Advances in Social Science and Culture
ISSN 2640-9682 (Print) ISSN 2640-9674 (Online)
Vol. 3, No. 3, 2021
www.scholink.org/ojs/index.php/assc

Original Paper

U.S. General Election as a Possible COVID-19 Super Spreader Event

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Received: July 7, 2021 Accepted: July 15, 2021 Online Published: July 17, 2021

doi:10.22158/assc.v3n3p39 URL: http://dx.doi.org/10.22158/assc.v3n3p39

Abstract

Many U.S. states changed election policies leading up to the November 3, 2020, general election to reduce the potential spread of COVID-19, and policy changes at the state level resulted in uneven access to voting options outside the polling site on the day of the election. This preliminary research examines the extent of in-person voting and other methods for voting as percentages of the overall population, separated by state, to determine if such policy changes helped reduce the spread of COVID-19. The data is correlated with the increase in the SARS-CoV-2 virus the week leading into the election compared to two weeks after the election. Political party in control of the state executive, urbanization, and the relative size of state government are also considered. While numerous court cases regarding the fairness of electoral methods were launched during the 2020 election cycle, the focus of this article is whether the percent of the population who voted in person on the day of the election may have differentially increased the spread of COVID-19 within the 50 U.S. states as well as the extent that the public service managed the election process in a safe manner by mitigating the risk of COVID-19.

Keywords

COVID-19, elections, pandemic, federalism, decentralization, public health

1. Introduction

More than 60% of all COVID-19 cases in the U.S. through January 19, 2021 were reported after the general election on November 3, 2020 (Maxouris, 2021). This leads to a rather obvious question: while states were focused on Thanksgiving, Christmas, and New Year's Day as possible super spreader events

(Stone, 2020, December 21), could the general election itself have been a major spreader of COVID-19? In seeking to define super spreaders, Emma Cave notes that an individual can be a super spreader, but there are also super spreader events. She states, "As for events, any large gathering or movement of groups or individuals can constitute super-spreading. So too can policy decisions or indeed any occurrence which in hindsight exacerbated infection rates" (2020, p. 237). Nearly 1 in 5 Americans voted in person on the day of this election therefore the potential to be a super spreader event certainly existed, yet the nature of an election is distinct from a holiday. Specifically, elections are different because state governments have direct control over whether people need to show up for in-person voting and over safety measures taken at polling locations to mitigate viral spread. In contrast, states only have indirect control over what people chose to do regarding holiday gatherings or Super Bowl parties, dubbed "Super spreader Sunday" in advance of the football game (Leonhardt, 2021, February 3).

We sought to determine the extent that voting in person on election day was linked with measurably higher COVID-19 cases following the election to determine the extent that states succeeded or failed to protect their residents. This leads to the policy question of whether or not states should change current voting laws to avoid large gatherings in the future, and changes in both directions have already been actively pursued by state legislatures. Alabama, for example, limited absentee voting in the 2020 general election and then quickly proposed legislation to make significant changes moving forward (Driggers, 2021)—87% of Alabama votes were cast in person on the day of the election compared to the national average of 36%. The Brennan Center for Justice noted that as of February 19, 2021, there were 253 active bills in 43 states seeking to restrict voter rights and 704 active bills in a different set of 43 states with provisions to expand voter access (Brennen Center for Justice, 2021).

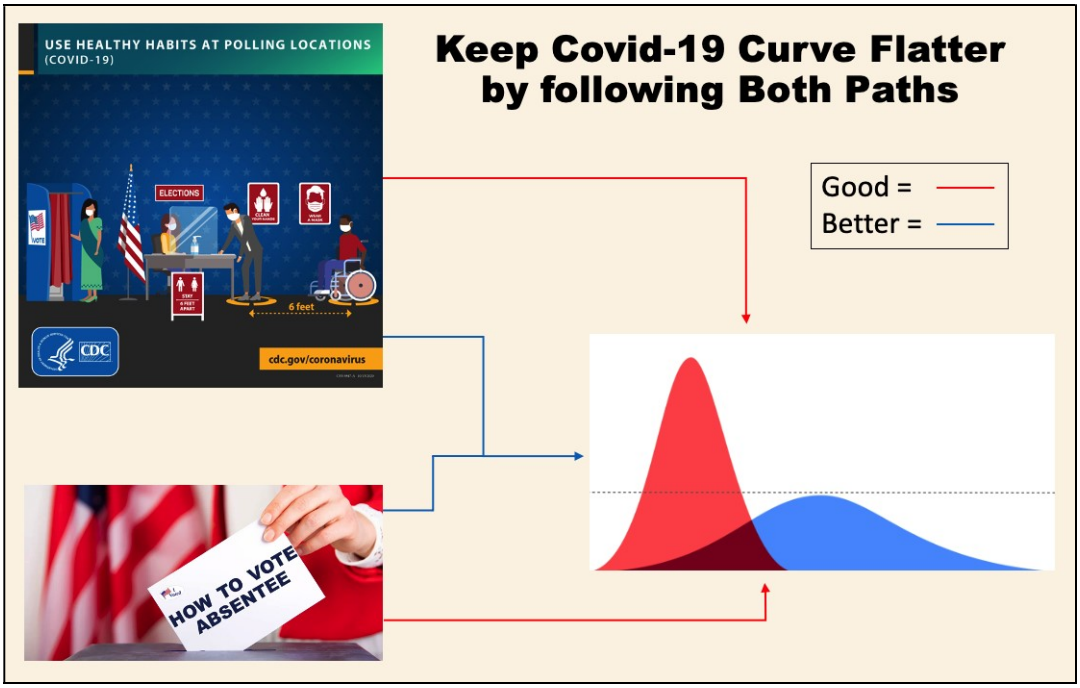

Figure 1. Conceptual Model of Risk Mitigation: Two Paths

There are many reasons to allow voting other than "in-person on the day of an election" that are beyond the public health scope of this research. In this regard, we seek to narrowly focus on whether the November 3, 2020, election was a super spreader event by comparing the 50 U.S. states, the percent of their population that voted in person, the ensuing rate of spread of COVID-19, and other closely related variables. This is considered preliminary research because data should become available in the future that would allow lower-level governments as the unit of analysis and might also allow for more differentiation in the types of and timing of voting.

The conceptual model depicted in Figure 1 is that two paths existed for state governments to mitigate the spread of COVID-19 while also seeking to maximize voter turnout. From one perspective it supposes that masks, distance, and cleanliness at the polls could reduce the risk of viral spread and from another perspective it supposes that allowing voters to entirely avoid the polls on election day could reduce viral spread. It follows that maximizing both approaches would be a safer path forward, though our design did not allow us to measure safety procedures at the polls. A state that allowed vote-by-mail applications and the actual voting process to happen entirely by mail or online might be considered the optimal model from a public health perspective.

2. Federalism, Political Polarization, and Changes in Voting Methods

Voter turnout was historically high at 67% for the 2020 general election, the highest in 120 years (Grzeszczak, 2020, November 4). The focus herein is on how many of those voters likely went to the polls in person on November 3, 2020, rather than voting by some other means (mail, fax, electronic,

early in-person voting, etc.), and if this measurably increased the spread of COVID-19. The CDC (2020) issued explicit guidelines for polling locations in late June to help election officials effectively mitigate the risk; however, there were nearly 21,000 fewer polling locations in 2020 than in 2016 thus potentially increasing the risk through larger crowds and longer waiting times (Joseph & Arthur, 2020, October 22). Our research shows that 17% of the U.S. population voted in person on the day of the election, which clearly makes it a possible super spreader event, and so local and state governments clearly faced a significant management challenge.

The relevance of this topic is explained by the lack of sufficient research regarding election-day safety and pandemics, including in an excellent international symposium regarding COVID-19 and street-level bureaucrats (Gofen & Lotta, 2021). Some related research exists. The Congressional Research Service, for example, produced a report on the ability of the election infrastructure to be secured when election modes were swiftly changing (Humphreys, 2020, June 10) and one article cogently considers the risk management factors associated with maintaining fair and transparent elections amidst a global pandemic (Landman & Splendore, 2020). Neither of these assessed the empirical health and safety outcomes. Leidman et al. come closer when they note that the pandemic led to "notable changes in the methods of voting, the number and types of polling locations, and in-person voting procedures." They examined public health mitigation factors in the September 2020 Delaware primary election in extensive detail (2020). Nevertheless, even this empirical report did not consider actual spread of COVID-19, but rather sought to determine the application of CDC guidance for healthy election operations by measuring, for example, the number of locations that ran out of hand sanitizer. This served as an important "compliance test" within one part of our complex federal election system, whereas we sought to examine all 50 states.

Dunlop, Ongaro, and Baker recently outlined an international COVID-19 research agenda for *Public Policy and Administration* and one of their themes was the functioning of the public sector in multi-level governance: "this area promises to be a vibrant area of applied research" (2020, p. 375). A pandemic might be the worst of all times to rely on federalism rather than national-level leadership. Donald Kettl pointedly demonstrates that when the federal government left most decisions to the states, states went in "very different directions" in managing the COVID-19 pandemic (2020). This was true regarding the pace of issuing shelter-in-place orders in Spring 2020, and the ensuing dynamic where every state that did not issue such a statewide order had both a Republican governor and a Republican-controlled state senate (Corder et al., 2020). In terms of the nature of federalism, Kettl states that "In no other country was the level of friction between the national and subnational governments as high as in the United States" (2020, p. 595).

Woodrow Wilson stated long ago that, "The question of the relation of the States to the Federal Government is the cardinal question of our constitutional system. At every turn of our national development we have been brought face to face with it, and no definition either of statesmen or of judges has ever quieted or decided it. It cannot, indeed, be settled by the opinion of one generation,

because it is a question of growth, and every successive stage of our political and economic development gives it a new aspect, makes it a new question" (1908, p. 684). While this system is extremely elastic, and thus allows significant central-subnational shifting over time, in this instance it allowed for a highly decentralized response to a crisis which was always—from the moment it reached our Western shores—going to be national.

On the other hand, former ASPA president Harlan Cleveland had a particular take on this dynamic at the turn of the century, "we learned again and again that complex social systems work badly if they are too centralized … The federal system itself was designed to create a continuous tussle between the states and the central government. That tussle was intended to be permanent; no part of the system was supposed to 'win it all,' not ever" (2000, p. 294).

Cleveland examined the need for the concept of "uncentralization" rather than decentralization, yet this "mutual adjustment" assumed a "generally understood environment of moral rules, norms, conventions, and mores, [where] very large numbers of people watch each other, then modify their own behavior just enough to accommodate the differing purposes of others" (Cleveland, 2000, p. 296). In contrast, COVID-19 arrived at a time of deep political polarization in America rather than commonly accepted principles, and so accommodating different purposes may have been the last thing on the minds of Americans or their elected policymakers.

One somewhat surprising aspect of the U.S. experience was the rapid politicization of many dimensions of the crisis—how to understand the severity and scope of the disease (crisis or hoax?), whether public health concerns should be prioritized over economic, and whether masks should be required in public. Answers to these trade-offs appear to fall along partisan lines, so it is worth determining if Republican elected officials and Democratic elected officials are responding to the crisis in different ways, as they respond to their very different partisan constituencies.

Political asymmetry and polarization seem more obvious is recent years; however, Hare and Poole are convinced that "the modern trend to greater polarization can be dated back to the 1964 Civil Rights Act and the 1965 Voting Rights Act" because of the race-related issues (2014, p. 415).

New or old, a growing body of empirical work reveals this ideological polarization playing out in a multitude of policy areas, remarkably ranging from climate change (Brewer, 2012; Clark et al., 2020; Dunlap et al., 2016; Merkley, 2018), healthcare reform (Heinrich & Johnson, 2008), and abortion (Carmines et al., 2010), to homosexual rights (Frank, 2012), religious values (Glaeser et al., 2005), and broader concerns about markets and the economy (Ura & Ellis, 2012). Historically, the balance between public health and civil liberties was also a source of conflict in the enforcement of vaccination mandates. At the turn of the 20th century, U.S. local and state authorities faced resistance to vaccines, which led the Supreme Court to uphold the public health powers of state and local governments (Corder et al., 2020). Given this research, the political conflict over wearing facial coverings, social distancing, and voting by mail should not come as a surprise, and people might expect that more individuals in Republican-controlled states were more likely to have engaged in riskier behaviors when

voting in person on election day. We seek to test this concept rather than make such an assumption.

It is noteworthy that political party preference and the preference for federalism appear to interact. Dinan and Heckelman demonstrated two factors in this regard: (1) Republicans and conservatives are generally more supportive of decentralization than Democrats and liberals, and (2) this view is more strongly held by Republicans because they sway less based on who controls the federal government whereas Democrats are more supportive of decentralization when Republicans control the federal government (2020). Additionally, the party in control of the state government does not appear to affect the preference for central or subnational control. This dynamic is relevant to the pandemic response because both the public health response (testing, school closures, mask mandates, and restrictions on public gatherings) and running elections have been largely controlled by state governments.

Specifically, these two policies interacted as numerous states sought to increase access to absentee or early voting ostensibly to keep their citizens safer from COVID-19. For example, Michigan changed electoral policies to allow anyone who wanted to vote by mail to do so, and the Secretary of State mailed out absentee ballot applications to all registered voters (Thompson, 2020, July 29), yet instructions to local poll workers were to allow people without a mask to vote even though this was a violation of the statewide mask mandate for indoor spaces. A report from the Brennen Center for Justice detailed the state of play regarding absentee voting laws and efforts during 2020, and documented that 34 states had “no excuse needed” vote by mail available before this global health crisis began (2021). This strongly suggests that non-legislative efforts in many states to encourage absentee voting had a large impact as opposed to new absentee voting laws. For example, at least 19 states mailed out absentee voter registration forms to most possible voters while 9 states mailed actual ballots out to all active registered voters (Brennen Center for Justice, 2021). In contrast, Tennessee, Texas, and some other states maintained a skeptical policy on absentee/mail-in voting within both primary and general elections (Dominguez et al., 2020, p. 1097).

On the legal side, several states that were not willing to expand access to mail-in voting were compelled to do so by courts, and 147 out of 182 voting rights cases in the 2020 cycle involved vote-by-mail issues (Brennen Center for Justice, 2021). Thus, the theme of this article while triggered by a global pandemic was clearly a major focus of political parties prior to the 2020 general election. In brief, political polarization within the decentralized election system has led political parties to seek voting methods they believe will help them win and the recent Supreme Court decision upholding Arizona’s election laws is an extension of those efforts (Reporter of Decisions, 2021).

3. Methodology

Four closely related research questions are explored:

RQ1: *Did states with a higher proportion of their population voting in person on November 3, 2020, experience a higher increase in COVID-19 caseloads soon after the election?*

It stands to reason that a widespread public gathering such as the election would increase caseloads;

however, an American national election takes place all day long at tens of thousands of locations and so there may be little to no correlation due to the highly dispersed nature of the election. In addition, it is possible that states that did not make voting in advance possible for all voters still managed public safety concerns well at their polling locations. To compare the increase of COVID-19 cases for each state to the voters who cast ballots on election day, we used three key variables: COVID-19 case increase, election day voting, and state population.

Case Increase: The 7-day average of new COVID-19 cases ending on November 3, 2020, and the 7-day average of new COVID-19 cases starting on November 10, 2020, were used to calculate the percentage increase from leading into the election to the impact two weeks after the election. COVID-19 cases usually take 4-5 days to show up as a positive test results and 1-2 weeks to be reflected in new "confirmed test" results as people with symptoms usually do not get tested immediately (Backer et al., 2020; Centers for Disease Control and Prevention (CDC), 2021, February 22; Lauer et al., 2020). There is admittedly some variability in this timing, yet there is no reason to suspect this would differ from state to state. While it is possible some election-related spread showed up before November 10 or after November 16, the use of rolling averages reduces the importance of testing on any specific date and avoids any overlap with Thanksgiving holiday travel.

Election Day Voting: The number of people who voted for a presidential candidate in each state minus the number who voted in advance of election day was used to determine how many people likely voted in person on the day of the election. While results have been certified by all 50 states, the actual number of ballots cast is not available across all 50 states and that reported data would have less consistency as it would come from multiple sources. To increase reliability, we utilized sources where data for all 50 states come from the same source, though we acknowledge that election data is still prepared and managed differently throughout the U.S. In fact, these differences are one reason that so much detailed election data is not yet available. One limitation in this research is that data separating vote-by-mail, early in-person voting, day-of-the-election voting, and possible other means for voting is not yet available for most states. Thus, we used a binary "voted in person on the day of the election" or "voted using another method" approach as this data is currently available. The most important missing data now is "voting in person in advance of election day," which is only available for some jurisdictions.

State Population: The 2019 U.S. Census population estimate for each state was used to determine the number who voted in person on November 3 as a percentage of the total state population. This is a more useful measure of the possibility for spreading COVID-19 than the "percent of voters who voted in person" because it adjusts for the voting turnout in each state. The data for this research question is also how we determined that over 17% of the U.S. population voted in person on the day of the election, which for this public health purpose is more important than examining the voter turnout was 67% or the percent of voting age population that voted.

Correlation coefficient analysis was applied to the weekly average cases and voting data to explore the

relationships between COVID-19 confirmed cases and voting method.

RQ2: *Did states with Republican governors experience a higher increase in COVID-19 caseloads soon after the election than states with Democratic governors?*

This research question emerges because there was extensive news coverage in the months leading up to the election showing that Republicans were aggressively challenging absentee voting laws in the courts while many Democratic states were seeking to expand access to early voting and absentee voting. In addition, Corder, Mingus, and Blinova (2020) demonstrated the partisan state-level dynamics in choosing not to issue a statewide Shelter-In-Place Order (SIPOs) in spring 2020. This research question seeks to understand if that same dynamic was still at play for the general election roughly six months later. Corder et al. demonstrated that Democratic controlled states and divided government all produced SIPOs whereas every state that did not issue a SIPO had Republican control of the state executive and state senate.

This research question examines only the party in control of the executive and thus does not seek to tease out the role of divided government. The primary reason is that there are 24 states with Democratic governors and 26 states with Republican governors, making for a nice balance from an analytical perspective. To determine if states with governors from each political party had different outcomes regarding the voting methods, a T-Test was applied to test whether the percentage of in-person votes on the day of election was significantly different in states with Republican versus Democratic governors. The earlier correlation analysis was also performed separately for the group of states with governors from each political party.

RQ3: *Did states with larger percentages of population living in urban areas experience a higher increase in COVID-19 caseloads soon after the election than states with smaller percentages of population living in urban areas?*

It is well known that much of the red state/blue state divide in the U.S. can be described as an urban/rural divide, or at least a large state/small state divide. A Catalyst report on the 2020 general election concluded this urban/rural voting divide continues with suburban areas shifting a bit toward the Democrats as they also became more racially diverse (Ghitza & Robinson, 2021). Thus, RQ2 and RQ3 essentially seek to separate political party as a possible explanation from urbanization as a possible explanation, to determine which, if either, has a meaningful correlation with the rate of increase of COVID-19 caseloads.

RQ4: *Did states with smaller per capita state governments experience a higher increase in COVID-19 caseloads soon after the election than states with larger per capita state governments*?

State capacity may impact the ability to manage public health issues during an election, such as following the extensive CDC guidance to maintain safe polling locations. We use the number of state-government FTEs per 100,000 residents as a proxy for state capacity. Utilizing this to compare state capacity allows for common data sources across all 50 state governments yet comes with the downside of being extremely general. Logically, states with higher capacity should have managed

polling sites better than states with lower capacity, but per capita spending on elections is not available. Partly this reflects how decentralized American election management is with thousands of jurisdictions being involved. The goal is essentially to ask, "did higher capacity states manage the election process better or worse than lower capacity states?" As with urbanization, the purpose of RQ4 is to assume that political party control may not be a key factor as determined in the Corder et al. study on SIPOs, or it may simply have been one factor among many with significant correlation to the observed caseload increases.

4. Data Analysis and Discussion

Shifting to the analysis phase, we present and discuss the analysis in the order of the four research questions.

RQ1: *Did states with a higher proportion of their population voting in person on November 3, 2020, experience a higher increase in COVID-19 caseloads soon after the election?*

The change in the 7-day rolling average of new COVID-19 confirmed cases for the week leading up to the general election (October 27 through November 2) versus two weeks after the election (November 10-16) is significantly positively correlated (r = .3402) at the .05 level with the percentage of the state population that voted by any means (see Table 1). This means that where a greater proportion of the population voted, the rate of increase in COVID-19 cases was greater than where a lesser proportion of the population voted. However, this finding does not hold when limiting the analysis to the rate of in-person voting on election day. Please note that all 50 states experienced caseload increases during this time frame, ranging from Hawai'i with a 1% increase to Vermont with a 317.6% increase.

Table 1. Correlations of Voting Methods with COVID-19 Caseload Increase

Variable	Correlation with Increased COVID-19 Cases
Votes not cast in person on November 3 as % of 2019 population estimate	-.0265
In person votes on November 3 as % of 2019 population estimate	.2003
Total votes cast as % of 2019 population estimate	**.3402***
% of total votes cast in person on November 3	.1402
% of total votes not cast in person on November 3	-.1402

Note. Asterisk (*) means the correlation coefficient is significant at level of 0.05.

While the correlation of .3402 between total votes cast and the increase in COVID-19 cases represents a moderate relationship, there is not enough evidence to answer "yes" for RQ1. This is a surprising finding, and somewhat counterintuitive. Why would the rate of increase in COVID-19 cases be significantly linked to overall voting as a percentage of the state population, which includes means where people voted without any physical contact, rather than to people who actually voted in person on election day? One possible answer is that available data does not allow us to establish a third category

such as “in person voting in advance of election day.” Another possible explanation is that most voting methods carry some risk as many people opted or were required to pick up absentee ballots in person or many people chose to vote in advance in person. Additional data usually becomes available 1-2 years after a general election that might allow analysis of such possibilities, at least for a significant subset of states.

Beyond the scope of this study would be the question of whether people in “more COVID-19 cautious states” or states with more COVID-19 restrictions in place before the election were simply less likely to vote regardless of the allowable methods for voting, though such dynamics of political culture would be a possible explanation for these findings. Examining this possible explanation would require a different methodology entirely and so additional data on the methods of voting that were utilized, if it should become available, would not help assess this possibility.

When looking only at states with Democratic governors, the correlation for “in-person voting on election day” was significant at the .05 level and was positive at .4370. This was only true for the “overall percentage of population that voted by any means” in states with Republican governors, which was significant at the .05 level and was positive at .4331, which is stronger than the .3402 for all 50 states. This leads into RQ2, which seeks to determine if Democratic governor vs Republican governor was a relevant factor.

RQ2: *Did states with Republican governors experience a higher increase in COVID-19 caseloads soon after the election than states with Democratic governors?*

At the onset, it is worth noting that the measured rate of increase of COVID-19 caseloads had a mean average of 88.4% across all 50 states, 89.7% across all states with a Democratic governor, and 87.1% across all states with a Republican governor. The standard deviation at .595 was higher among states with Republican governors, versus .435 for states with Democratic governors, but this is entirely attributed to Vermont as an outlier with a 317.6% increase. That standard deviation drops to .372 if Vermont is removed, and the next closest state saw a 170.1% increase. The key point is that, on average, the rate of increase of COVID-19 was extremely similar during this brief timeframe in states regardless of the governor’s political party.

States with Democratic governors saw a greater proportion of their population voting for president than states with Republican governors (see Table 2), and they saw a higher proportion of votes cast as absentee or early votes (see Table 3). However, this does not mean that states with governors from either party experienced a more rapid increase in confirmed COVID-19 cases after the general election.

On this first issue, the p-value of the two-way T-Test is 0.0542, which indicates that the two-way T-Test is significant at a level of 0.1. Moreover, the p-value of the one-way T-Test (average percentage of states with Democratic governor minus the average percentage of states with Republican governor) is 0.0271, which means that the one-way T-Test is significant at a level of 0.05. Based on these results, states with Democratic governors are more likely to have more votes cast for president than states with Republican Governors as detailed in Table 2. This refers to the votes cast as a percentage of the total

state population not as a percent of eligible or registered voters because we are focused on this as a public health issue rather than as a voter energy/apathy comparison across the 50 states.

Table 2. T-Test on the Percent of Total Votes Cast over the Total Population by Governor's Political Party

Variable	Observations	Mean	Std. Err.	Std. Dev.	95% Conf. Interval	
D	24	.5115	.0111	.0545	.4885	.5346
R	26	.4828	.0095	.0483	.4633	.5023
Combined	50	.4966	.0075	.0529	.4816	.5116
Difference		.02871	.0145		(.0005)	.0579
Difference = mean (D) -mean (R)					t = 1.9736	
H0: diff = 0					Degrees of freedom = 48	
Ha: diff < 0		Ha: diff != 0			Ha: diff > 0	
Pr (T< t) = .9729		Pr(|T| > |t|) = .0542			Pr(T> t) = .0271	

On the second issue, the p-value of the two-way T-Test is 0.0212, which indicates that the two-way T-Test is significant at a level of 0.05. Moreover, the p-value of the one-way T-Test (average percentage of states with Democratic governors minus the average percentage of states with Republican governors) is 0.0106, which means that the one-way T-Test is significant at a level of 0.05. Based on these results, states with Democratic governors were more likely to have a greater proportion of voters casting votes before election day as detailed in Table 3.

While these T-tests confirm the general view that Democratic states experienced more voting in general, and better enabled early/absentee voting in particular, these data do not speak to the impact on COVID-19 caseloads. They do confirm that states with Democratic governors achieved higher rates of participation in the 2020 general election, and thus better adapted to the pandemic from a democratic rights perspective. However, this may have been a byproduct of Democratic party energy/mobilization to remove a Republican president and thus not related to citizens feeling more protected than in other states.

Table 3. T-Test on the Percent of "Not In Person on the Day of the Election" Votes over the Total Population by Governor's Political Party

Variable	Observations	Mean	Std. Err.	Std. Dev.	95% Conf. Interval	
D	24	.3319	.2142	.1049	.2876	.3762
R	26	.2605	.0210	.1069	.2173	.3036
Combined	50	.2948	.01568	.1109	.2632	.3263
Diff		.0714	.0157		.0112	.1317

Diff = mean (D) -mean (R)		t = 2.3525
H0: diff = 0		Degrees of freedom = 48
Ha: diff < 0	Ha: diff != 0	Ha: diff > 0
Pr (T< t) = 0.9894	Pr(|T| > |t|) = 0.0212	Pr(T> t) = 0.0106

Regarding COVID-19 caseloads, Table 4 presents correlations and their significance among states with governors of each party. These correlations show differences among the two groups of states, and with regard to RQ2 these correlations show that case increases were significantly correlated with in-person voting in states with Democratic governors yet only with total voting in states with Republican governors. This dynamic is at contrast with expectations and thus is worthy of additional research. In particular this may hinge on how, when, and where voting took place in advance of November 3 yet other possibilities may exist.

Table 4. Key Correlations Separated by R Governor and D Governor States

Nature of the Correlation	Democratic Governor	Republican Governor
Votes not cast in person on November 3 as % of 2019 state population estimate to observed COVID-19 caseload change	-.2808	.1238
In person votes cast on November 3 as % of 2019 state population estimate to observed COVID-19 caseload change	.4370*	.0717
Total votes cast as percentage of state population estimate to observed COVID-19 caseload change	.2515	.4331*
Estimated state population to confirmed COVID-19 cases (weekly new cases average 10-27-2020 to 11-02-2020)	.5441*	.9197*
Estimated state population to confirmed COVID-19 cases (weekly new cases average 11-10-2020 to 11-16-2020)	.5924*	.8611*
Percentage of state population living in urban areas to confirmed COVID-19 cases (weekly new cases average 11-10-2020 to 11-16-2020)	.2135	.5257*
State government FTEs per 100,000 population to confirmed COVID-19 cases (weekly new cases average 11-10-2020 to 11-16-2020)	-.5322*	-.5862*

Note. Asterisk(*) means the correlation coefficient is significant at level of 0.05.

RQ3 and **RQ4** asked essentially the same question, only with regard to urbanization and state government capacity, as explained in the methodology section.

It is well known throughout the political science literature that much of the red state/blue state divide in the U.S. is also an urban/rural divide, or at least a large state/small state divide. Thus, RQ2 and RQ3 essentially seek to separate political party as a possible explanation from population density as a possible explanation.

RQ4, on the other hand, used state government FTEs per 100,000 residents as a proxy for state government capacity, to determine if higher capacity states were better able to protect their populations during this large-scale event. RQ4 was thus a more direct test of the effectiveness of public

administrators (i.e., election officials) and their ability to mitigate risk. Table 4 does show that states with higher capacity experienced lower COVID-19 caseloads during this time frame, regardless of the political party of the governor.

We performed linear regressions on weekly average new cases for the week of November 10 and November 17 to determine the impact of numbers of votes not cast in person on the day of the election, in-person votes cast on the day of the election, urbanization (percent of the population living in urban areas and percent of the state area that is urban area), and state government capacity.

Table 5 displays the regression on the weekly average new cases for the week of November 10, 2020 (dependent variable), which covers the new cases confirmed 7 to 14 days after Election Day. The model is significant as the p-value is 0 and can predict about 53% of the dependent variable's total variance. However, the impact of either the "number of votes not cast in person on the day of the election" or "in-person votes cast on the day of the election" on the dependent variable is minimal, even though they are significant impacts. The parameter estimates for state government capacity is -1.2988, which suggests the number of confirmed cases might decrease by 1.2988 unit as the state government capacity increase by 1 unit.

Table 5. Regression on Weekly New Cases Average 11-10-2020 to 11-16-2020 (Dependent Variable)

Source	Sumof Squares	Degree of Freedom	Mean Squares	Number of Observations	50	
Model	269885201	5	53977040.2	F (5, 44)	12.21	
Residual	194440777	44	4419108.57	Prob > F	0.0000	
Total	464325978	49	9476040.37	R-squared	0.5812	
				Adj R-squared	0.5337	
				Root MSE	2102.2	
Parameter Estimates						
Independent Variables	Coefficient	Standard Error	t	P > |t|	95% Conf. Interval	
# of absentee/early votes	.0004	.0002	2.28	.028	.0000	.0007
# of in-person votes	.0007	.0003	2.26	.029	.0001	.0014
% of state population living in urban areas	3206.91	2686.097	1.19	.239	-2206.56	8620.383
% of state urban areas	-4905.911	3331.907	-1.47	.148	-11620.93	1809.106
State government size/capacity	-1.2988	.6025	-2.16	.037	-2.5130	-.0846
Constant	1997.014	2088.731	0.96	.344	-2212.545	6206.574

Table 6 displays the regression on the weekly average new cases for the week of November 17, 2020 (dependent variable), which covers the new cases confirmed 15 to 21 days after Election Day. The model is significant as the p-value is 0 and can predict about 72% of the total variance of the dependent variable, which is certainly robust. Again, however, the impact of voting type, though statistically significant, is minimal. The parameter estimates of urbanization, urban areas, and state government capacity are also statistically significant in this model, with urbanization having a positive impact on the dependent variable (i.e., more population living in urban areas suggests higher caseloads) while urban area and state government capacity have negative impacts on the dependent variable. For instance, the average confirmed new cases would increase by 3773 units as urbanization increases by 1 unit.

Table 6. Regression on Weekly New Cases Average 11-17-2020 to 11-23-2020 (Dependent Variable)

Source	Sum of Squares	Degree of Freedom	Mean Squares	Number of Observations	50	
Model	396906449	5	79387289.8	F (5, 44)	26.18	
Residual	133404749	44	3031926.1	Prob > F	0.0000	
Total	530311198	49	10822677.5	R-squared	0.7484	
				Adj R-squared	0.7199	
				Root MSE	1741.2	
Independent Variables	Coefficient	Standard Error	t	P > |t|	95% Conf. Interval	
# of absentee/early votes	.0006	.0001	3.86	.000	.0003	.0008
# of in-person votes	.0009	.0003	3.48	.001	.0004	.0015
% of state population living in urban areas	3773.293	2224.916	1.70	.097	-710.7316	8257.317
% of state urban areas	-5256.606	2759.846	-1.98	.054	-11018.71	105.4972
State government size/capacity	-1.0765	.4990	-2.16	.036	-2.0823	-.0708
Constant	1059.501	1730.113	0.61	.543	-2427.312	4546.314

5. Findings and Future Research

As is often the case with research, this preliminary study of COVID-19 risk mitigation and the 2020 general election did not yield decisive conclusions. We expected a strong correlation between the percentage of the state population that voted in person and the increase in caseloads after the election

yet discovered a moderate correlation with overall voting by any method. We also discovered a difference depending on the political party of the governor that runs contrary to a common assumption. However, information from this study can push deeper research around the impact of voting methods on the provision of public health in the future once more data are available.

Table 7. Summary of Findings by Research Question

Research Question	Key Findings
Did states with a higher proportion of their population voting in person on November 3, 2020, experience a higher increase in COVID-19 caseloads soon after the election?	The correlation of .3402 between total votes cast and the increase in COVID-19 cases represents a moderate relationship, yet there is not enough evidence to answer "yes" because the correlation is not statistically significant when only considering in-person voting on election day.
Did states with Republican governors experience a higher increase in COVID-19 caseloads soon after the election than states with Democratic governors?	There was a significant difference between states based on the governor's political party. When looking only at states with Democratic governors, the correlation between in-person voting on election day and the increase in COVID-19 cases was significant at the .05 level and was a moderate relationship at .4370. This did not hold for states with Republican governors.
Did states with larger percentages of population living in urban areas experience a higher increase in COVID-19 caseloads soon after the election than states with smaller percentages of population living in urban areas?	The percentage of people living in urban areas shows a moderate and significant relationship with the increase in COVID-19 cases after the election, yet only for states with Republican governors. This means the more urban Republican-led states saw greater caseload increases following the election than the more rural Republican-led states. The second regression model confirms the significance of urbanization on total caseloads as well.
Did states with smaller per capita state governments experience a higher increase in COVID-19 caseloads soon after the election than states with larger per capita state governments?	There is a significant negative correlation between state capacity and the increase in COVID-19 caseloads after the election, regardless of the political party of the governor, and these correlations establish a moderate relationship. This means states with higher per capita state government employment generally saw lower caseload increases after the general election.

One suggestion for future research, based on the unexpected finding that increased absentee/alternative voting methods did not appear to protect states from an equal increase in COVID-19 cases is the question of whether citizens in "more COVID-19 cautious states" were simply less likely to vote regardless of the allowable methods for voting. This a question of political culture or risk culture and is worthy of future exploration. In addition, as time passes more detailed data should be available across all 50 states so that such analysis may be performed at a lower level of government (township, city/village, county).

Perhaps the most important finding is simply that in-person voting can be managed well from a public health and safety perspective, and that states with greater capacity appear to have mitigated the risk of

viral spread better than states with lower capacity. Confirmation of these findings could be achieved by examining these issues at the county level so that far more than 50 units are being compared and/or by applying multiple measures of state capacity in future research rather than using one general measure of state capacity. In addition, as stated earlier, future data will likely allow researchers to tease out absentee or electronic voting from in-person advance voting from in-person voting on election day, and also to include factors such as the average number of voters per election polling site. This additional data would allow a more thorough examination of the issue at hand even though it may never be available for all 50 states, and indeed it might draw into question the findings of this preliminary research.

Circling back to federalism—in a nation so politically divided, it may essentially be hazardous to allow local control (i.e., township, village, city, and/or county) of elections with inconsistent state oversight and minimal national involvement. Article 1, Section 4, of the U.S. Constitution states, "The Times, Places and Manner of holding Elections for Senators and Representatives, shall be prescribed in each State by the Legislature thereof; but the Congress may at any time by Law make or alter such Regulations…." The intent of this delegation was to protect Americans from a tyrannical national government, yet the current threat may be allowing tens of thousands of partisan local officials a hand in the process and outcomes. This issue has essentially emerged because most state governments heavily delegated the power provided to them by the U.S. Constitution; however, Congress could assert more control through the legislative process.

Rather than 51 closely monitored electoral systems, now that the District of Columbia votes for the presidency, the U.S. has thousands of jurisdictions each more or less seeking to follow relevant state laws and regulations. This adds to the challenge faced by the current study, which examined data from 50 states, because the consistency within individual states varies significantly. While perhaps moving too far from the public health focus of this research, this inconsistency may allow for partisan political opportunism or interference in the administration of elections and may have reached the tipping point where Congress should get involved. On the other hand, as reasonable people would point out, it would be foolhardy to think that Congress is somehow less partisan in the current politically polarized American environment.

Acknowledgement

This research was funded in part by a Western Michigan University Meader Presidential Endowment Covid-19 Response Grant through the Office of Research and Innovation.

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