

Association between perceived risk of COVID-19 and support for transportation policies



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ABSTRACT

The association between perceived risk of COVID-19 at the individual level and support for transportation policies designed to mitigate coronavirus transmission has received little attention. We surveyed a nationally representative sample of U.S. adults ($N = 2,011$) in June 2020 to examine how support for public policy varied according to perceived risk. We used logistic regression models to control for demographic factors and identify the effect of perceived risk, defined as a combination of self-reported perceptions of personal risk of acquiring the disease and the severity of the illness if infected, on support for a range of policies related to transportation. We found that perceived risk did not vary significantly by sex, race, urbanicity, income, or age. Support for policies aimed at mitigating COVID-19 transmission was consistently higher among those with higher perceived risk of the disease.

1. Introduction

An emerging literature is examining how travel behavior has changed during the coronavirus disease 2019 (COVID-19) pandemic (Pan et al. 2020; Ehsani et al. 2021) and the role of transportation policies in influencing this change (Glaser and Krizek 2021; Barbieri et al. 2021). However, little attention has been given to public perceptions of those policies. Support in the U.S. for policies to reduce the transmission of the novel coronavirus disease 2019 (COVID-19) has been mixed (McClain and Rainie 2020). While the initial travel restrictions implemented in the spring of 2020 limiting public movement to essential activities such as accessing food and outdoor exercise resulted in widespread compliance, this diminished over time (Hamidi and Zandiastabar 2021). Recent increases in the prevalence of COVID-19 cases have not had a corresponding impact on public behavior (Jackson and Newall 2020). Understanding individual-level characteristics that might influence support for public policies could assist in developing appropriate communication and public education strategies. Conceptual frameworks involving perceived risk can offer insight into factors underpinning public policy preferences related to a range of outcomes (Gerber and Neeley 2005). An individual's perceived susceptibility and perceived severity of COVID-19, collectively referred to as perceived risk, offers an approach to understand support for policies aimed at mitigating disease transmission. The Health Belief Model is a

foundational theory in public health, which has as an essential component the assumption that people will engage in a given health behavior when they perceive a harmful consequence of not engaging in that behavior as being likely and severe (Glanz et al. 2015). A logical extension would suggest those who perceive a higher risk from the disease would support more stringent measures to curb transmission. **Fig. 1..**

Understanding public support for policy is important because some factors affecting support may be modifiable, resulting in increased adherence to public health policies and related health behaviors. Further, research in this area may provide insight into a range of other factors associated with support, such as political or geographic attributes. Existing literature on the association between COVID-19 risk perception and travel behavior suggests that risk perception influences travel decisions by many people (Chan et al. 2020) including selection of modes of travel that have less exposure with the general public, such as bicycling, rather than using public transportation (Barbieri et al. 2021; Zafri et al. 2022). Travel is an importation mechanism through which infectious disease transmission can be amplified (Browne et al. 2016). However, research has yet to examine the association between an individual's perceived risk of COVID-19 and support for public policies aimed at mitigating COVID-19 transmission.

The COVID-19 pandemic has brought renewed attention to the importance of perceived risk in societal discourse (Kwon 2022; Barrios

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and Hochberg 2020; Bruine de Bruin and Bennett 2020). Prior research has examined individual-level perceptions of severity and susceptibility of COVID-19 (Calvillo et al. 2020; Commodari et al. 2020; Jahangiry et al. 2020) and found substantial differences in risk perceptions and health behaviors corresponding to political affiliation and partisanship (Bruine de Bruin and Bennett 2020; Kwon 2022). Other research has found limited variability in policy preferences at the state-level, likely overshadowing variability at a more micro-level within the U.S. (Duren et al. 2021). Recent scholarship has also started to connect partisanship to policy preferences during the COVID-19 pandemic, such as whether air travel should be suspended (Gadarian et al. 2021). A remaining gap in this area of the literature is developing an understanding of the more direct association between perceived risk and policy preferences. The purpose of this study was to examine the association between perceived risk and policy support in the U.S. in the context of the COVID-19 pandemic. A survey was administered in June 2020, roughly 150 days after the first cases of COVID-19 were detected in the U.S. At that point, the U.S. had recorded approximately 2.5 million cases and over 125,000 deaths; the greatest number of cases and deaths of any country in the world (Dong et al. 2020). The survey was administered after most states lifted their stay-at-home orders and began easing travel restrictions in late April to mid-May 2020 (Moreland, 2020). At the start of the survey period the seven-day average of daily coronavirus cases was 23,177 cases per day; by the end of the survey period, this seven-day average increased to 39,888 cases (CDC, 2020). The survey also coincided with a period when public health officials were concerned about the upcoming national July 4th holiday and were conducting information campaigns about the risks of COVID-19, while at the same time, mobility was increasing due to eased restrictions.

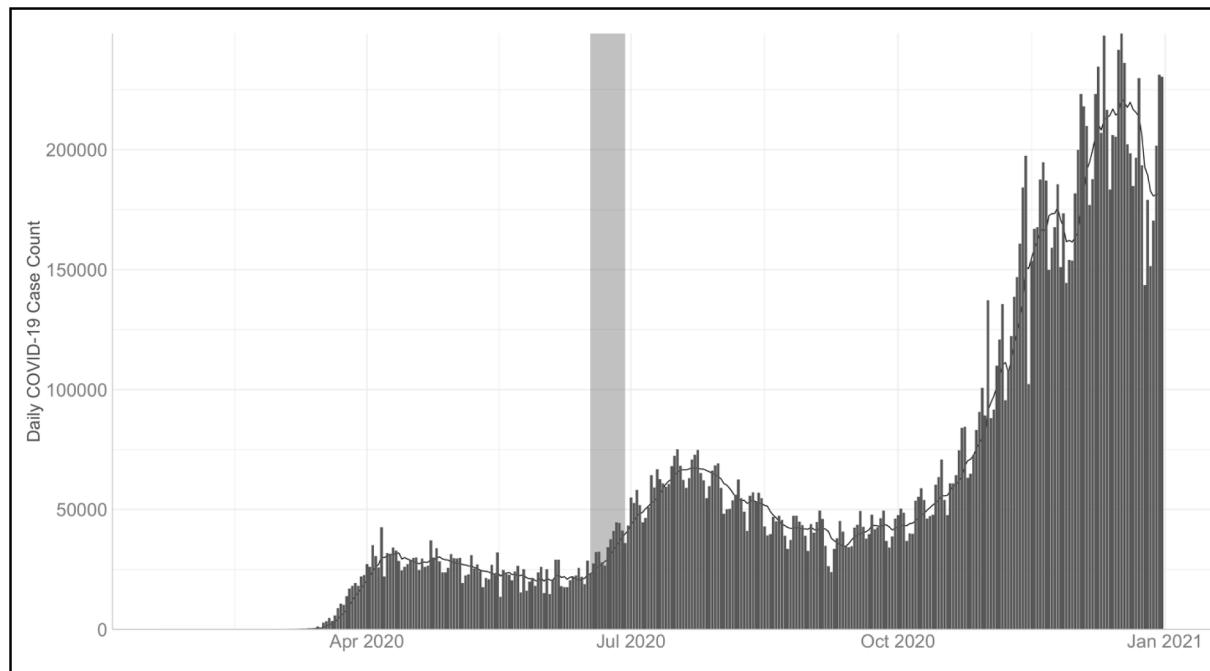
2. Methods

We conducted an online survey of 2,011 U.S. adults aged 18 or older using The Harris Poll panel. Data were weighted to reflect nationally

representative demographic proportions in the U.S. population, and propensity score weighting was used to adjust for respondents' propensity to be online. The survey was conducted between June 17 and 29, 2020. Two questions measured the construct of perceived risk. The first asked about likelihood that the respondent would contract the virus and the second asked about the seriousness of the virus if they were to be infected. Using responses to these questions, individuals with low perceived risk were defined as those who reported they were unlikely to contract the virus and who reported that the illness would not be serious if they were to contract it. Individuals with medium perceived risk were those who reported either that they would be likely to contract the virus or that the disease would be serious, but not both. Individuals with high perceived risk were those who both perceived that they were likely to be infected and that the disease would be serious.

Respondents reported their support for a set of measures that were being considered in jurisdictions in the U.S. at the time the survey was fielded. More specifically, respondents were asked whether they support, oppose, or are unsure regarding eight policies to reduce transmission of COVID-19, including: (1) require people to sit apart on public transit, (2) require people to wear masks on public transit, (3) require people to wear masks in all indoor spaces where people congregate, (4) stagger school and work start and end times to eliminate peak commuting hours, (5) expand walking and biking areas by closing a vehicle traffic lane, (6) reduce speed limits to accommodate pedestrians and bicyclists, (7) continue or expand remote/telework practices, and (8) continue or expand practices for curbside pick-up of food and other products. We grouped these into policies related to individual behaviors (1, 2 and 3), those related to the workplace, school, and retail environment (4, 7 and 8), and those related to transportation infrastructure (5 and 6). We considered support for these policies individually as well as overall support across all policies.

We calculated weighted proportions for our descriptive statistics and used chi-square tests to determine the statistical significance of differences. For our measures of interest, we calculated means and 95 percent



Notes: The grey region indicates the period when the survey was fielded. The line reflects the 7-day moving average number of daily coronavirus cases. The data reported was taken from CDC's COVID Data Tracker.⁵

Fig. 1. Daily total Coronavirus cases, United States March 2020 – January 2021. Notes: The grey region indicates the period when the survey was fielded. The line reflects the 7-day moving average number of daily coronavirus cases. The data reported was taken from CDC's COVID Data Tracker.⁵

confidence intervals. To determine the likelihood of policy support by level of perceived risk, we used logistic regression models for each policy mentioned above. Odds ratios were calculated from the logistic regression models by exponentiating the regression coefficients, which represent the log of the odds. We selected logistic regression models as the basis of our analysis given the binary nature of the outcome variable, which in our case is 1 to indicate support for a given policy and 0 to indicate the absence of support. Further, logistic regression offers a powerful yet simple classification algorithm for binary variables that allows for the inclusion of control variables. The regression models we employed account for key demographic factors, including age, sex, race, urbanicity, household income, and educational attainment. The analyses and figures were completed using Stata version 16 and R 4.0.2.

3. Results

Of the 2,011 respondents in our sample, 15.7 % [95 % CI, 13.4 %–18.0] had a low perceived risk of the coronavirus, 60.8 % [95 % CI, 57.8 %–63.8 %] had a medium perceived risk and 23.5 % [95 % CI, 20.9 %–26.0] had a high perceived risk. Within the medium perceived risk category, the vast majority thought the virus was serious but thought they were unlikely to contract it. Perceived risk did not vary significantly by sex, race, urbanicity, income, or age groups (Table 1).

3.1. Overall support for policies by perceived risk

Assessing the effect of perceived risk on overall support for these transportation policies, we found those with greater perceived risk were significantly more likely to support the policies under consideration. Specifically, respondents with the highest perceived risk supported an average of 5.3 policies of the 8 policies considered in our survey [95 % CI, 5.0–5.6]. Respondents with medium perceived risk on average supported 4.6 policies [95 % CI, 4.4–4.8] and those with low perceived risk on average supported 2.9 policies of our 8 policies identified as being commonly implemented during the pandemic [95 % CI, 2.5–3.3]. Overall, those with medium and high perceived risk had relatively similar levels of support for policies, differing by 1.7 to 14.8 percentage

points depending on the policy. In contrast, respondents with low perceived risk had significantly lower levels of support for each policy than the medium or high perceived risk groups—with levels of support that were more than 15 percentage points lower for each policy option.

Roughly-one in ten respondents (10.8 %) opposed all the policies that were under consideration. Of these, 34 percent were in the low perceived risk category, 52 percent were in the medium perceived risk category, and the remaining 14 percent were in the high perceived risk category. In contrast, a small proportion (7 %) of those in the lowest perceived risk category supported all of the policies considered.

3.2. Percentage of respondents supporting individual policies by perceived risk

Policies related to individual behavior change or the workplace, school, or retail environments were supported by the majority of overall respondents (Fig. 2), with the highest levels of support from all respondents being for requiring masks on public transit. Specifically, 76.6 % of those with high perceived risk [95 % CI, 71.3 %–81.9 %], 74.9 % of those with medium perceived risk [95 % CI, 71.3 %–78.6 %] and 47.2 percent in the lowest risk perceived risk group [95 % CI, 39.3 %–55.1 %] expressed support for this policy. In contrast, policies related to changing the transportation infrastructure received the lowest levels of support. Specifically, the policy to reduce vehicle speeds had the lowest support for respondents with low or high perceived risk levels—failing to achieve a majority either overall or for any of the risk groups. The policy option that would expand bicycle and walking space had similarly low levels of support. While roughly half of those in the highest risk group supported this policy, it failed to achieve a majority of support among respondents overall or for the low and medium risk groups.

3.3. Likelihood of respondents supporting individual policies by perceived risk

The likelihood of support for each policy similarly increases for those with moderate and high perceived risk levels after accounting for demographic factors, as shown in Fig. 3. Respondents with moderate

Table 1
Descriptive statistics by level of perceived risk.

	Low Perceived Risk (N = 316)	Medium Perceived Risk (N = 1223)	High Perceived Risk (N = 472)	Total Sample (N = 2011)
Sex				
Male	141 (44.8 %)	608 (49.7 %)	225 (47.6 %)	974 (48.4 %)
Female	174 (55.2 %)	616 (50.3 %)	247 (52.4 %)	1037 (51.6 %)
<i>p</i> -value = 0.52				
Race				
White	200 (63.3 %)	793 (64.8 %)	298 (63.2 %)	1291 (64.2 %)
Black	29 (9.3 %)	135 (11.0 %)	61 (12.9 %)	225 (11.2 %)
Asian	25 (8.1 %)	74 (6.0 %)	30 (6.4 %)	129 (6.4 %)
Hispanic	45 (14.3 %)	200 (16.3 %)	71 (15.0 %)	315 (15.7 %)
Other	16 (5.1 %)	22 (1.8 %)	12 (2.6 %)	50 (2.5 %)
<i>p</i> -value = 0.50				
Urbanicity				
Urban	92 (29.0 %)	387 (31.6 %)	180 (38.2 %)	659 (32.8 %)
Suburban	156 (49.4 %)	602 (49.2 %)	210 (44.5 %)	968 (48.1 %)
Rural	68 (21.6 %)	235 (19.2 %)	82 (17.3 %)	385 (19.1 %)
<i>p</i> -value = 0.33				
Household Income				
Less than \$50,000	116 (36.8 %)	410 (33.5 %)	128 (27.2 %)	654 (32.5 %)
\$50,000 to \$99,999	85 (26.9 %)	385 (31.5 %)	159 (33.7 %)	629 (31.3 %)
\$100,000 or more	115 (36.4 %)	429 (35.0 %)	185 (39.2 %)	728 (36.2 %)
<i>p</i> -value = 0.24				
Age Group				
18–29	59 (18.6 %)	227 (18.6 %)	87 (18.4 %)	373 (18.5 %)
30–54	145 (45.9 %)	488 (39.9 %)	234 (49.6 %)	867 (43.1 %)
≥ 55	122 (35.5 %)	509 (41.6 %)	151 (32.0 %)	772 (38.4 %)
<i>p</i> -value = 0.08				

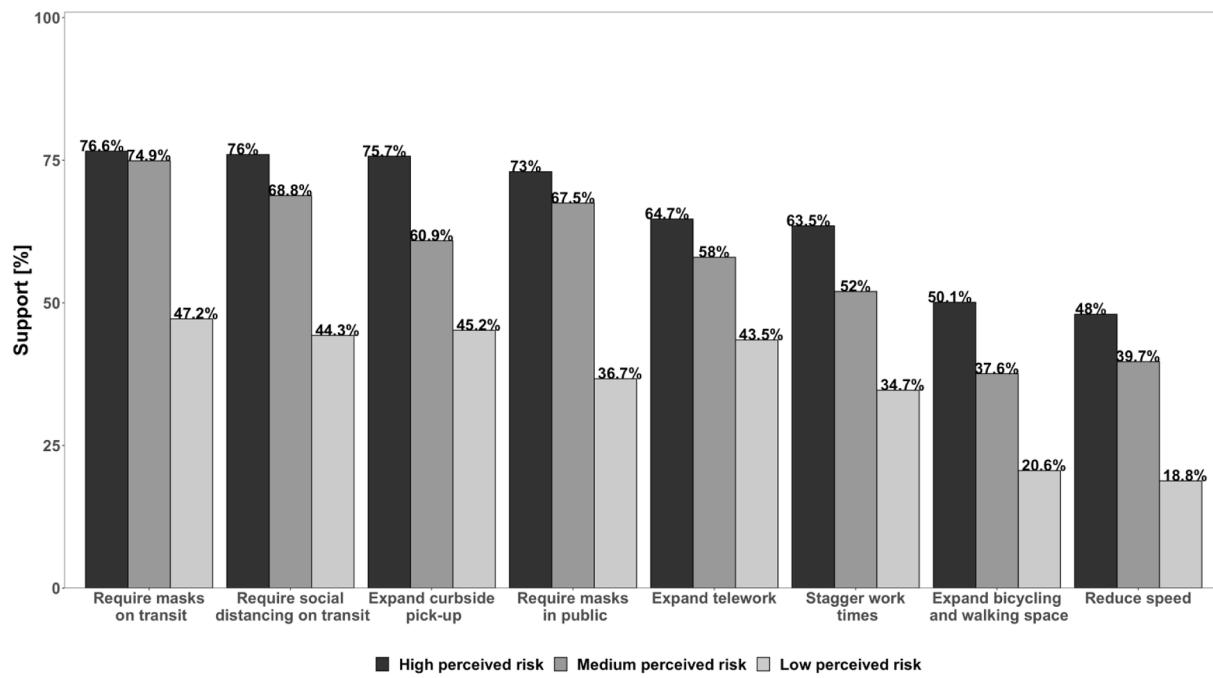


Fig. 2. Percent of respondent support by policy and by level of perceived risk.

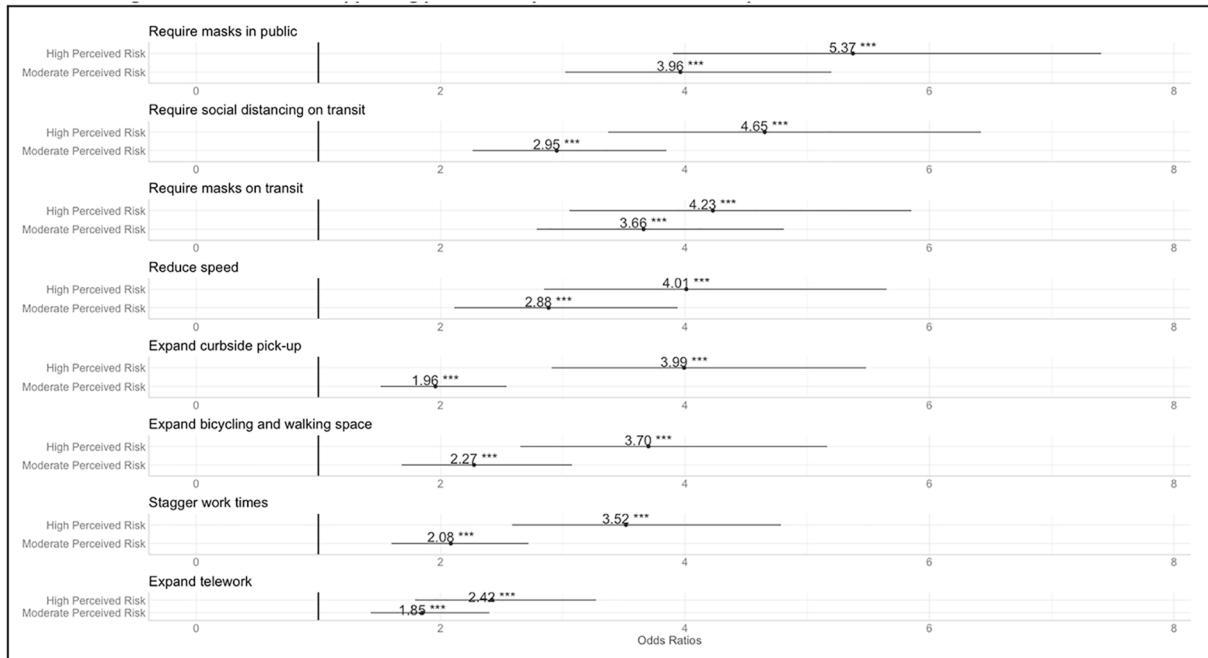


Fig. 3. Odds ratios of supporting policies compared to those with low perceived risk.

perceived risk of COVID-19 were between 1.9 and 4 times as likely to support policies aimed at reducing COVID-19 transmission as those with low perceived risk. Those with high perceived risk were between 2.4 and 5.4 times more likely to support these policies as compared to respondents with low perceived risk. All odds ratios for perceived risk values were statistically significant at the 0.001 significance level. The level of perceived risk exerted the greatest influence on support for mask mandates, with those with moderate perceived COVID-19 risk being nearly 4 times as likely to support mask mandates than those with low perceived risk, and those with high levels of perceived risk more than 5 times as likely. Across all policy options, those with high perceived risk

of COVID-19 consistently had a higher likelihood of supporting each policy when compared to respondents with either low or moderate levels. This result suggests a dose-response relationship between risk perception and strength of policy support.

The associations presented in Fig. 3 accounted for key demographic factors, including age, sex, race, urbanicity, household income, and educational attainment. Age and sex were significant predictors for the majority of policies (6 of the 8 policies). More specifically, for age, each additional year was associated with a 3 to 4 percent increased likelihood of support for the following policies, based on the resulting odds ratios: requiring social distancing on transit, requiring masks in public and on

public transit, expanding telework flexibility, staggering work times, and expanding curbside pick-up practices. Women were between 20 and 50 percent more likely to support the following policies: requiring social distancing on transit, requiring masks in public, expanding telework flexibility, staggering work times, expanding curbside pick-up, and reducing speed.

Considering other variables with statistically significant associations with policy support, those without a college education were less likely to support expanding street space for active transportation and expanding telework practices but were more likely to support requiring social distancing on public transportation. Those in high income groups were more likely to support requiring masks in public and on transit and expanding telework practices. At the same time, those who currently telework were more likely to support requiring masks in public, expanding telework practices, staggering work times, and expanding curbside pick-up practices. The race and urbanicity variables were not statistically significant predictors of support for any of the policies we considered.

Distinctive patterns emerge when considering the interrelatedness of support between policies. Correlations were strongest among the three individual-level behavior change policies: requiring social distancing, requiring masks on transit, and requiring masks in public spaces. The correlation among this trio of policies ranged from 0.55 to 0.69 –with the strongest link connecting requiring masks in public and on transit.

4. Discussion

The purpose of this study was to examine public support for a range of transportation policies that were receiving attention during the summer of 2020 in the U.S. In addition, we examined how individual level characteristics, including perceived risk of COVID-19, were associated with support for the policies under consideration. Our findings suggest that perceived risk of COVID-19 is associated with support for policies intended to reduce transmission of the disease. Specifically, policy support was consistently higher among those who thought they were both likely to contract COVID-19 and that it would result in a serious illness. Conversely, policy support was lowest among those who perceived a low risk of contracting the disease and a low severity of illness if they contracted the disease.

Examining how policy preferences across a range of issues varied by perceived risk of COVID-19 provided the advantage of understanding how domain-specific mitigation strategies influenced support (e.g., individual behaviors such as mask wearing versus those requiring changes to the transportation infrastructure). We observed that in general, support for policies that require individual behavior change were more likely to be supported than those which required changes in the workplace, school or retail environments or in transportation infrastructure. For example, support among respondents ranged from a high of 71.0 percent support for requiring masks on public transit to a low of 37.9 percent support for expanded active transportation street space policies. While this finding suggests that policies to prevent the transmission of COVID-19 are more likely to be supported if they target personal behavior, enforcement of individual-level mandates such as mask wearing has been challenging (Gostin et al. 2020).

Our findings capture policy support at an early point in the pandemic. As the pandemic continued, politicization of mandates aimed at curbing the pandemic increased (Green et al. 2020) and public health messaging continued to evolve (Capurro et al. 2021; Haberer et al. 2021). One study examining mask wearing in retail locations across five counties in southeastern Wisconsin found that in early June 2020 (before our survey) approximately 40 percent of individuals wore masks and this percentage increased to 80 percent by the end of July (after our survey was fielded); both of these mask wearing rates predated mandates (Haischer et al. 2020). Our findings fall in between these two rates, with a national average of 64 percent support for mask mandates in public spaces between June 17 and 29, 2020. The same study of

Wisconsin mask wearing compliance found that after a state mandate was in place, mask wearing increased to over 90 percent, but a small proportion continued to resist complying with the mandate (Haischer et al. 2020). Developing a better understanding of determinants of both support for public health policies and compliance with these policies can inform public health practitioners on actions to better protect public health in the future.

While past studies have found an association between perceived risk and health behaviors (Ferrer and Klein 2015), our study adds to the literature by finding an association between perceived risk and support for public health policies. Moreover, our findings suggest that risk perception can be disaggregated into levels, which correspond to increased levels policy support. Future research should further refine understanding of these associations by determining the interrelatedness of perceived risk, health behaviors, and support for related policies. In particular, developing a better understanding of differences between those who oppose mandates but comply as compared to those who resist complying would be important for improving public health messaging, policy development, and strategies for encouraging greater compliance. Despite lower levels of support for infrastructure-related and environmental level policies, these strategies have been adopted in many jurisdictions to mitigate transmission of COVID-19 in light of the ongoing pandemic (NLC, 2021; NACTO, 2021). In order to increase public support for these measures, messaging campaigns about individual risk of infection and severity of infection may improve support of these measures. Additionally, given the less direct connection of infrastructure-related and environmental level policies on public health in comparison to individual-level policies such as mask wearing, more communication may be needed to articulate the mechanisms through which these more macro-level policies impact public health.

Although perceived risk was a significant determinant of policy support, it did not fully explain differences in policy support among respondents. Thus, other explanatory factors should be investigated to better understand what influences policy support, particularly in the transport sector. Transportation is undergoing profound changes, which have accelerated during the pandemic. Findings from research during this period of change suggests significant shifts away from public transportation and greater reliance on personal vehicles and active modes of transportation (Ehsani et al. 2021; Zhang et al. 2021). While the research presented here begins to explore individual level factors that influence support for transportation-related policies during the pandemic, more work is needed to connect these determinants to the policy environment. Future research investigating the interconnectedness of policy support, behavior, and key drivers can inform policymakers and practitioners on the potential feasibility of policies and expected behavior change following their implementation.

5. Limitations

Previous research has found that the association between perceived risk and policy support is associated with knowledge of the issue and their attitudes towards government, scientific expertise, and ideology (Gerber and Neeley 2005). We did not ask respondents about these constructs and future research on this topic should consider the role of these factors. A further limitation to our study is related to the sample sizes in each perceived risk category. While there were differences in sample sizes across the risk group, the individual groups were still large enough to detect statistically significant differences related to the outcomes of interest.

6. Conclusions

Perceived risk of COVID-19 influenced public opinion of policies intended to reduce transmission of the disease. There was widespread support for policies that are intended to limit transmission of COVID-19 by targeting individual behavior change, with nearly 85 percent of the

public expressing majority support for these policies. However, even among individuals with higher risk perception, support was limited for workplace environment or transportation system measures, including the expansion of teleworking, reducing speed limits, or giving up roadway lanes to allow more space for bicycling and walking. These findings pose a challenge to policymakers, who are facing increasing resistance to individual-level mandates such as mask-wearing. At the same time, the results contain some encouraging findings, suggesting that most of the American public were supportive of at least one policy under consideration. The findings also indicate a positive association between risk perception and public health policy support –suggesting that improved risk communication could be an effective means of encouraging greater policy support and consequently compliance with protective public health behaviors. Understanding how perceived risk influences preferences can inform transportation policymakers regarding which strategies are most likely to be adopted and sustained in the context of the COVID-19 pandemic.

CRediT authorship contribution statement

Michelle Duren: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Johnathon Ehsani:** Conceptualization, Investigation, Resources, Supervision, Writing – review & editing. **Jeffrey Michael:** Investigation, Resources, Writing – review & editing. **Keshia Pollack Porter:** Investigation, Resources, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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