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Understanding the influence of contextual factors and individual social capital on American public mask wearing in response to COVID-19

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ABSTRACT

The COVID-19 pandemic poses unprecedented risks to the health and well-being of the entire population in the U.S. To control the pandemic, it is imperative for individuals to take precautionary behaviors (e.g., wearing a mask, keeping social distance, washing hands frequently, etc.). The factors that influence individual behavioral response thus warrants a close examination. Using survey data for respondents from 10 states merged with state-level data, our study represents a pioneering effort to reveal contextual and individual social capital factors that explain public mask wearing in response to COVID-19. Findings of logistic multilevel regression show that the COVID-19 death rate and political control of government at the state level along with one's social capital at the individual level altogether influence whether people decide to wear face masks. These findings contribute to the rapidly growing literature and have policy implications for mitigating the pandemic's devastating impact on the American public.

1. Introduction

Since the first case appearing in Snohomish County, Washington on January 21 2020, the COVID-19 pandemic has led to cascading effects including rising death toll, increased economic hardship among low-income individuals (Chetty et al., 2020), and mental health issues (Ammerman et al., 2020) in the U.S. The most recent data shows over 28 million confirmed cases and more than 500 thousand deaths by the end of February 2021 (Johns Hopkins University). To protect public health and well-being, the Centers for Disease Control and Prevention (CDC) have suggested that the American public adjust personal behaviors in response to COVID-19. Some of the suggestions include wearing a face mask, keeping social distance, and maintaining hand hygiene (CDC, 2020). However, not all Americans strictly follow these suggestions and many people refuse to do so even when they have symptoms of infection (Pew Research Center, 2020). Because the public response in terms of mask wearing is critical to reduce the transmission of the virus when preventive vaccine or effective treatment is not widely available, it is significant to identify underlying factors that can motivate public response to COVID-19.

Previous studies on this topic primarily attributed American public response to individual-level factors, including sociodemographic

background and political orientation (Algara et al., 2021; Lunn et al., 2020; McFadden et al., 2020; Shao and Hao, 2020). For example, one study reveals that females and Catholics are more likely to practice social distancing (Charles et al., 2020). Another study finds that faith in President Trump is a strong predictor of refusal to social distance (Graham et al., 2020). Regarding mask wearing, studies find that gender, age, and mask mandate affect one's voluntary mask wearing behavior (Haischer et al., 2020; Knotek II et al., 2020). Beyond research on Americans, one study about Canadians (Merkley et al., 2020), one study conducted among British university students (Barrett and Cheung, 2020), one study of young adults in Switzerland (Nivette et al., 2020), and another study on Italians (Briscese et al., 2020) all report that whether people take proactive actions is associated with their income, education, age, and gender. In addition, there are studies about mobility patterns and COVID-19 transmission at the metropolitan-level (Lasry et al., 2020), county-level (Badr et al., 2020), and state-level (Gao et al., 2020). However, with the pandemic being an ongoing event, there is a lack of knowledge of how other factors at both the collective and individual levels influence public response to COVID-19.

This study aims to bridge this gap in the literature by investigating the multilevel determinants of American mask wearing in response to COVID-19. We expand on previous research by treating the individual

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response as a function of their individual characteristics and the circumstances of the state where they live. The two state-level factors that we include for investigation are the COVID-19 impact and political climate. In addition to the commonly used sociodemographic factors, we highlight social capital's impact at the individual level. We first explore theoretical reasons that account for why these factors can influence individual response to COVID-19 and use the rationale to develop hypotheses. We then use data from multiple sources to build measurements and estimate multilevel regression to empirically test these factors' effects among people from 10 states where the data are available. This study's findings can shed light on public response to this emerging health crisis and provide policymakers with useful insights to mitigate the pandemic's devastating impact on the American public.

In what follows, we begin with a literature review, theoretical discussions, and hypothesis development. Next, we introduce the data sources and describe the variable measures. We then present results from logistic multilevel regression analyses. In the conclusion section, we summarize the key findings, discuss this study's contributions and policy implications, and offer future research suggestions.

2. Literature Review

A growing body of literature has focused on factors that influence people's cognitive and behavioral response to COVID-19 (e.g., Charles et al., 2020; Graham et al., 2020; Haischer et al., 2020; McFadden et al., 2020; Shao and Hao, 2020). Expanding from previous research, we focus on investigating two collective-level factors and one individual-level factor that have received less attention. Notably, we analyze the influence of the degree to which the state has been impacted by the COVID-19 pandemic and the political climate as well as individual social capital on the American public response.

2.1. COVID-19 Impact

In theory, if people reside in an area exposed to greater COVID-19 impact, their risk perceptions are likely to be heightened which then leads to an increased propensity of risk reduction behaviors. In comparison, when people live in an area less affected by COVID-19, their concern regarding this matter might be diminished. Despite this general assumption, heterogeneity of response still exists due to perceived risk and the amount of risk misinterpreted. For people from the same area affected greatly by COVID-19, the ones who have heightened risk perceptions are expected to respond more proactively than those who downplay the risk. The argument can be supported by the construal level theory that describes how psychological distance influences one's perceptions and behaviors (Liberman and Trope, 2008; Trope and Liberman, 2010). The theory proposes that the perceived distance to a specific risk is important because it could become a barrier to adopting corresponding beliefs and actions if the distance is perceived far away. Meanwhile, if the distance is perceived close enough, the risk mitigation actions can be more easily motivated. The theory has been applied to interpreting variations in public perceptions of climate change. Studies have found that the experience of climate extremes brings the psychological distance of climate change closer and incentivizes people to perceive this issue as more concrete and urgent (Brügger et al., 2016; Hao et al., 2020; Spence et al., 2012). However, not all victims of extreme events show a heightened level of risk perception. Studies of flood victims of England and vulnerable populations to the earthquake in Israel indicate that the heightened risk perception of climate change is also due to their value orientation and socioeconomic status (Shapira et al., 2018; Whitmarsh, 2008). Furthermore, consumer response to genetically modified organisms sometimes is due to the misinterpretation of the risk (Nelson, 2001).

Generally speaking, the greater COVID-19 impact of the place where people live –represented by more cases or deaths – brings the psychological distance closer and incentivizes people to perceive this issue as

more urgent, which can then manifest in active public response to mitigate its threat. Meanwhile, if the place where people live is less impacted by COVID-19 represented by indicators such as a low number of confirmed cases or death rate, local residents are likely to perceive the risk as abstract and distant. Consequently, the motivation to control the transmission of the virus is weak. Thus, there is a mechanism with which people are more motivated to respond if their home state is confronted with substantial challenges brought by the virus. Despite the general pattern, there are differential impacts of perceived risk related to COVID-19, and the differences can be accounted for by additional contextual or individual factors. Informed by previous studies and the relevant theory (Charles et al., 2020; Graham et al., 2020; Shao and Hao, 2020), we expect that the elderly, female, and people with higher income and education might perceive higher risk of the pandemic when controlling for the effects of severity of the pandemic in their home states.

There are some empirical studies of Americans to examine the association between the degree of a place's COVID-19 impact and its residents' likelihood of making a response. Findings show that more confirmed cases at the county level can reduce residents' overall mobility (Borgonovi and Andrieu, 2020) and people are more likely to stay at home in these counties (Bai et al., 2020; Ding et al., 2020). Meanwhile, other studies examine the association from a temporal perspective. For example, one study reveals that the average Google search for COVID-19 related terms increases with the confirmed cases in the U.S. (Barrios and Hochberg, 2020).

2.2. Political Climate

In a political climate where polarization has become the norm, political ideology and party identification are the basis on which individual perceptions and behaviors of different issues are formed (Bartels, 2002). Related to one's political identity, individuals with different ideologies and affiliated with different political parties rely on separate information sources (e.g., news outlets and political elites). For instance, consistent liberals turn to CNN, MSNBC, NPR, and New York Times for their information sources while consistent conservatives use Fox News as their major news source (Pew Research Center, 2014). Regarding the COVID-19 pandemic, Democratic and Republican leaders have sent contrasting messages about its severity from the outset. Democratic leaders (e.g., Governor of New York) tend to highlight the risk and promote the CDC recommendations while Republican leaders (e.g., Governor of Florida) are more likely to downplay the risk and reject measures such as economic shutdown to control the pandemic (Beauchamp, 2020; Coppins, 2020). The politically driven rhetoric from leaders quickly managed to polarize the public in its response to COVID-19 (Allcott et al., 2020; Shao and Hao, 2020). The media is also highly polarized in reporting, with the right-leaning media even playing a role in facilitating the dissemination of misinformation about the pandemic (Hart et al., 2020; Motta et al., 2020). As a result, there is an immense division on American public risk perceptions of and behavioral response to COVID-19, with Republicans being less likely than Democrats to see a high level of threats (Shao and Hao, 2020) and engage in behaviors to slow the disease transmission (Allcott et al., 2020).

In addition to the influence of political leaders and the polarized media environment, the immediate social setting's political environment exerts unignorable influence on individual perceptions and behaviors (MacKuen and Brown, 1987). Consequently, the political climate of a region where Americans reside is expected to influence their response to COVID-19. Some studies have started examining how political contextual factors shape one's behavior related to COVID-19. For example, one study finds that people in areas with more Republicans engage in less social distancing (Allcott et al., 2020). Similarly, another study reports that in counties with higher shares of Trump voters, people are less likely to practice social distancing (Barrios and Hochberg, 2020). Also, residents in Republican-leaning counties are less likely than

Democratic-leaning counties to comply with the “stay-at-home” orders (Goldstein and Wiedemann, 2020; Painter and Qiu, 2020).

2.3. Social Capital

Social capital refers to social networks, trust, and norms that facilitate coordination and cooperation for mutual benefit (Putnam, 2000). Social capital has been linked to one’s health since Durkheim’s classic research on suicide that finds the lowest rate of suicide occur in societies with the highest degree of social integration while an excess of suicides occurs in societies undergoing loosening of social bonds (Durkheim, 1951). Such connection is also found in contemporary research that reveals high social capital is related to better health and lower syndromes of depression (Rodgers et al., 2019). Meanwhile, social capital has played a critical role in public response during previous influenza outbreaks such as the H1N1 pandemic and avian flu (Chuang et al., 2015; Jung et al., 2013; Kim et al., 2006; Ronnerstrand, 2013; Waisbord et al., 2008).

Following the existing research of social capital, we argue that social capital, in theory, might also be effective to motivate behaviors that mitigate one’s health risk due to COVID–19. The claim is supported by empirical findings showing that places with stronger social capital tend to have more active responses to the pandemic and fewer confirmed cases (Borgonovi and Andrieu, 2020; Markridis and Wu, 2020). Social network facilitates the distribution of valuable and timely information regarding the virus. Individual behaviors are likely influenced by their family, neighbors, and friends in their social network. Studies reveal that as information on the pandemic spreads, areas with close-ties start to show a slower increase in COVID–19 cases as people decide to engage more in health-protective action (Fraser and Aldrich, 2020). Also, people living in a trustful environment are more likely to act for the common good with the expectation that others will likewise do the same. Thus, trust promotes social coordination that incentivizes people to take similar actions such as wearing a mask in response to COVID–19. Using data from a survey of Chinese respondents and the World Values Survey, Wu (2020) shows that higher social trust and political trust are associated with fewer confirmed cases.

The impact of social capital on public response to COVID–19 among American communities has been highlighted in a study that finds communities with high capital are expected to respond more effectively than communities with low capital (Pitas and Ehmer, 2020). One study shows that individuals reduce mobility earlier and to a larger degree in response to COVID–19 in counties with high social capital (Borgonovi and Andrieu, 2020). One similar study conducted in China finds that people with higher social capital do better in response to COVID–19 than their counterparts (Bian et al., 2020). Another study in Europe also reveals that the higher social capital of a country is related to lower mobility, which in turn leads to fewer confirmed cases and deaths (Bartscher et al., 2020).

2.3. Hypotheses

Overall, public response to COVID–19 is rooted in the context in which individuals live. The literature review suggests that the COVID–19 impact and political climate of an area are likely to influence how residents behave in response. In addition, there is a close connection between one’s social capital and their motivation to respond. Considering these theoretical perspectives and using wearing face masks as an indicator of public response, we propose the following three hypotheses:

Hypothesis 1. People from states that suffer greater impact from COVID–19 are more likely to wear face masks in response to the virus than people from states that suffer less impact.

Hypothesis 2. People from states with Democratic Party controlled government are more likely to wear face masks in response to COVID–19 than people from other states.

Hypothesis 3. People with higher social capital are more likely to wear face masks in response to COVID–19 than people with lower social capital.

3. Data and measures

We utilize data from several sources. All individual-level data, including one’s decision to wear a face mask in response to COVID–19, social capital, and the sociodemographic control variables, are drawn from the COVID–19 household impact survey. The survey is funded by the Data Foundation and is conducted by the National Opinion Research Center at the University of Chicago. The survey provides weekly estimates of the U.S. adult household population nationwide and for 18 regional areas, including ten states and eight metropolitan areas. The national survey along with the regional survey shed light on how the American public responds to the evolving pandemic. Data collection occurs over a week-long period with interviews conducted in English and Spanish. Respondents are offered a small monetary incentive for completing the survey.¹

Data for the regional estimates are collected using a multi-mode address-based approach that allows residents of each area to complete the interview via the Internet or with a telephone interviewer. The sampling frame is based on an extract of the U.S. Postal Service delivery sequence file that provides sample coverage of approximately 97% of the U.S. household population. Once the sample has been selected and data have been collected, an iterative raking process is used to adjust for any survey nonresponse as well as any noncoverage or under and oversampling. Raking variables are based on demographic indicators from the 2018 American Community Survey. The data reflect the population of adults in each region.

For this study that focuses on state-level factors, we use data for over 10 thousand respondents from 10 states (California, Colorado, Florida, Louisiana, Minnesota, Missouri, Montana, New York, Oregon, and Texas). The selection of these 10 states is likely due to a combination of factors that include both demographic (these states tend to have large and diverse populations) and geographic diversity (these states are located across the country). Also, the pandemic is extremely severe in some of these states. We combine the first three weeks’ data that are currently available. The first week’s data was collected during April 20–26, the second week’s data was collected between May 4–10, and the third week’s data was collected from May 30 to June 8. The number of cases rose when the survey was fielded (García-Basteiro et al., 2020).

We include two state-level measures and merge those measures with individual-level data drawn from the COVID–19 impact survey. Our choice to focus on the state as the geographic level is based on the following rationale. The U.S. has a federalist system with the political power being distributed between the federal government and state governments. States operate more or less independent from one another. Each state has its distinctive history as well economic and political context (Gelman et al., 2007). Many policies at the state level and decisions made by the governor can affect the entire population in that state. We use the COVID–19 death rate to measure the level of impact that each state has suffered due to the virus. The number of deaths is obtained from a dataset compiled and shared by The New York Times (2020).² We measure political climate in terms of whether the Democratic Party has unified control of state government. We describe these variables below, and the summary statistics are reported in Table 1.

¹ The data can be accessed from the survey’s website: <https://www.covid-impact.org/>.

² The data can be accessed at a GitHub website: <https://github.com/nytimes/covid-19-data>.

Table 1
Descriptive statistics.

Variable	Mean	S.D.	Min	Max
<i>Dependent Variable</i>				
Wear a face mask in response to COVID-19	0.867	0.340	0	1
<i>State-Level Independent Variables</i>				
COVID-19 death rate	25	41	1	134
Political control of government	0.400	0.516	0	1
<i>Individual-Level Independent Variables</i>				
Talk with neighbors	3.225	1.184	1	5
Communicate with friends and family	4.574	0.699	1	5
Trust people in the neighborhood	2.521	0.746	1	4
Health condition	2.291	0.974	1	5
Employment stability	3.090	1.685	1	5
Age	4.259	1.750	1	7
Sex (Female = 1)	0.564	0.496	0	1
Race (White = 1)	0.738	0.440	0	1
Income	5.710	2.378	1	9
Education	4.310	1.613	1	7
Type of residence (Urban = 1)	0.750	0.433	0	1

3.1. Dependent Variable

We measure one's response to COVID-19 in terms of mask wearing. The question asks, "Are you wearing a face mask in response to the coronavirus?" We use this indicator as a key response to COVID-19 because wearing a mask is the most effective way to stop person-to-person spread when the coronavirus spreads mainly via airborne transmission (Cheng et al., 2020a; Cheng et al., 2020b; Eikenberry et al., 2020; Zhang et al., 2020). Answers to this question are coded in a binary way as yes (1) and no (0). On average, 87% of respondents from all ten states said yes to this question. We calculate each state's percentage and present the geographical variation as a map in Fig. 1. Three states in dark green (California, Colorado, and New York) have over 90% of their respondents decide to wear a mask. In comparison, one state in light green (Montana) has less than 80% of respondents choose to wear a mask. For the other six states (Florida, Louisiana, Minnesota, Missouri, Oregon, and Texas), the percentages of respondents who wear a mask range from 80% to 90%.

3.2. State-Level Independent Variables

We obtain each state's cumulative deaths for the period when the survey was conducted and then divide the number by the 2020 population obtained from the Census. On average, 25 deaths per every 100 thousand people among these ten states with New York has the highest 134 deaths/100,000 people. In addition, we use the one-party control of state government to gauge the political climate of each state. We obtain data from the National Conference of State Legislatures. The variable is measured in a binary way with states coded as 1 if the Democratic Party holds control over a state's senate, house, and governor's office. California, Colorado, New York, and Oregon belong to this group. States are coded as 0 if the Democratic Party does not have unified control.

3.3. Individual-Level Independent Variables

There are three variables to measure one's social capital. Two indicators measure one's social network, the frequency they talk with the neighbor as well as the frequency they communicate with friends and family in the past month. The responses include not at all (1), once a month (2), a few times a month (3), a few times a week (4), and basically every day (5). The ways in which individuals are connected influence what information they share. The extensive connections that people possess will increase the possibility to learn information regarding the pandemic, which is a major topic during the survey period. Because there have been growing cases when the survey was conducted, it is likely that shared concern or public health recommendations is more

promoted within social networks. Further, people who are nested in a close-knit community are more likely to feel obligated towards one another. Wearing a mask protects not only oneself but also others. In this sense, social capital implies physical and mental well-being. Trust is measured by how much they trust people in the neighborhood, and the responses include none (1), some of the people (2), most of the people (3), and all the people (4). A higher value of these indicators suggests a closer social network or stronger trust. We use these measures because social network and trust are the two core domains of social capital as defined by Putnam (2000) and there are available data in the COVID-19 impact survey to build measurement.

Next, we control for eight sociodemographic variables. There is one question about one's general health condition and the responses include excellent (1), very good (2), good (3), fair (4), and poor (5). A higher value suggests a relatively bad health condition. We assume one's decision of mask wearing is related to their health status, with poor health population is more likely to wear a mask because they are more vulnerable to the infection by the pandemic. The employment stability is measured as one's likelihood of being employed in 30 days from now, and the responses include not likely at all (1), not too likely (2), moderately likely (3), very likely (4), and extremely likely (5). During the pandemic, people were being laid off across the country, and it is thus important to control for one's stability in employment for this study. In addition, age is measured in seven groups ranging from young (18-24) to old (75 and over). Sex is measured as 1 for female and 0 for male. Race is measured as 1 for white and 0 for nonwhite. Household income is measured in nine categories ranging from low (under \$10,000) to high (\$150,000 or more). Education is measured with a 1-7 scale ranging from 1 being has no high school diploma to 7 being has a doctorate degree. The residence type is measured as urban (1) and rural (0).

4. Logistic multilevel regression analyses and results

We employ logistic multilevel regression with random intercepts to assess the influence of individual-level and state-level variables on one's decision of whether to wear a face mask in response to COVID-19. Multilevel modeling is used because the data is hierarchical with three levels – the individual units of analysis at a lower level are nested within the state units at a higher level, which is then nested in the survey wave. We use the logistic model because the dependent variable is coded in a binary way. In the analyses, explanatory variables are fixed and not allowed to vary across states. However, a random intercept controls the different means in one's decision to wear a mask across states and helps reveal whether the cross-state variation in the intercepts depends on the state-level variables (Robson and Pevalin, 2016; Snijders and Bosker, 2012).

In the preliminary analysis, we run an unconditional multilevel model (or intercept-only model) with no predictors. In this model, one's decision to wear a mask is estimated to test whether multilevel modeling is needed. We obtain the intraclass correlation (ICC), which estimates the percentage of the total variance of whether wearing a mask between states and is calculated by dividing the between-states variance by the total variance. The ICC statistic is 0.099, indicating that approximately 10% of the variance in the dependent variable occurs between states. The result suggests that a multilevel specification is reasonable for data analysis (Hox, 2002).

The regression model includes several individual-level and state-level variables. The COVID-19 death rate variable is transformed into logarithmic form (base 10) to correct data skewness. We conduct regression in different models step-by-step. Model 1 only includes the eight individual-level control variables; Model 2 adds two state-level variables (death rate and political control of state government); and Model 3 adds three social capital variables. The models are estimated using Stata 16. We report the odds ratio findings in Table 2.

Results in Model 1 show that all individual-level control variables

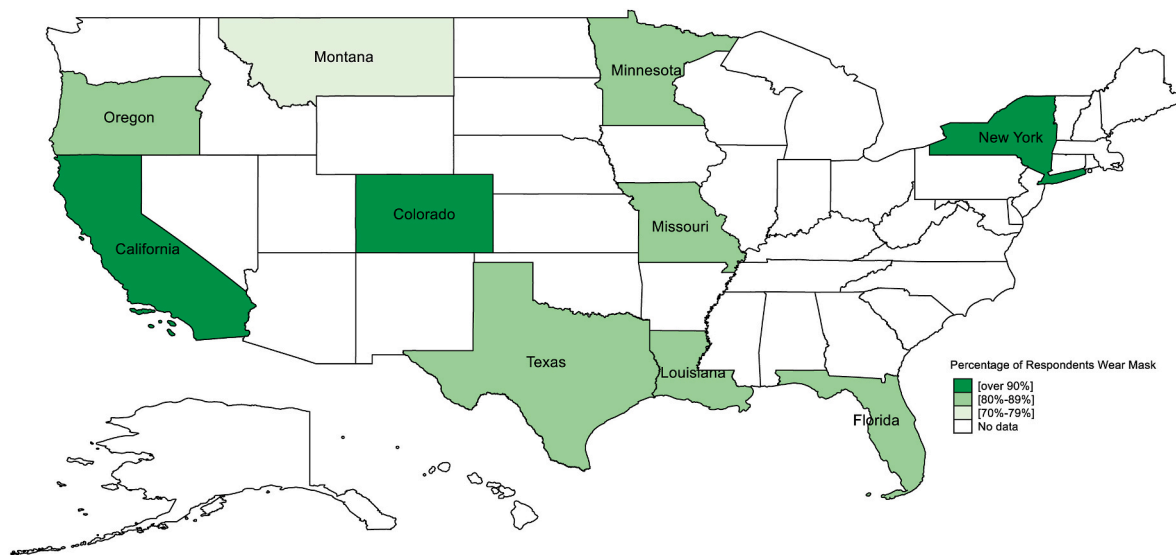


Fig. 1. A map of percentage of respondents from each state wear a face mask in response to COVID-19.

Table 2
Logistic multilevel regression results.

	Model 1	Model 2	Model 3
	Odds Ratio		
<i>Individual-Level Independent Variables</i>			
Talk with neighbors	–	–	1.045 [†]
Communicate with friends and family	–	–	1.162***
Trust people in the neighborhood	–	–	1.012
Health condition	1.129***	1.129***	1.152***
Employment stability	0.924***	0.924***	0.925***
Age	1.120***	1.121***	1.118***
Female	1.535***	1.534***	1.499***
White	0.624***	0.618***	0.612***
Income	1.061***	1.061***	1.059***
Education	1.195***	1.194***	1.194***
Urban	1.726***	1.719***	1.710***
<i>State-Level Independent Variables</i>			
COVID-19 death rate (ln)	–	1.265**	1.259**
Political control of government	–	2.021***	2.014***
<i>Model Statistics</i>			
Constant	1.241	0.546	0.234
Number of Observation/Number of States	12,021/ 10	12,021/ 10	11,792/ 10

Note: [†]p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001.

significantly influence one’s decision to wear a mask. People who have a worse health condition (odds ratio = 1.129) and might not be employed in 30 days (odds ratio = 0.924) are more likely to wear masks than people with better health conditions and higher chances of being employed. Also, the odds of wearing a mask increase by 12% for each unit increase in age, by 6% for each unit increase in income, and by 20% for each unit increase in education. Female (odds ratio = 1.535), nonwhite (odds ratio = 0.624), and people who live in urban areas (odds ratio = 1.726) are generally more likely to wear a mask. The influence of these variables remains significant in subsequent models after adding other variables.

Next, we add two state-level variables in Model 2. The findings show that people from states with higher COVID-19 death rates are more likely to wear a mask (odds ratio = 1.265). The odds of wearing a mask increase by 27% for each unit increase in the death rate. In addition, people from states with unified Democratic Party controlled government are also more likely to wear a mask (odds ratio = 2.021). The findings support H1 about how the individual decision to wear a mask is influenced by the degree of their home state being impacted due to the virus.

The findings also support H2 about the state political climate influences one’s decision to wear a mask. To further examine the effect of these two state-level variables, we use the “margins” suite of commands in Stata to visualize their associations with the dependent variable. We compute the adjusted means of the odds of wearing a mask given different values of the two state-level measures respectively, after controlling for other variables in the model. Fig. 2 provides the estimated odds with 95% confidence intervals. The odds increase concomitantly with the growth of the two state-level measures.³

Finally, we include the social capital variables in Model 3. We find that the trust variable is insignificant, while the two social network variables are statistically significant (odds ratio for the variable of talk with neighbors = 1.045 and odds ratio for the variable of communicate with friends and family = 1.162). Particularly, the odds of wearing a mask increase by approximately 5% for each unit increase in the frequency of talking with neighbors and by 16% for each unit increase in the frequency of communicating with friends and family. The findings provide some support to H3 about one’s likelihood of wearing a mask increases with higher social capital. We also visualize the associations between the two significant social network measures and the dependent variable in Fig. 3, which shows that the odds of wearing a mask increase concomitantly with more frequent networking with neighbors and family.

In sum, our analyses that control for a series of individual-level and state-level variables reveal the influence of different factors on one’s decision to wear a mask. At the state level, people from states with high COVID-19 death rates are more likely to wear a mask than people from states with low death rates (H1). Also, people from Democratic Party controlled states are more likely to wear a mask than other states (H2). At the individual level, people with higher social capital represented by more frequent networking with others are more likely to wear a mask (H3). The decision to wear a mask is also influenced by other personal characteristics including one’s health condition, employment stability, age, sex, race, income, education, and urban/rural residence. We have run multiple diagnostics to test the model fit. The likelihood ratio test

³ In addition to the two state-level measures, we consider the state mandatory orders to wear face masks. During the study period, only New York among all ten states imposed the mandatory order. There is thus a lack of variation in this measure. We nevertheless include this variable in our analyses and obtain insignificant results. Although we do not report them here, the results can be made available upon request.

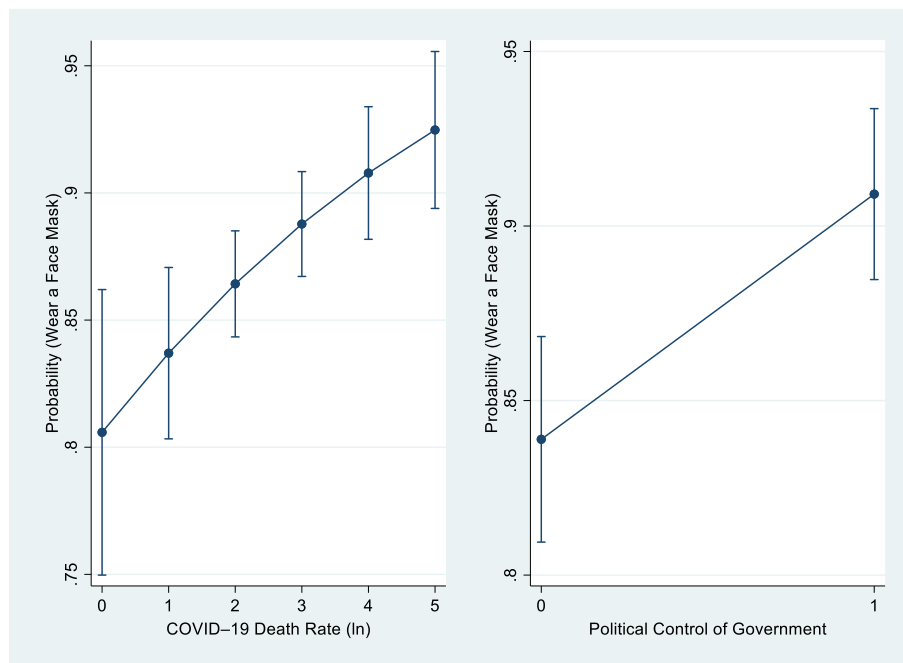


Fig. 2. Estimated Odds of Wearing a Face Mask predicted by State-Level COVID-19 Death Rate and Political Control of Government.

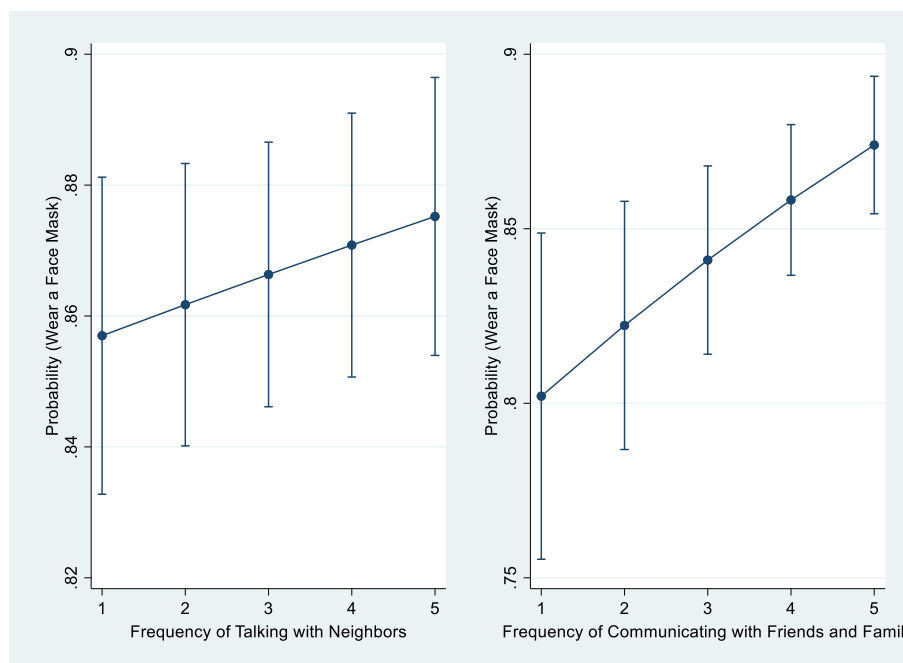


Fig. 3. Estimated Odds of Wearing a Face Mask predicted by Social Capital Indicators.

results show the multilevel estimates differ significantly from simple logistic model estimates of standard errors. The positive chi-square values mean the multilevel models display fewer errors and better fit than the simple model. Both AIC and BIC evaluate models in terms of their parsimony/complexity and their statistical fit. The scores decrease as we include state-level measures for analyses, which suggest better fitting models. Overall, the results show that we specify the models reasonably well. The tests for multicollinearity and influential cases find no substantial problem.

5. Discussion and conclusion

The COVID-19 pandemic continues to affect Americans with growing cases and deaths each day. Precautionary behaviors such as wearing a mask can reduce the transmission of the virus and ultimately save lives (Anderson et al., 2020). Thus, it is critical to understand the factors that motivate the American public’s behavioral adjustment. In this study, we systematically examine the influence of two contextual factors at the state level and social capital at the individual level on public response to COVID-19.

We utilize data from several sources and conduct multilevel analyses to test three hypotheses derived from the theoretical discussion. At the

state level, the findings support H1 by showing one's likelihood of wearing face masks is positively associated with the COVID-19 death rate of their home state. As suggested by the construal level theory (Lieberman and Trope, 2008), living in a state affected more by COVID-19 helps bring the psychological distance to this pandemic closer and promote one's response. The findings also support H2 and reveal that people from states with a Democratic Party controlled government are more likely to wear masks. This pattern fits the literature expectation of the political climate's influence on individual attitude and behavior (MacKuen and Brown, 1987).

At the individual level, we report significant and positive influence of one's social network on their decision to wear face masks, which supports H3. Our interpretation of this result is that people who are nested in a close-knit community are more likely to feel obligated towards one another and make personal sacrifice for the common good as wearing a mask protects oneself as well as others. It is also possible that information on COVID-19 can be spread fast among individuals living in a large social network. Given that the information environment is mixed, the effects of information and misinformation may cancel out each other. Our result however suggests that the urgency embodied in the accurate COVID-19 information may trump various conspiracy theories in one's immediate social network. Considering the growing COVID-19 cases, medical advice and public health recommendations might be more promoted within social networks. While the epidemiological literature suggests that social interaction can foster the spread of the virus, the pandemic's evolution beyond this initial phase is determined by the extent to which communities can adopt behaviors that reduce transmission promptly and in a sustained way. The patterns of family interactions and social bonds within a community are essential to influence individual behaviors in response to the virus and shape the course of the pandemic. We do not find significant influence of the trust variable, which might be because the survey question is about trust in the neighborhood only. Future studies should consider variables about generalized trust that involves neighbors, family, friends, colleagues, and even strangers. We suspect that generalized trust would have significant findings since people are more likely to behave in a way that benefits each other if their general living surrounding is trustful.

Overall, because mitigating the pandemic requires behavior change, insights from social science can help align human behavior with the recommendations of public health experts (Bavel et al., 2020; Lunn et al., 2020). Some studies have analyzed the influence of sociodemographic factors on one's risk perception or behavioral adjustment in response to the pandemic (e.g., Charles et al., 2020; Gao et al., 2020; Haischer et al., 2020; Lasry et al., 2020; Shao and Hao, 2020). In this study, we complement the literature by investigating the multilevel determinants of public response to COVID-19. Differences in the response may stem not only from variations in sociodemographic characteristics but also from variations in contextual factors of states where people live. An effective public response to this emerging pandemic also relies on higher social capital.

In addition to the contributions to scholarly knowledge, our study carries important policy implications. First, since people from states with higher death rates are more likely to wear masks, it might be effective to build on the heightened response and inform residents about the severity of COVID-19. Such measures are helpful to maintain general alertness to the pandemic even though the number of cases and deaths begin to decline. Second, COVID-19 has become a politicized issue among Americans. Different segments of the population may reach polarized conclusions about its threat and they also vary in terms of behavioral response. To reduce political division, it is essential to highlight a common identity that all Americans share when facing the same virus and bipartisan support is necessary for identifying effective solutions. Third, social networks that comply with public health recommendations is conducive to health information sharing, which might provide more opportunities for cross-partisan communication and reduce biased opinion about this pandemic.

COVID-19 will continue afflicting Americans for months and perhaps years to come. Thus, it is critical to motivate individual responses when the Trump administration has done little to promote a national plan (Haffajee and Mello, 2020). Despite our contributions, this study has limitations and research on the behavioral response to this unprecedented public health crisis in modern times call for more studies. First, reverse causality may be a concern. While we find COVID-19 death rate can drive mask wearing, the relation can also be reversed with more prevalent mask wearing associated with reducing COVID-19 death rate. Second, our dependent variable of mask wearing is based on self-reports. The social desirability in surveys might produce biases and affect the accuracy of estimation. Third, we analyze data for ten states over three weeks, dated to the beginning of the summer of 2020. Future studies should continue to track and examine the public response from residents from all 50 states and D.C. using more recent data. Fourth, in addition to the two state-level factors included in the present study, future studies might consider other factors such as the level of economic damages due to the pandemic and the recovery progress when data are available. It is significant to analyze the influence of state-level mask mandates or shutdown policies on the individual decisions on mitigation measures. Including individual-level political orientation measures is also meaningful. Finally, our study merges individual-level data with state-level data. Subsequent research should explore data at a finer geographic level to examine whether findings in this study are generalizable at the county level or city level.

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