



Rural and Urban Differences in COVID-19 Prevention Behaviors

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Abstract

Purpose: To examine whether the adoption of COVID-19-related preventive health behaviors vary in rural versus urban communities of the United States while accounting for the influence of political ideology, demographic factors, and COVID-19 experiences.

Methods: We rely on a representative survey of 5009 American adults collected from May 28 to June 8, 2020. We analyze the influence of rural status, political ideology, demographic factors, and COVID-19 experiences on self-reported adoption of 8 COVID-19-related preventive health behaviors.

Findings: Rural residents are significantly less likely to have worn a mask in public, sanitized their home or workplace with disinfectant, avoided dining at restaurants or bars, or worked from home. These findings, with the exception of dining out, are robust to the inclusion of measures accounting for political ideology, demographic factors, and COVID-19 experiences.

Conclusions: Rural residents are significantly less likely to participate in several COVID-19-related preventive health behaviors. This reality could exacerbate existing disparities in health access and outcomes for rural Americans. Health messaging targeted at improving COVID-19 preventive behavior adoption in rural America is warranted.

KEYWORDS

COVID-19, health behavior, prevention, rural

The SARS-CoV-2 virus, otherwise known as COVID-19, has infected millions of individuals in the United States (US), with hundreds of thousands of Americans losing their lives.¹ While much discussion has centered on the response efforts of federal, state, and local agencies and policy makers to the virus,²⁻⁴ it is thought that individual citizens have a significant role to play in combating the spread of COVID-19. The Centers for Disease Control and Prevention (CDC), members of the White House Coronavirus Task Force, governors, mayors, and county judges have routinely encouraged Americans to stay at home and away from other people, to avoid social gatherings, avoid discretionary travel, wear masks, and practice good hygiene, among other strategies.⁵⁻⁸ Nevertheless, the country has been deeply divided with respect to

whether or how closely these recommendations and mandates should be followed, due to their negative implications for the economy, personal finances, and freedom of choice.⁹

From the onset of the spread of COVID-19 in the US, particular concern has been directed toward rural communities.^{10,11} Compared to urban residents, rural residents have limited access to quality health care, tend to be older, and have more underlying chronic conditions that have been associated with adverse COVID-19 outcomes.^{12,13} Previous research has noted that rural residents also often forgo medical care and are more likely to present for treatment at more advanced stages of disease.¹⁴ Additionally, hospital closures in rural areas have been on a steady increase.¹⁵ This “double jeopardy” of

comparatively worse health behaviors and outcomes combined with less investment in health care facilities¹⁶ uniquely positions rural residents to be at higher risk for severe illness from COVID-19. Historically, rural populations have consistently shown higher mortality rates from infectious disease outbreaks and pandemics.^{17,18} In a study examining military records during the 1918 pandemic (Spanish Flu), it was noted that rural soldiers were at a higher risk of mortality despite less social interaction than their urban counterparts.¹⁹ More recently, excess mortality from infectious disease increased significantly for the rural poor through the 1990s and early 2000s.²⁰ This trend remains consistent with the emergence of COVID-19. Early reports have shown that rural areas have seen lower COVID-19 testing rates,²¹ and have pointed out that rural health care facilities are not well-equipped to handle the surge of patients needing care as a result of the pandemic.^{11,22,23} As such, current concerns about the resilience of rural populations with respect to COVID-19 are warranted.

Preventive measures are, therefore, important in reducing the disease burden of COVID-19 in rural communities and elsewhere. One observational study of COVID-19 prevention behaviors among shoppers along the urban–rural continuum showed that rural residents were less likely to wear face coverings in line with CDC recommendations. However, the study was limited in health behavior and location (Wisconsin).²⁴ Urban–rural differences in COVID-19 preventive behavior compliance may potentially stem from geographic differences in partisan affiliation; rural residents tend to be more conservative and are more likely to support Republican candidates than their nonrural counterparts.²⁵ Early findings have shown lower adoption of preventive health behaviors against COVID-19 among politically conservative individuals.²⁶ Therefore, differences in urban–rural behaviors could simply be attributed to differences in political affiliation. In any case, little research has been done on urban–rural differences in COVID-19 prevention behavior compliance.

To date, no national studies have examined whether the adoption of COVID-related preventive measures varies along the urban–rural continuum and whether factors, such as political ideology, race/ethnicity, and socioeconomic status, play a role in the decision to adopt these health behaviors. To the authors' knowledge, this study is the first to assess a comprehensive list of preventive health behaviors put forth by health and government officials in this context, namely, mask-wearing, social distancing (e.g., staying 6 feet apart and limiting social and professional interactions), personal hygiene, and sanitation procedures. Findings will provide critically important insights into the public's knowledge about, attitudes toward, and adoption of health behavior recommendations put forth by government and health officials to slow the spread of COVID-19. As such, we will add to our current understanding of the public's adoption of preventive behaviors recommended by government officials to mitigate the spread of COVID-19. These findings will be of particular interest to public health agencies, health care providers, policy makers, and other stakeholders involved in efforts to lower the disease burden of the COVID-19 pandemic in the US.

METHODS

To understand whether or not individuals in urban and rural areas of the US are following suggested guidelines to reduce the spread of COVID-19, we developed and administered a nationally representative survey that was given to a sample of 5009 US adults. The survey was fielded from May 28 to June 8, 2020, using the Lucid Marketplace (Lucid Holdings, LLC, New Orleans, LA) survey platform and had a completion rate of 64.4%. Lucid relies on quota sampling to closely mirror US demographic characteristics along a number of dimensions, including age, gender, race, education, and income. We further accounted for any other differences between our sample and the US population by developing and implementing post-stratification weights in all models based on Census benchmarks for age, gender, race, education, and income. Importantly, past research suggests that Lucid samples closely approximate the US population and outperform convenience samples, leading to growing use of the platform in the social sciences and health services research.^{27–30}

In our survey, we captured self-reported COVID-19 prevention behaviors, which served as our dependent variables, with a series of yes/no questions that asked respondents, "Since May 1st, have you done any of the following to prevent the spread of coronavirus" and then provided a list of preventive behaviors. These behaviors were (1) wearing a mask in public, (2) staying at least 6 feet apart from others in public spaces, (3) sanitizing your home or workspace with disinfectant, (4) regularly washing your hands, (5) cancelling social engagements, (6) avoiding dining at restaurants or bars, (7) changing travel plans, and (8) working from home. According to government and health officials, these behaviors have been characterized as COVID-19 preventive health behaviors. As such, we were particularly interested in whether these health behaviors were known, interpreted, and adopted in different ways depending on whether US individuals lived in urban or rural areas.

We focus on May 1st as the reference point because we wanted to understand whether respondents had done each of the behaviors recently (e.g., in the past month). Each of these eight behaviors was turned into a dichotomous indicator dependent variable where a score of 1 indicated that the survey respondent had done the behavior and a score of 0 indicated that they had not. We created an additional dependent variable that represented the count of preventive behaviors each respondent had previously engaged in (ranging from 0 to 8).

The key independent variable in our analysis is rurality, which was determined based on self-reported ZIP Codes that we linked with rural-urban commuting area (RUCA) codes. RUCA codes use Census tracts as well as information on population density, urbanization, and daily commuting to identify whether an area is metropolitan, micropolitan, a small town, or a rural area based on a 10-point scale.³¹ RUCA codes have two levels—whole numbers that delineate metropolitan (1–3), micropolitan (4–6), small town (7–9), and rural areas (10), and subcodes which further divide areas based on levels of commuting.³¹ Additional information about the RUCA code scale is available in online Appendix B. In our primary analysis, we dichotomized the

measure such that urban was defined as metropolitan and rural was defined as micropolitan or below. Using this binary measure, 14.38% of our weighted sample (13.61% unweighted) lived in rural areas. An alternative specification of our models using the full RUCA index is available in online Appendix A and finds a similar pattern of results to those identified here using our dichotomous urban/rural measure.

While there are strong reasons to suspect differences in preventive behaviors across levels of rurality based on previous research, it is important to account for other possible factors that could determine whether individuals participate in these behaviors. For that reason, our survey also included a number of items that serve as additional independent variables that could also affect whether individuals reported participation in various COVID-19 prevention behaviors. First, given the polarized nature of political discourse surrounding COVID-19, our analysis includes a measure of political ideology, which asked respondents to place themselves on a 7-point scale ranging from extremely liberal to extremely conservative. This measure is particularly important to include in a study of participation in prevention behaviors because public opinion research suggests that conservatives are less likely to wear a mask, more likely to feel comfortable going to restaurants or parties, and less concerned about COVID-19 overall.^{9,32}

Next, our analysis included responses to questions focused on experiences with COVID-19, which could influence individual behavior. The first of these items is a dichotomous measure that asked respondents whether or not they had been tested for COVID-19. Next, our analysis included a measure of perceived risk of getting COVID-19, which asked respondents "How would you rate your own risk of getting infected with the coronavirus within the next 12 months, compared to other individuals who are similar to you in age, health, income, and lifestyle?" This question had seven response options from much lower to much higher and is included because those who perceive that they are at higher risk compared to others might be more likely to participate in preventive behaviors. Lastly, we included a measure to reflect how often each respondent was worried about getting infected with the virus, with four response options from never to all the time.

The final key independent variable included in our analysis is designed to capture how trusting individuals are of experts. The variable is based on a 5-point survey question that asked all respondents whether they tended to trust ordinary people or experts more when it comes to making policy decisions.^{33,34} Response options ranged from trusting experts much more to trusting ordinary people much more. This measure is important to include in our analysis because our prevention behaviors are based on the recommendations of medical experts. To the extent that an individual does not trust the advice of experts, they may be less likely to participate in preventive behaviors.

In addition to these independent variables, our analysis also included a series of demographic control measures that could also help to explain individual behavior. Specifically, our analysis included measures for age (intervalized), gender (a dichotomous measure with female coded as 1), indicators for Black and Hispanic racial

and ethnic status, education (based on a 7-point scale), household income (based on a 12-point scale), and religiosity (a 5-point scale).

RESULTS

To begin our analysis of individual participation in COVID-19 prevention behaviors in urban and rural areas of the US, we assessed the weighted prevalence of participation in each of our behaviors in urban and rural areas in Table 1. Our results suggest that rural Americans are less likely than urban Americans to participate in seven of the eight analyzed prevention behaviors, with statistically significant differences in five cases. The two largest differences we found in participation in prevention behaviors were for working from home and wearing a mask when in public. While 52.37% (CI: 50.86–53.88) of Americans in urban areas had worked from home in the past month, only 36.02% (CI: 32.36–39.67) of Americans in rural areas had done so. Similarly, although 84.55% (CI: 83.46–85.64) of urban residents had worn a mask, only 73.65% (CI: 70.30–77.01) of rural residents had followed this recommendation. Beyond these two behaviors, we found significant evidence that rural residents were less likely to report sanitizing their home or workspace with disinfectant, less likely to have avoided dining at restaurants or bars, and less likely to have changed travel plans. Notably, we found no statistically significant differences between urban and rural Americans in staying 6 feet away from others in public spaces, regularly washing hands, and cancelling social engagements. Unweighted results in the online Appendix reveal a similar pattern of results.

We built on these descriptive frequencies in Table 1 with bivariate regression models that assessed the potential impact of rurality alone on participation in each of our prevention behaviors in Table 2. Models 1–8 show the results of binary logistic regressions with coefficients presented as odds ratios. Our count-based dependent variable in Model 9 relies on a Poisson regression. In Table 2, we found statistically significant effects for rural status on prevention behavior in five of our nine models and marginal statistical significance in a sixth model. Specifically, we found that compared to Americans in urban areas, Americans in rural areas were 49% less likely to wear a mask (OR: 0.51, CI: 0.40–0.66), 29% less likely to sanitize their home or workspace (OR: 0.71, CI: 0.55–0.91), 27% less likely to avoid dining at bars and restaurants (OR: 0.73, CI: 0.55–0.98), and 49% less likely to have worked from home (OR: 0.51, CI: 0.41–0.63). In addition, we found a marginally statistically significant effect for changing travel plans, with rural residents 17% less likely to have engaged in the activity (OR: 0.83, CI: 0.67–1.03). Finally, our count-based composite measure of behavior was statistically significant, with urban residents more likely than rural residents to have participated in more prevention behaviors. As with Table 1, we found no statistically significant differences based on rural status for staying 6 feet apart, washing hands, and cancelling social events in Table 2.

While the analysis to this point has provided valuable information about differences in COVID-19 prevention behaviors based on

TABLE 1 Rural and urban COVID-19 health behaviors

Behavior	Urban percentage	Rural percentage	Difference	Significance
Worn mask in public	84.55% (83.46; 85.64)	73.65% (70.30; 77.01)	10.9%	***
Stayed six feet away in public spaces	88.72% (87.76; 89.67)	89.33% (86.97; 91.68)	-0.59%	
Sanitized home or workplace with disinfectant	80.86% (79.68; 82.05)	74.91% (71.61; 78.21)	5.95%	***
Regularly washed your hands	89.97% (89.06; 90.87)	88.34% (85.89; 90.78)	1.63%	
Cancelled social engagements	73.02% (71.68; 74.36)	69.68% (66.18; 73.18)	3.34%	
Avoided dining at restaurants or bars	85.87% (84.82; 86.92)	81.67% (78.71; 84.62)	4.20%	**
Changed travel plans	65.93% (64.50; 67.37)	61.58% (57.88; 65.28)	4.35%	*
Worked from home	52.37% (50.86; 53.88)	36.02% (32.36; 39.67)	16.35%	***

Notes: Results based on a series of questions asking respondents whether since May 1st, they had done each activity to prevent the spread of coronavirus with options for yes and no. Significance of weighted results determined using the `lincom` command in Stata 15SE and *t*-statistics.

95% Confidence intervals in parentheses.

****p* < 0.01.

***p* < 0.05.

**p* < 0.10.

TABLE 2 Bivariate regression of relationship between rurality and COVID-19 behaviors

Variables	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)	(Model 7)	(Model 8)	(Model 9)
	Wear mask	Six feet apart	Sanitize	Wash hands	Cancel social events	Restaurants	Changed travel	Work from home	Behavior composite
Rural status	0.51*** (0.40; 0.66)	1.06 (0.76; 1.50)	0.71*** (0.55; 0.91)	0.84 (0.60; 1.19)	0.85 (0.67; 1.07)	0.73** (0.55; 0.98)	0.83* (0.67; 1.03)	0.51*** (0.41; 0.63)	-0.08*** (-0.12; -0.04)
Constant	5.47*** (4.89; 6.12)	7.86*** (6.94; 8.91)	4.23*** (3.83; 4.66)	8.97*** (7.85; 10.25)	2.71*** (2.48; 2.95)	6.08*** (5.44; 6.78)	1.94*** (1.79; 2.10)	1.10** (1.02; 1.19)	1.83*** (1.81; 1.84)
Pseudo R ²	0.01	0.0001	0.003	0.0005	0.0006	0.002	0.0008	0.01	0.0001
Observations	4884	4881	4882	4880	4884	4880	4875	4872	4784

Notes: Results in Models 1–8 reflect odds ratios. Results in Model 9 based on Poisson model. Parentheses present 95% confidence intervals.

95% Confidence intervals in parentheses.

****p* < 0.01.

***p* < 0.05.

**p* < 0.10.

TABLE 3 Correlates of COVID-19 health behaviors

Variables	(Model 10)	(Model 11)	(Model 12)	(Model 13)	(Model 14)	(Model 15)	(Model 16)	(Model 17)	(Model 18)
	Wear mask	Six feet apart	Sanitize	Wash hands	Cancel social events	Restaurants	Changed travel	Work from home	Behavior composite
Rural status	0.50*** (0.38; 0.66)	0.91 (0.63; 1.32)	0.74** (0.57; 0.97)	0.76 (0.52; 1.11)	1.06 (0.83; 1.36)	0.80 (0.58; 1.10)	1.11 (0.88; 1.40)	0.77** (0.61; 0.98)	-0.04** (-0.08; -0.01)
Female	1.17 (0.94; 1.45)	1.33** (1.04; 1.72)	1.44** (1.20; 1.74)	1.42** (1.08; 1.87)	1.27*** (1.07; 1.51)	1.38*** (1.11; 1.71)	1.06 (0.90; 1.25)	0.93 (0.80; 1.10)	0.04*** (0.01; 0.06)
Education	1.22*** (1.12; 1.32)	1.12** (1.01; 1.23)	0.97 (0.90; 1.04)	1.05 (0.94; 1.16)	1.13*** (1.06; 1.20)	1.09** (1.00; 1.19)	1.18*** (1.11; 1.26)	1.34*** (1.26; 1.42)	0.03*** (0.02; 0.04)
Age	1.03*** (1.02; 1.03)	1.03*** (1.02; 1.04)	1.00 (0.99; 1.00)	1.03*** (1.02; 1.04)	1.00 (0.99; 1.00)	1.02*** (1.01; 1.03)	0.99** (0.99; 1.00)	0.97*** (0.97; 0.98)	0.001 (-0.00; 0.00)
Black	1.17 (0.85; 1.63)	0.98 (0.69; 1.40)	1.12 (0.85; 1.49)	1.06 (0.73; 1.52)	0.94 (0.72; 1.22)	1.09 (0.78; 1.52)	1.09 (0.85; 1.39)	0.89 (0.70; 1.12)	0.01 (-0.03; 0.04)
Hispanic	1.02 (0.77; 1.34)	0.93 (0.69; 1.25)	0.95 (0.75; 1.21)	0.92 (0.67; 1.25)	1.09 (0.88; 1.36)	1.10 (0.84; 1.45)	1.11 (0.90; 1.36)	1.14 (0.94; 1.38)	0.01 (-0.02; 0.04)
Income	1.03 (0.98; 1.09)	0.98 (0.92; 1.04)	1.07*** (1.02; 1.12)	1.02 (0.96; 1.09)	1.06*** (1.02; 1.10)	1.04 (0.99; 1.09)	1.09*** (1.05; 1.14)	1.05** (1.00; 1.08)	0.01*** (0.00; 0.02)
Conservative	0.87***	0.97	0.93***	1.01	0.97	0.90**	0.94**	0.92***	-0.01***

(Continues)

TABLE 3 (Continued)

	(Model 10)	(Model 11)	(Model 12)	(Model 13)	(Model 14)	(Model 15)	(Model 16)	(Model 17)	(Model 18)
Religiosity	1.04 (0.82; 0.93)	0.98 (0.90; 1.04)	1.07* (0.88; 0.98)	1.00 (0.93; 1.09)	1.09*** (0.92; 1.02)	0.93* (0.84; 0.95)	1.09*** (0.90; 0.99)	1.06** (0.88; 0.96)	0.01* (-0.02; -0.01)
Trust in experts	1.41*** (1.29; 1.55)	1.42*** (1.29; 1.57)	1.27*** (1.18; 1.37)	1.54*** (1.38; 1.72)	1.27*** (1.19; 1.36)	1.42*** (1.30; 1.55)	1.13*** (1.06; 1.21)	1.01 (0.95; 1.08)	0.04*** (0.03; 0.05)
Tested for COVID	1.02 (0.77; 1.37)	0.78 (0.58; 1.07)	1.12 (0.86; 1.46)	0.91 (0.65; 1.27)	1.11 (0.86; 1.42)	0.96 (0.72; 1.29)	1.39*** (1.09; 1.76)	1.31** (1.04; 1.64)	0.01 (-0.02; 0.04)
Perceived risk	1.02 (0.95; 1.10)	0.99 (0.91; 1.08)	1.00 (0.94; 1.07)	0.98 (0.89; 1.07)	0.99 (0.93; 1.05)	1.04 (0.96; 1.11)	0.97 (0.91; 1.02)	0.93*** (0.88; 0.98)	-0.003 (-0.01; 0.01)
COVID worry	1.49*** (1.28; 1.73)	1.33*** (1.12; 1.57)	1.44*** (1.26; 1.64)	1.28*** (1.07; 1.52)	1.44*** (1.29; 1.62)	1.32*** (1.13; 1.53)	1.32*** (1.19; 1.47)	1.22*** (1.11; 1.34)	0.06*** (0.04; 0.07)
Constant	0.17*** (0.09; 0.34)	0.42** (0.18; 0.95)	0.52** (0.29; 0.95)	0.35** (0.16; 0.79)	0.20*** (0.11; 0.34)	0.43** (0.21; 0.90)	0.27*** (0.16; 0.45)	0.87 (0.52; 1.46)	1.38*** (1.30; 1.46)
Pseudo R ²	0.11	0.08	0.04	0.09	0.05	0.07	0.06	0.11	N/A
Observations	4585	4582	4583	4582	4583	4580	4577	4571	4494

Notes: Results in Models 10–17 reflect odds ratios. Results in Model 18 are based on Poisson regression. Parentheses present 95% confidence intervals.

95% Confidence intervals in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.10$.

rural status, it is critical to ask whether these differences should be attributed to rurality itself, or to other differences between individuals that manifest themselves between rural and urban residents. To investigate this possibility, we replicated the analyses from Table 2 while adding all of our additional independent variables and controls to our models in Table 3. In analyzing our results, we found that in these adjusted models, rural status remained a significant predictor for three of our eight prevention behaviors. We found that rural residents were 50% less likely to wear a mask (OR: 0.50, CI: 0.38–0.66), 26% less likely to sanitize their home or workspace (OR: 0.74, CI: 0.57–0.97), and 23% less likely to work from home (OR: 0.77, CI: 0.61–0.98). In addition, rurality was a negative and significant predictor of our count-based measure of participation in COVID-19 prevention behaviors. Our other five prevention behaviors, including dining at bars and restaurants and changing travel plans which had been significant in previous models, were not statistically significant.

Over and above rural status, other important factors influence preventive health behavior adoption. Notably, respondents' level of concern about COVID-19 was a statistically significant predictor in all nine models, and trust in experts was significant in eight of nine models. Individuals who were more worried about COVID-19 were more likely to take the virus seriously and adopt all recommended health behaviors. Similarly, individuals who were more trusting of experts as opposed to ordinary people were significantly more likely to engage in every prevention behavior except working from home, which may itself be a behavior out of the control of individuals themselves.

Other notable patterns stand out in Table 3. Highlighting the importance of polarized political discourse surrounding COVID-19, conservatives were less likely than liberals to have worn a mask (OR: 0.87, CI: 0.82–0.93), sanitized their home or workspace (OR: 0.93, CI: 0.88–0.98), avoided dining at bars or restaurants (OR: 0.90, CI: 0.84–0.95), changed their travel plans (OR: 0.94, CI: 0.90–0.99), or worked from home (OR: 0.92, CI: 0.88–0.96). In addition, women were more likely than men to participate in five of the eight COVID-19 prevention behaviors, increased education was associated with higher likelihood to engage in six of the prevention behaviors, and higher levels of income were associated with participating in four of the eight behaviors. Interestingly, the impact of age was mixed. Older Americans were more likely to wear a mask (OR: 1.03, CI: 1.02–1.03), stay 6 feet apart (OR: 1.03, CI: 1.02–1.04), wash their hands (OR: 1.03, CI: 1.02–1.04), and avoid dining out (OR: 1.02, CI: 1.01–1.03). However, older Americans were less likely to change their travel plans (OR: 0.99, CI: 0.99–1.00) or work from home (OR: 0.97, CI: 0.97–0.98). We suspect that the negative effect for working from home could simply be an artifact of many older Americans being retired and therefore having no need to change their work patterns.

DISCUSSION

Political leaders and medical experts are counting on individual citizens to participate in a number of preventive health behaviors to slow the spread of COVID-19. Our analysis of participation in these preventive

behaviors suggests that while levels of participation in each of these behaviors is generally high, engagement does vary within the US population based on a number of individual characteristics. Most importantly, US residents dwelling in rural areas are significantly less likely to engage in a number of health behaviors, including wearing a mask, sanitizing homes and workspaces, and working from home. While the "work from home" finding could be a result of unique features of rural life, including the types of employment available (i.e., farm labor) and the lack of access to high-speed Internet, these results should still be alarming. Convincing evidence suggests that social distancing and mask-wearing are critical to slowing the spread of the pandemic, with dramatic increases in case incidence without following public health best practice.³⁵ By not engaging in recommended health behaviors, rural residents are placed at greater risk of contracting the virus and increasing case incidence in rural areas. Given the limited availability and capacity of the health care infrastructure in rural areas, this could lead to negative, yet avoidable, health outcomes.

Other factors also appear to matter in preventive health behavior adoption rates. For example, individuals who have been tested for COVID-19 are significantly more likely to change travel plans and work from home. While there might be concern that a negative test could lead to a false and inflated sense of immunity or that a positive test and subsequent recovery might make someone feel invulnerable to reinfection, our results instead suggest that going through the testing process might make individuals more cognizant of the risks of the pandemic and lead them to participate in more prevention behaviors. Separately, the universal significance of COVID-19 worry suggests that individuals who take the virus seriously are more likely to engage in all of our examined preventive health behaviors. As such, a fruitful avenue for increasing participation in these behaviors and to reduce virus transmission could simply be to educate Americans about the dangers of COVID-19 and the importance of participating in preventive behaviors.

Interestingly, however, our results also suggest that the source of these messages could prove to be vital. With participation in each preventive behavior being considerably higher among those who trust experts as opposed to ordinary people, our results suggest that additional outreach may be needed for people who do not trust experts. Identifying which communicators of public health messaging are effective in engaging those who do not trust medical experts is an important direction for future research and could be critical to improving participation in each recommended health behavior. In addition, our results suggest that the partisanship of that source could matter as well. It appears that conservative Americans are mirroring the behavior of conservative political leaders who have downplayed the virus and are less likely to take part in preventive behaviors.^{36–38} Specifically, research has found that public opinion and behavior on COVID-19 have been shaped by political elites, with conservatives less likely than liberals to express concern over the virus, to report mask use, or practice social distancing.^{36–38} Given the charged partisan discourse surrounding COVID-19, having conservative voices encourage Americans about the importance of wearing masks, social distancing, and other preventive behaviors could be helpful in changing behavior and slowing the pandemic.

LIMITATIONS

There are several limitations of our study that are worthy of note. First, due to the cross-sectional nature of our data, we are only able to present a snapshot of individual behavior at a single moment in time. It is reasonable to expect that individual behavior could change as the circumstances of COVID-19 change and our analysis is unable to capture this possibility. For example, growing case infection rates in the winter of 2020–2021 could lead individuals to exhibit more prevention behaviors. Alternatively, growing pandemic fatigue could lead to reduced adherence to prevention behaviors. Future work would benefit from a longitudinal analysis of individual behavior to overcome this issue.

In addition, our work is limited in its reliance on self-reported participation in each of these behaviors. There is reason to suspect that social desirability could lead individuals to report inaccurate levels of participation in each of these behaviors, and our data are unable to capture this possibility. For instance, some respondents could over-report positive behaviors like mask-wearing even if they typically do not wear a mask in public and under-report negative behaviors like not washing their hands to appear to be following public health guidelines. Notably, however, research does suggest that social desirability bias for self-reported health behaviors is typically lower in online surveys like ours.³⁹ Relatedly, in asking individuals to reflect on the past month, individuals could simply forget whether they engaged in each activity, potentially leading to some degree of error in each of our measures.

Finally, to measure rurality, this study used RUCA codes because the survey included a question for respondent ZIP Code but not county; using RUCA codes rather than county-based measure of rurality minimizes the error inherent to matching county to ZIP Code measures. That said, it is important to note that there are several ways to measure rurality and that our results could vary with an alternative specification.⁴⁰ While RUCA codes are based on Census tracts applied to ZIP Codes and are widely used in rural-focused research, it would be beneficial for future research to replicate and expand on our findings using alternative measures of rurality.³¹ For example, researchers could alternatively rely on county-based measures of rurality like the NCHS 2013 6-level classification scheme (large central metropolitan areas to noncore areas)⁴¹ or the Index of Relative Rurality,⁴² which accounts for population, population density, extent of urbanized area, and distance to the nearest metro in a continuous index. These county-level measures could reveal alternative patterns of preventive health behavior, potentially driven by differences in shelter in place orders, guidance from county health departments, or unique features of virus spread in a given area.

CONCLUSION

Ultimately, despite its limitations, our research represents an important advancement in our understanding of individual participation in COVID-19 prevention behaviors. Our analysis highlights critical differences in individual behavior between residents of rural and urban areas

and demonstrates that many of these differences persist even after controlling for other predictors of individual behavior.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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