robust standard errors clustered by state. Dependent variable: Self-reported voter wait times with the reference category of those reporting no wait. Controls included (see Table 1 and Tables C1–C2 in Appendix C), omitted for space. Bolded coefficients significant at the \( p = 0.05 \) level without controlling for other safety measures as an additional robustness check against multicollinearity driving the reported results (not applicable for models with index, see Tables D1–D3 in Appendix D and Tables E1–E6 in Appendix E). * = 0.1, ** = 0.05, *** = 0.01.
saying they had no wait; the second two predict the impact between saying a 10–30-min wait occurred, compared to no wait; and the last two between saying the wait was longer than 30 min, compared to no wait. Odd-numbered models represent the multinomial model that includes all Covid safety indicators simultaneously, with bolded coefficients denoting results that are robust to the exclusion of alternative indicators as an additional robustness check against potential multicollinearity concerns with multiple Covid safety measures in the same model (see Tables E1–E6 in Appendix E). Even-numbered models interchange the single indicators for an additive index ranging from 0 to 6. For ease of interpretability, Figures 1 and 2 display the marginal effects of each Covid safety measure using a coefficient plot (Jann 2014), and Figure 3 shows the same for the Covid Safety Index. Each marginal effect is plotted with 95
FIGURE 3 The marginal effect of Covid safety index (range 0–6) on voter wait times. Marginal effects plot shown with 95 percent confidence intervals. Results from multinomial logistic regression with robust standard errors clustered by state (see Table 2 and Table C2 in Appendix C).

TABLE 3 The effect of a one unit change in Covid safety measures and polling place/worker evaluations on the probability of reporting different voter wait times

| Variable (range)                        | No wait | <10 min. wait | 10–30 min wait | 30+ min wait |
|----------------------------------------|---------|---------------|----------------|--------------|
| Face Coverings (0–1)                   | –       | −4.8          | −              | +4.8         |
| Protective Barriers (0–1)              | −       | −2.4          | +2.7           | −            |
| Socially Distanced Voting (0–1)       | −3.5    | −             | +2.6           | −            |
| Hand Sanitizer (0–1)                   | −       | −             | −              | −            |
| Single-Use Ballot Marking Pens (0–1)  | −       | −             | −2.0           | −0.6         |
| Booths Cleaned Between Voters (0–1)   | −5.5    | +3.5          | −              | −            |
| Covid Safety Index (0–6)               | −0.9    | −             | +0.9           | −            |
| Poll Worker Evaluations (0–3)         | +4.6    | −             | −3.5           | −2.7         |
| Polling Place Evaluations (0–3)       | +14.0   | +0.5          | +5.6           | +8.9         |

Note: The above table reports the change in predicted probability of reporting different wait times varying independent variables one unit. Results derived from multinomial logistic models with robust standard errors clustered by state (see Table 2 and Tables C1–C2 in Appendix C).

percent confidence intervals, and any coefficient with intervals that cross the gray, vertical, dashed line cannot be confidently determined to have an effect that is statistically distinct from 0. Also, for ease of interpretation, Table 3 displays the change in probability of reporting different wait times varying whether Covid policies were seen, as well as varying the Covid safety index by one unit. For comparison, the effects of polling place and poll worker evaluations, two factors routinely tied to voter wait times (Spencer and Markovits 2010; Stein et al. 2020) are also shown varying each one unit.

Starting first with those policies that affect air transmission (face coverings, protective barriers, socially distancing), Table 2 and Figure 1 display mixed evidence of significant effects depending on the safety policy examined. Compared to those who voted in polling places without poll workers wearing face coverings, Table 2 suggests those who voted with poll workers wearing face coverings were more likely
to report waiting longer than 30 min, compared to reporting no wait, while the effect of face coverings on reporting a less than 10-min or 10–30-min wait cannot be significantly distinguished from their effect on reporting no wait. The leftmost panel in Figure 1 supports these findings with some additional caveats. Face coverings appear to have no significant impact on whether voters say they had no wait while decreasing the likelihood they report a less than 10-min wait ($p = 0.025$; change in probability $= -4.8$), though this effect is not statistically different from the effect of face coverings predicting no wait (i.e., the insignificant coefficient in Column 3 of Table 2). There is also no significant effect on reporting a 10–30-min wait, while face coverings are tied to a wait greater than 30 min ($p = 0.001$; change in probability $= +4.8$). These findings are further supported when estimating the effects of face coverings not controlling for other Covid policies to ensure multicollinearity is not driving results.

Next, Table 2 and Figure 1 provide some evidence that protective barriers may increase wait times. The coefficient for protective barriers is statistically significant in Column 3 of Table 2, suggesting that those who cast their ballot in a voting place with protective barriers were more likely to incur a 10–30-min wait than no wait, compared to those who voted without protective barriers. This is further corroborated by the center panel in Figure 1, which suggests that protective barriers increased the probability of reporting a 10–30-min wait ($p = 0.008$; change in probability $= +2.7$). Additionally, the marginal effects plot also suggests that protective barriers decreased the probability of reporting a less than 10-min wait ($p = 0.043$; change in probability $= -2.4$), though this effect is not significantly different than the effect found on the probability of reporting no wait. Again, these results are supported by models only including protective barriers for Covid safety measures.

Concerning socially distant voting, the last of the airborne transmission prevention mechanisms, Table 2 suggests those who voted in polling places that practiced social distancing were more likely to report a wait of 10–30 and greater than 30 min than they are to report no wait, compared to those without socially distance procedures in place. The rightmost panel in Figure 1 shows the marginal effects of socially distant voting on wait times. First, it appears that those who voted socially distanced were significantly less likely to report no wait ($p = 0.022$; change in probability $= -3.5$) and more likely to report a 10–30-min wait ($p = 0.017$; change in probability $= +2.6$). The effects on reporting a wait of less than 10 min or greater than 30 min are not statistically significantly different than 0; though the effect on reporting a 30+ min wait is statistically different than reporting no wait as suggested by Table 2. These effects are also found when estimating the impact of social distancing in isolation.

Moving on to Figure 2, which displays the marginal effects for surface transmission prevention policies of hand sanitizer, single-use pens, and routine booth cleaning, again, effects differ depending on the mechanism examined. Hand sanitizer is not significantly related to wait times in the full model, nor in isolation. This may be due to hand sanitizer not impeding traffic (e.g., people do not use it or use it quickly) or may reflect the administration of hand sanitizer vis-à-vis its placement. For example, if the sanitizer is made available at the voting booth, then voters may lather up before casting their ballot, increasing voting wait times. However, if it is available in the line, where voters can sanitize their hands while waiting to check in or vote, or after the voter exits the voting booth, where they can leave the premises while still working in the hand sanitizer, it may have no impact.

Contrary to expectations, single-use ballot pens do not increase wait times and may actually decrease them. Table 2 suggests that voters with single-use pens are less likely to report a 10–30 min wait ($p = 0.040$; change in probability $= -2.0$) or 30+ ($p = 0.035$; change in probability $= -0.6$) than no wait, compared to those who voted without single-use pens. Looking at the middle panel in Figure 2 corroborates these effects while suggesting that both effects are statistically significant, statistically distinct from the effect on no wait times while also statistically similar to each other. With that being said, these results are not robust to excluding all other Covid safety policies. It could be that multicollinearity is driving these results, though the correlation between single-use pens and other safety features tends to be low (highest correlation $= 0.223$). Further, dropping one Covid policy at a time does not influence the significance or effect of single-use pens to any large extent. Instead, it could be that the positive impacts of single-use pens is masked when not controlling for other Covid policies (i.e., single-use pens decrease wait times but are used in
conjunction with other Covid safety policies such that not controlling for other policies masks the effect of single-use pens).

The last Covid safety policy explored here is routine voter booth cleaning. According to Table 2, those who voted in polling places where booths were routinely cleaned are more likely to report all wait times than no wait time, compared to those without routine booth cleaning. However, this finding is actually somewhat misleading. As shown in Figure 2, those who experienced routine booth cleaning are more likely to report all wait times than no wait, but this effect is mostly driven by a lower propensity to cite no wait ($p = 0.000$; change in probability $= -5.5$) rather than a greater likelihood of reporting long waits. The exception to this is that these same respondents are also more likely to report a wait less than 10 mins ($p = 0.022$; change in probability $= +3.5$). Again, results are robust to the omission of other Covid safety policies during model estimation. Taken together, these results suggest that those policies that affect airborne transmission tend to have the highest impacts on wait times as they increase the likelihood of reporting a 10–30-min wait, and in the case of face masks, also a 30+ min wait. However, those policies aimed at surface transmission tend to have less of an impact, with cleaning voting booths mostly influencing whether the voter reports no wait or a 10–30-min wait, hand sanitizer having no effect, and single-use pens potentially decreasing voter wait times.

Though estimating the effects of each policy is beneficial in that it shows the effects of specific policies, it is likely that many polling places employed multiple policies simultaneously. Less than 1 percent of voters reported polling places having no policies in place, 8 percent reported one policy employed, 9 percent cited two; 17 percent recorded three, 24 percent marked four, an additional 24 percent mentioned five, and 17 percent reported all six. To examine how these policies combine to impact voter wait times, models were re-estimated interchanging an additive index of the number of Covid safety features for the individual Covid safety feature indicators (see Columns 2, 4, and 6 in Table 2). The Covid safety index is a positive and significant predictor of voter wait times of 10–30 min and 30+ min, suggesting those who cast their ballots in polling places outfitted with more safety measures were more likely to experience longer wait times than no wait time, compared to those who voted with fewer safety measures in place. Turning to Figure 3, which displays the marginal effects plot for the Covid Safety Index, results suggest the real pattern uncovered is that voters in more Covid-safe environments are significantly less likely to report no wait ($p = 0.020$; one unit change in probability $= -0.9$; min–max change in probability $= -5.6$) and more likely to report a 10–30-min wait ($p = 0.007$; one unit change in probability $= +0.9$; min–max change in probability $= +5.4$). While the effect on the probability of reporting a wait greater than 30 min is significantly different than reporting no wait, the effect cannot be reliably distinguished from 0. These results support the findings presented above that Covid safety measures impacted voter wait times.11

Last, to place these findings in the proper election administration context, these effects are compared to two other factors routinely found to impact voter wait times: poll worker performance and polling place operation. Previous work has suggested that voters casting their ballot in polling places with better performing poll workers or better-operated polling places tend to have lower wait times (Spencer and Markovits 2010; Stein et al. 2020), and the above analyses in Table 1 further corroborate these previous findings. But how do the effects of Covid safety features compare to the polling place and worker performance? Additional analyses in Table 3 suggest that voters who rated their poll workers higher were 9.1 percentage points more likely to say they faced no wait ($p = 0.000$; one unit change in probability $= +4.6$), while 7 percentage points less likely to report a wait of 10–30 min ($p = 0.000$; one unit change in probability $= -3.5$) and 5.4 points less likely to report a wait of 30+ min ($p = 0.000$; one unit change in probability $= -2.7$), with no significant differences found for reporting a wait of less than 10 min. More drastic, those who rated their polling places higher were 28.0 percentage points more likely to cite no wait

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11 Further, given the finding that single-use pens decrease voter wait times, additional models were estimated subtracting one from the index if single-use pens were available, transforming the index from a measure of how many Covid safety measures were employed to how hampered by Covid voting was. This ad hoc analysis results are as follows: Covid safety index decreases the probability of reporting no wait by 8.7 percentage points ($p = 0.001$; one unit change in probability $= -1.5$); increases the probability of reporting a 10–30 min wait by 9.8 percentage points ($p = 0.000$; one unit change in probability $= 1.6$); increases the probability of citing a 30+ min wait by 6.6 points ($p = 0.026$; one unit change in probability $= 1.1$), each significantly different from zero and the latter two significantly different than the effect found for no wait (results available upon request).
(\(p = 0.000\); one unit change in probability = 14.0), 1 percentage point less likely to say they waited less than 10 min (\(p = 0.000\); one unit change in probability = 0.5), 11.2 percentage points less likely to cite a 10–30 min wait (\(p = 0.000\); one unit change in probability = 5.6), and 17.7 percentage points less likely to report 30+ min wait (\(p = 0.000\); one unit change in probability = 8.9). Comparing these findings to that of the Covid safety measures and index suggest that the Covid safety policies have effects similar and only slightly smaller than that of poll worker evaluations while tending to be lower than that of polling place evaluations (see Table 3). These results further suggest the impact of Covid safety policies on voter wait times is substantively large.

**SUMMARY AND CONCLUSION**

In November of 2020, Covid was claiming 1000 American lives each day. Yet many voters still intended to vote in person. To protect voters from the spread of Covid, election administrators and street-level bureaucrats outfitted their polling sites with a myriad of Covid safety protocols. Many poll workers wore face coverings when on duty, voters and voting booths were sufficiently spaced out to allow for socially distanced voting, voting booths were routinely cleaned between voters, and more. At the same time, despite the decrease in in-person voters and decreasing voter wait times over previous elections, in-person voters in the 2020 U.S. election faced longer wait times than in recent years (Persily and Stewart 2021). This article argues that, though these safety protocols increase the safety of voting, they may also burden election administration and cause longer voting lines and wait times.

Using voter self-reported wait times and reports of Covid safety precautions at the voting place, this study assesses how six safety protocols impacted voter wait times: poll workers wearing face coverings, protective barriers separating poll workers/voters, socially distanced voters and booths, hand sanitizer availability, single-use ballot marking pen availability, and cleaning voting booths between voters. Through a series of multinomial logistic regression models, results suggest that Covid safety features significantly impacted voter wait times, though not always in the expected direction. Specifically, face coverings, protective barriers, socially distanced voting, and cleaning voting booths significantly increased voter wait times, while single-use pens decreased wait times, and hand sanitizer had no significant impact. However, not all safety features are created equal. Instead, face masks and social distancing tend to be more likely to result in waits of 10–30 or 30+ min, while other factors like booth cleaning tend to affect the likelihood of reporting no wait or an under 10-min wait. These findings are further supported when using separate indicators to create an additive index. Overall, these results suggest that voters who cast their ballot at more Covid-safe polling places likely waited between 10–30 min longer, all else held constant.

The results of this study have great normative importance for the administration of elections, particularly during health pandemics. First, this study provides additional evidence that changes to the way elections are administered, even small changes such as face masks and single-use ballot pens can have significant impacts on voter access. Second, concerning the substantive impact, adding 10–30 min to voting may act as a significant deterrent for voting. Previous work has established that long lines can cause individuals to renge on their decision to vote and leave the voting line (Lamb 2021), as well as decrease their likelihood of returning the following year (Pettigrew 2021). Though this study is unable to assess the degree to which voters reneged or their probability of voting in the future, it is likely the extended wait time associated with these Covid policies may have caused voters to leave the voting line without voting or may affect whether they decide to vote in the future.

Third, these results should be used to inform how to safely administer elections during health pandemics without having an undue effect on voters. With that being said, the evidence presented here should not be interpreted to imply that those safety features that hindered voter wait times should be discarded. Rather, they should be investigated further to determine how they can be implemented without burdening the election process, and their use should be guided by both their effects on voter wait times and related outcomes (e.g., voter satisfaction), as well as their efficacy in protecting voters. For example, if face cover-
ings are increasing wait times due to issues with communication, election administrators should consider alternative ways to provide information to voters, such as through informational pamphlets mailed ahead of the election or made available at polling place entrances/voting booths. Further, if solutions to decreasing the negative impact of these policies cannot be found, practitioners should look to other arrangements that may alleviate the need for them, such as increased mail and absentee voting.

The results of this work suggest Covid safety features impact the wait times of the average voter. However, it is likely that these impacts are not uniform across all voters in the United States, nor are they likely reserved to just how long it took to cast a ballot. For example, one reason face coverings are hypothesized to negatively impact voter wait times is that they hinder communication by stifling speech. Given that older voters and those with hearing difficulties may face greater difficulty hearing poll workers even without the added burden of face coverings, these safety protocols may unduly burden older and hearing-impaired voters to a larger extent. Future work should consider how Covid safety mechanisms impacted voter wait times across different demographic groups. As mentioned, previous work has also shown that long lines can cause voters to renge on voting or not vote in the following election (Lamb 2021; Pettigrew 2017, 2021), with black and Hispanic voters more likely to face long lines, renge on voting, and abstain in the subsequent election (Cottrell, Herron, and Smith 2021; Lamb 2021; Pettigrew 2021). Future studies should examine the participatory impact these factors may have had and whether that effect differs by voter demographics such as race and ethnicity. While 10–30 min may not seem like a long time for some, this additional time constraint is likely to be especially burdensome for those who have less free time on their hands. Last, previous work has also found that voter wait times are significantly related to voter evaluations of the voting process and their confidence in the vote counts (King 2017; Stein and Vonnahme 2012). Future works should investigate how these Covid safety measures impacted voter evaluations and confidence in the accuracy of the vote count.

CONFLICTS OF INTEREST
The author declares no conflicts of interest.

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SUPPORTING INFORMATION
Additional supporting information may be found in the online version of the article at the publisher’s website.

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