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Rural/urban differences in mental health and social well-being among older US adults in the early months of the COVID-19 pandemic

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Abstract

Objectives: This study seeks to identify differences in mental health and social well-being during the early months of the COVID-19 pandemic among older adults by rural/urban location.

Methods: We use data from the COVID-19 Coping Study, a nation-wide online study of U.S. adults aged 55 and older (n = 6,873) fielded during April-May, 2020. We investigated rural/urban differences in mental health (depressive symptoms and anxiety symptoms) and social well-being (loneliness and social isolation); concern about COVID-19; and types of social participation (e.g. phone/video calls, visits). We also used multivariable logistic regression models to assess the relationship of rurality with mental health, adjusting for socio-demographic correlates, COVID-19 history, and COVID-19 concern.

Results: We found similar prevalence of mental health and social well-being outcomes for rural and urban respondents. Rural respondents reported lower concern about COVID-19 and more frequent use of social media than urban respondents.

Conclusion: Mental health and social well-being did not differ by rural/urban location in the early months of the COVID-19 pandemic. However, rural residents reported less concern about COVID-19 and more use of social media, potentially leading to greater risk of illness from the pandemic in later months.

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1.Pearson's chi-square unless otherwise noted

2.Adjusted Wald test

Disclosure statement

No potential conflict of interest was reported by the authors.

Keywords

Rural; COVID-19; social isolation; loneliness; environmental factors/housing/rural-urban factors

Introduction

In addition to its devastating toll on physical health and longevity, the COVID-19 pandemic has upended daily routines and created barriers to social connectedness (Banerjee & Rai, 2020; Collins & Casey, 2020; Lewis et al., 2020). As a result, the pandemic has had widespread negative implications for mental health, including social isolation, anxiety, and depression (Ettman et al., 2020; Kobayashi et al., 2021; Mazza et al., 2020; Torales et al., 2020). Public health measures to stem the tide of the pandemic also required that people change their behavior, such as whether and how they interact with others.

In the United States (U.S.), older adults were among the hardest hit by the COVID-19 virus, with the highest death rate of any population group (Bonanad et al., 2020). The pandemic also revealed differences in risk and structural barriers by geography, with rural areas of the U.S. having higher case and death rates than urban areas for much of the pandemic, starting in the summer of 2020 (Mueller et al., 2021; The Daily Yonder, 2021). Older adults living in rural U.S. areas have faced unique challenges to social distancing and remaining COVID-19-free during the pandemic (Henning-Smith, 2020b). These challenges include higher rates of underlying chronic conditions, more limited access to health care, and less access to broadband Internet and technological devices, compared to their urban counterparts (Henning-Smith, 2020b; Mueller et al., 2021).

The heightened risk for severe illness and mortality from COVID-19 among older adults and the intersectional influence of rurality and age is increasingly clear, in the U.S. and internationally, including in Mexico (Bonanad et al., 2020; Rivera-Hernandez et al., 2021; The Daily Yonder, 2021). Yet, there are unanswered questions about the mental health, social participation, and prevention behaviors of older adults during the COVID-19 pandemic, with even less information on differences by rural and urban residential location. Early evidence suggests that older adults had better mental health during the pandemic than their younger counterparts (García-Portilla et al., 2021; Kobayashi et al., 2021; Wilson et al., 2021), but also that older adults were more likely to be concerned about the virus and more likely to adhere to precautionary measures (Ceccato et al., 2021; Maxfield & Pituch, 2021). Much less is known about well-being of older adults by rural/urban location as the pandemic began to unfold.

Further, neither rural nor urban older adults are homogeneous groups. It is important to acknowledge how rurality and other socio-demographic characteristics such as sex, race, and ethnicity may intersect to affect health risks (Henning-Smith et al., 2021; Iyanda et al., 2022). COVID-19 has had a disproportionate impact on Black, Indigenous, and other people of color (BIPOC), many of whom face structural barriers to social distancing, such as housing, employment conditions, and access to virtual technology (Andraska et al., 2021; Egede & Walker, 2020; Tan et al., 2022). There are also important differences in mental health and social well-being measures for BIPOC populations, including among rural older

adults, even before the COVID-19 pandemic (Henning-Smith, 2020a; Henning-Smith et al., 2019). Similar differences in mental health and social well-being have been reported by gender (Henning-Smith et al., 2018).

This study addresses these important research gaps using novel online survey data collected from U.S. adults aged 55 and over during the early months of the pandemic to examine mental health, social participation, and concern about COVID-19 by rural and urban residential location. Results from this study will highlight where there are differences by rurality, if any, in how people reacted to the beginning of the pandemic, which may help shed light on how the pandemic unfolded in later months. These results will also provide important data to inform prevention and social well-being improvement efforts as the COVID-19 pandemic persists. This information is especially important with rising cases from emerging variants, debates over masking and prevention measures, vaccine hesitancy, and potential future pandemics.

Materials and methods

Study design

Data were from the COVID-19 Coping Study, a nation-wide online study of U.S. adults aged 55 and older, representing all 50 U.S. states, Washington, DC, and Puerto Rico (Kobayashi et al., 2021). The study aims to investigate how social, behavioral, and economic impacts of the COVID-19 pandemic affect the mental health and well-being of older adults. A total of 6,938 participants were recruited from April 2 to May 31, 2020, using a multiframe online recruitment strategy. Participants completed a 20-minute online baseline questionnaire. For the current analysis, we included respondents with complete responses to all questions used in this analysis (n = 6,873, 99%). Additional details about this survey have been published elsewhere (Abrams et al., 2021; Eastman et al., 2021; Finlay et al., 2021; Kobayashi et al., 2021). The University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board approved the study protocol (HUM00179632), and all participants provide informed consent.

Measures

We had four primary dependent variables for this study: depressive symptoms, presence of anxiety, loneliness, and social isolation. Depressive symptoms were measured using the 8- item Center for Epidemiological Studies Depression Scale (CES-D) (Lewinsohn et al., 1997); presence of anxiety using the 5-item Beck Anxiety Inventory (BAI) (Beck et al., 1988); loneliness using the 3-item UCLA Loneliness Scale (Russell, 1996); and degree of social isolation using the 5-point social isolation index from the English Longitudinal Study of Ageing (monthly contact with children, family, and friends, monthly participation in a social organization or club, and living alone) (Kobayashi & Steptoe, 2018). We also looked at measures of social participation, including phone and video calls, social media use, face-to-face visits, and time spent social distancing.

The primary independent variable was rural vs. urban residential location. To determine rurality, we used 2010 Rural Urban Commuting Area (RUCA) codes, classifying

respondents' locations by ZIP code. We then created a dichotomous variable for rurality, where RUCA codes one through three (metropolitan areas) were classified as urban and those four and above (micropolitan, small town, and rural areas) were classified as rural (WWAMI Rural Health Research Center, n.d.). To observe differences in the degree to which respondents' lives were impacted by COVID-19, we also compared rural and urban residents based on concern about COVID-19 (5-point scale from not at all worried to extremely worried) and COVID-19 history (no, yes and recovered, yes and still sick, and not diagnosed but recently symptomatic).

Socio-demographic characteristics included age (continuous), sex (male vs. female), race and ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latinx, Other), relationship status (married or in a relationship, never married, divorced/separated, widowed), and educational attainment (postgraduate or professional degree, less than high school, high school diploma or equivalent, some college or two-year associate degree, four-year college or university). The data also included a measure of self-rated health (5-point scale from excellent to poor) to adjust for overall health.

Statistical analyses

We conducted bivariate cross-sectional comparisons of mental health and social isolation by rural/urban location using Pearson's chi-squared tests for categorical variables and two-sample t-tests with equal variances for continuous variables. We then conducted multivariable logistic and linear regression models predicting the associations between rurality and each of our four outcome variables, including the presence or absence of depressive symptoms (≥3 on the CES-D), anxiety (≥10 on the BAI), high versus low degree of social isolation, and the presence or absence of loneliness (≥6 on the UCLA loneliness scale). Analyses controlled for age, sex, race and ethnicity, relationship status, educational attainment, self-rated health, COVID-19 history, and COVID-19 worry. These covariates were included because of known differences in social isolation and mental health by socio-demographics and health. All analyses were conducted in Stata 15 using a population-weighted sample. Weights were generated to account for the sampling design to approximate a nationally representative sample based on data from the 2018 American Community Survey. More details about how the population weights were constructed is presented elsewhere (Kobayashi et al., 2021).

Results

Table 1 shows descriptive characteristics of the sample by rural/urban location. Using population-weighted estimates, 13 percent of respondents lived in rural areas. The average age was 67.9, just over half of the respondents were female (53.8%) and married (58.9%), and nearly three-quarters lived with someone else (vs. alone; 72.2%). Rural respondents were more likely than urban respondents to be non-Hispanic White (88.4% vs. 70.2%, $p < 0.001$) and rural respondents had lower levels of educational attainment than urban respondents (Table 1). Most of the sample reported good/very good/excellent health, and rural respondents were more likely to report not having had COVID-19 or its symptoms at the time of the survey, compared to urban residents (95.5% vs. 92.1%, $p < 0.05$).

Rural residents were also less likely than urban respondents to report being worried about COVID-19 (23.4% reported being 'extremely worried' vs. 33.3% of urban respondents, $p < 0.001$) and were slightly more likely to report daily/almost daily social media use (61.3% vs. 56.4%, $p < 0.1$).

Table 2 shows the population-weighted percentages of the sample with depressive symptoms, anxiety, loneliness, social isolation, and social participation by rural and urban location. Nearly one-third of the sample showed signs of depression (32.0%) and nearly as many were classified as lonely using the UCLA loneliness scale (29.5%), with no significant difference by location (Table 2). There were few differences by rural and urban location in social isolation and social participation. However, rural respondents were more likely to report spending at least 15 min outside daily, compared to urban residents (45.3% vs. 37.8%, $p < 0.05$). More than two-thirds of rural and urban residents reported spending every day self-isolating each week (68.6% and 69.6%, respectively). Across locations, more than one-fifth of all respondents reported no days of 15 min of face-to-face contact each week, as well as no days of 15 min of phone or video calls each week (Table 2).

Table 3 shows multivariable, population-weighted analyses predicting each of the four outcome variables. In fully adjusted models, there were no rural/urban differences in any of the four dependent variables (Table 3). There were differences by socio-demographic characteristics, COVID-19 history, and COVID-19 concern. Older age and better self-rated health were associated with lower odds of each mental health outcome. Being female was associated with higher odds of depressive symptoms (adjusted odds ratio [AOR]: 1.71, $p < 0.001$), anxiety (AOR: 1.43, $p < 0.001$), and loneliness (AOR: 1.33, $p < 0.01$), but lower odds of social isolation (AOR: 0.49, $p < 0.001$). Non-Hispanic Black race, Hispanic or Latinx ethnicity, and 'other' race were all associated with lower odds of depressive symptoms (AOR: 0.48 $p < 0.001$; 0.65, $p < 0.05$; 0.61, $p < 0.01$, respectively); non-Hispanic Black respondents also had lower odds of loneliness (AOR: 0.58, $p < 0.01$). Higher education was associated with lower odds of social isolation, as was reporting greater concern about COVID-19. A prior diagnosis of COVID-19 was associated with higher odds of depressive symptoms, whereas having had COVID-19 symptoms, but no diagnosis, was associated with higher odds of anxiety (AOR: 1.51, $p < 0.01$).

Discussion

Using nation-wide online survey data collected during the early months of the COVID-19 pandemic, we found that nearly one-third of older adults exhibited elevated depressive symptoms and nearly as many were high in loneliness. There were few differences between rural and urban residents in mental health and social well-being during the early months of the pandemic. This may be indicative of the universality of the COVID-19 pandemic; rural residents have historically had poorer mental health outcomes (Steelesmith et al., 2019; Stein et al., 2017), but the pandemic impacted older adults regardless of geography. However, urban residents were more likely to report being worried about COVID-19 than rural residents. This may be because COVID-19 began in the U.S. in early 2020 as a mostly urban phenomenon, first spreading in places like Seattle, WA and New York, NY. By the summer of 2020, both case and mortality rates were higher in rural areas than in urban

areas (The Daily Yonder, 2021). Before long, COVID-19 had been detected in virtually every county in the U.S., rural and urban alike (Ullrich & Mueller, 2020). It is possible that lower concern about COVID-19 among rural residents in the early pandemic period created barriers to proactive preventive measures.

We also found that rural respondents reported higher rates of social media use than urban respondents, with more reporting daily use and fewer reporting no use. This is counter to the common narrative that rural residents, especially older adults, are not as well technologically connected as their urban counterparts. However, this was an online survey, and therefore does not capture the experiences of rural residents who could not access the survey. Still, while social media can be a powerful tool for sparking and maintaining social connections, it has also been used to spread disinformation about public health measures and science during the COVID-19 pandemic (Apuke & Omar, 2021; O'Connor & Murphy, 2020; Venegas-Vera et al., 2020), again potentially putting rural residents at greater risk. This may be reflected in the lower rates of COVID-19 concern that we found among rural older adults if they were encountering more disinformation online than urban older adults. More research is needed to better understand how older adults in rural areas access and interact with social media and what the health impacts – mental and physical – of such interactions are.

While we did not find differences between rural and urban older adults in mental health outcomes in either unadjusted or adjusted models, we did identify differences by socio-demographic characteristics. The relative lack of differences between rural and urban residents, including in adjusted models, may be indicative of the pervasiveness of depression, anxiety, loneliness, and isolation across geographic locations in the early months of the COVID-19 pandemic. However, our findings that the odds of each mental health outcome differed significantly by sex, age, race, ethnicity, relationship status, educational attainment, self-rated health, COVID-19 history, and COVID-19 concern point to the heterogeneity of populations grouped by geographic location and to the importance of research that illuminates nuance beyond simple rural/urban dichotomies. In particular, we found that women in both rural and urban locations reported higher odds of loneliness, anxiety, and depression, but lower odds of social isolation, than men. This is consistent with other research showing greater social connectivity, but also poorer mental health, among women (Henning-Smith et al., 2018; Salk et al., 2017). We also found that older adults in the 'other' race and ethnicity category reported higher odds of social isolation than their non-Hispanic White counterparts. Whether this is indicative of structural racism, unwelcoming environments, or barriers to social engagement is an important area of future study. Additionally, given prior research showing differences in loneliness and social isolation by race among rural residents (Henning-Smith et al., 2019), this study presents further evidence of the importance of identifying heterogeneity in mental health and social well-being across race, ethnicity, and geographic location, and of the importance of gathering more data to illuminate more nuanced population categories.

Altogether, our findings have several policy implications. First, the high rates of depression, anxiety, loneliness, and social isolation among older adults in the sample provides additional evidence supporting the importance of funding mental health treatment, as well as the importance of funding broader initiatives that support mental and social well-being. Second,

given the high rates of social media and technology use in the sample, policies to support the availability, use, and reimbursement of telehealth services, especially in the age of a pandemic when people need to take additional measures to remain safe, are warranted. Such policies should also include expansion of broadband Internet to provide equitable access regardless of geographic location. Conversely, the high rates of social media use in the sample, with a majority of older adults reporting daily or near-daily use, requires policies to ensure that public health misinformation cannot be widely disseminated through those channels. Finally, the high level of concern with COVID-19 and associated mental health outcomes, even in the early months of the pandemic, calls for strong, evidenced-based policy responses to protect the health of older adults in rural and urban areas alike.

Strengths and limitations

The COVID-19 Coping Study launched during the first upswing of the pandemic and did not capture people who may have been too sick to participate, such as those who were hospitalized with COVID-19 or other health conditions. Data used in this study were collected early in the pandemic (April-May 2020) and may not capture fluctuating experiences and perceptions of mental health and social connectedness over time, including potential variation by urban versus rural locations in COVID-19 susceptibility and risk. Men, older adults from racial and ethnic minority groups, Spanish speakers, and those with a high school education or less were under-represented relative to the general population. However, we used population-weighted data to approximate national estimates and reduce the likelihood of any selection bias associated with these factors, consistent with prior research (Kobayashi et al., 2021). A binary measure of rural and urban residence was defined using RUCA codes, which masks heterogeneity within those categories. Future research should explore these issues with more geographic granularity.

Additionally, using data from the early months of the pandemic is important to shed light on how the pandemic unfolded and to better understand how to be prepared in the event of a future public health crisis. Finally, these data were collected with an online survey, which may exclude those who are most socially isolated and least well connected (Anderson & Perrin, 2017; Pew Research Center, 2019). Yet, our finding that among those who have access to the Internet to take the survey, rural residents were more likely to be frequent users of social media is important to countering the narrative that older rural residents are not well connected to technology.

Conclusion

Social connectedness is a key ingredient for health and well-being, with loneliness and social isolation serving as risk factors for poor health and mortality (Holt-Lunstad et al., 2015). The impact of the COVID-19 pandemic goes far beyond physical health and mortality, with serious implications for mental health. We found that more than one-quarter of all respondents in urban and rural areas alike reported no face-to-face contact with others for at least 15 min on a weekly basis and more than one-fifth reported no phone/video calls with others that lasted at least 15 min. It is critically important to better understand the mental health and social well-being of older adults during the pandemic to recognize

current and future health risks. Doing so will require additional longitudinal research on the long-term mental and social well-being impacts of the pandemic.

We also found differences by rural and urban location in use of social media and concern about COVID-19 risk, both of which may have exacerbated actual COVID-19 risk later in the pandemic. In the early months of the pandemic, rural respondents in this study reported less concern about COVID-19 and more use of social media, both of which may have prevented the spread of factual, science-based information and may have led to the heighted mortality in rural areas that has continued since the summer of 2020, as well as higher rates of vaccine hesitancy in 2021 (The Daily Yonder, 2021). Finally, we found differences in the odds of each mental health outcome by socio-demographic characteristics, COVID-19 history, and COVID-19 concern. These findings serve as an important reminder that no geographic group is homogenous, and that research, policy, and programming should take that nuance into account, with targeted support for those most impacted by the mental, physical, and social toll of the pandemic.

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Table 1.

Sample characteristics by rural and urban location, COVID-19 Coping Study, April-May, 2020.

	Total	Geographic Density		
	N (Weighted %) ***N*** **= 6,873**	**Urban weighted %** ***N*** **= 6,107 (87.02)**	**Rural weighted %** ***N*** **= 766 (12.98)**	***p-value*** [1]
Age (Mean, SD)	67.87 (0.23)	67.86 (0.24)	67.27 (0.65)	0.396[2]
Sex				
Male	2,477 (46.16)	46.38	44.74	
Female	4,396 (53.84)	53.62	55.26	0.580
Race and Ethnicity				
Non-Hispanic White	5,805 (72.58)	70.23	88.36	
Non-Hispanic Black	381 (10.25)	10.90	5.91	
Hispanic or Latinx	344 (10.52)	11.64	3.04	
Other race	343 (6.64)	7.23	2.69	<0.001
Relationship Status				
Single, never married	566 (8.27)	8.39	7.42	
Single, divorced/separated	1,129 (17.68)	17.97	15.75	
Single, widowed	656 (15.13)	15.10	15.10	
Married or in a relationship	4,504 (58.92)	58.54	61.44	0.684
Highest Level of Education				
Less than high school	162 (13.7)	12.75	20.04	
High school diploma or equivalency	1,032 (30.18)	29.22	36.61	
Some college or 2-year associate degree	1,369 (27.61)	28.25	23.30	
Four-year college or university	1,887 (16.45)	17.16	11.67	
Postgraduate or professional degree	2,423 (12.08)	12.63	8.38	<0.001
Lives Alone[2]				
No	5,036 (72.19)	72.08	72.95	
Yes	1,780 (27.81)	27.92	27.05	0.743
Self-rated Health[2]				
Poor	157 (3.59)	3.37	5.10	
Fair	827 (16.86)	16.54	19.05	

	Total	Geographic Density		
	N (Weighted %) *N* = 6,873	**Urban weighted % *N* = 6,107 (87.02)**	**Rural weighted % *N* = 766 (12.98)**	***p-value*** [1]
Good	2,178 (36.65)	36.54	37.41	
Very good	2,614 (31.84)	32.31	28.72	
Excellent	1,089 (11.05)	11.25	9.73	0.264
Had COVID-19[2]				
No	6,225 (92.51)	92.06	95.47	
Yes, diagnosed with test (recovered)	19 (0.27)	0.23	0.51	
Yes, diagnosed with test (still sick)	14 (0.21)	0.21	0.20	
Not diagnosed, but recently had symptoms	596 (7.10)	7.49	3.81	0.023
Worried about COVID-19				
Not at all	232 (5.22)	4.87	7.58	
Slightly	772 (12.76)	12.34	15.58	
Somewhat	1,210 (17.56)	17.37	18.80	
Moderately	2,566 (32.48)	32.16	34.68	
Extremely	2,088 (31.97)	33.26	23.36	0.003
How Often Uses Social Media				
Less than once a month	1,428 (25.20)	25.87	20.77	
Once or twice a month	236 (3.50)	3.24	5.29	
Once or twice a week	466 (7.38)	7.70	5.21	
3 to 5 times a week	460 (6.92)	6.84	7.40	
Daily or almost daily	4,226 (57.00)	56.35	61.32	0.097

N = 6,873.

Table 2.

Outcome variables by rural and urban location, COVID-19 Coping Study, April-May, 2020.

	Total	Geographic Density		
	N (%) ***N* = 6,873**	**Urban n (%)** ***n* = 6,107**	**Rural n (%)** ***n* = 766**	***p-value***
Depressive Symptoms				
No	4,641 (67.98)	67.69	69.93	
Yes	2,215 (32.02)	32.31	30.07	0.409
Presence of Anxiety				
No	4,832 (70.68)	70.46	72.11	
Yes	1,968 (29.32)	29.54	27.89	0.562
Loneliness				
No	4,801 (70.51)	70.57	70.12	
Yes	1,938 (29.49)	29.43	29.88	0.872
Degree of Social Isolation				
Low	4,613 (57.27)	57.03	58.91	
High	2,260 (42.73)	42.97	41.09	0.524
Has Social Contact as Often as They'd Like				
Never	46 (1.45)	1.49	1.17	
Hardly ever	246 (7.60)	7.56	7.97	
Some of the time	1,114 (25.67)	26.27	21.04	
Most of the time	2,983 (65.27)	64.68	69.81	0.337
Day/Week Spent Self-Isolating[2]				
0 days	360 (8.54)	8.50	8.79	
1-3 days	555 (8.74)	8.79	8.36	
4-6 days	845 (13.27)	13.13	14.25	
7 days	4,902 (69.45)	69.58	68.60	0.936
Days/Week Social Distancing Outside				
0 days	99 (5.13)	4.96	6.16	
1-3 days	249 (12.54)	12.53	12.60	
4-6 days	170 (7.72)	7.17	11.16	

	Total	Geographic Density		
	N (%) *N* = 6,873	Urban n (%) *n* = 6,107	Rural n (%) *n* = 766	*p-value*
7 days	1,887 (74.61)	75.34	70.08	0.248
Days/Week Outside at Least 15 min				
0 days	387 (8.68)	8.86	7.44	
1-3 days	1,938 (32.78)	33.64	27.16	
4-6 days	1,651 (19.79)	19.75	20.07	
7 days	2,676 (38.75)	37.75	45.33	0.041
Days/Week 15-min Face-to-Face Contact				
0 days	1,287 (26.73)	27.18	23.78	
1-3 days	898 (14.28)	13.89	16.88	
4-6 days	320 (4.15)	4.32	3.04	
7 days	4,111 (54.84)	54.61	56.30	0.227
Days/Week 15-min Phone or Video Call				
0 days	865 (20.98)	20.71	22.77	
1-3 days	2,642 (40.31)	40.04	42.09	
4-6 days	1,490 (16.55)	16.96	13.85	
7 days	1,668 (22.15)	22.28	21.29	0.443
Day/Week Text/Email/Social Media with Friends/Family				
0 days	431 (12.06)	12.18	11.25	
1-3 days	1,075 (20.81)	21.20	18.23	
4-6 days	1,186 (16.91)	16.84	17.42	
7 days	3,935 (50.22)	49.79	53.10	0.551

Estimates based on population-weighted analyses. *N* = 6,873.

Table 3.

Multivariable analyses predicting outcome variables, COVID-19 Coping Study, April-May 2020.

	Depressive symptoms	Presence of anxiety	Loneliness	Social isolation
	AOR (95% CI)	**AOR (95% CI)**	**AOR (95% CI)**	**AOR (95% CI)**
Rurality				
Urban	1	1	1	1
Rural	0.83 (0.64, 1.08)	0.98 (0.73, 1.32)	1.04 (0.77, 1.40)	0.85 (0.64, 1.13)
Age	0.96 (0.94, 0.97)***	0.97 (0.95, 0.98)***	0.96 (0.95, 0.98)***	0.97 (0.96, 0.99)***
Sex				
Male	1	1	1	1
Female	1.71 (1.43, 2.04)***	1.43 (1.18, 1.73)***	1.33 (1.11, 1.59)**	0.49 (0.41, 0.59)***
Race/Ethnicity				
Non-Hispanic White	1	1	1	1
Non-Hispanic Black	0.48 (0.33, 0.72)***	0.72 (0.49, 1.07)	0.58 (0.41, 0.81)**	0.94 (0.68, 1.30)
Hispanic or Latinx	0.65 (0.46, 0.91)*	0.98 (0.69, 1.40)	0.80 (0.56, 1.13)	1.01 (0.72, 1.42)
Other race	0.61 (0.43, 0.87)**	0.85 (0.59, 1.21)	1.08 (0.74, 1.58)	1.83 (1.25, 2.68)**
Relationship Status				
Single, never married	1	1	1	1
Single, divorced/separated	0.95 (0.66, 1.37)	0.85 (0.58, 1.25)	1.26 (0.89, 1.78)	0.35 (0.23, 0.53)***
Single, widowed	0.87 (0.58, 1.33)	0.78 (0.50, 1.22)	1.26 (0.85, 1.87)	0.26 (0.17, 0.41)***
Married or in a relationship	0.58 (0.42, 0.81)**	0.77 (0.54, 1.08)	0.42 (0.31, 0.57)***	0.10 (0.07, 0.14)***
Highest Level of Education				
Less than high school	1	1	1	1
High school diploma or equivalency	1.13 (0.75, 1.69)	0.99 (0.65, 1.51)	0.90 (0.59, 1.37)	0.62 (0.41, 0.95)*
Some college or 2-year associate degree	1.38 (0.91, 2.09)	1.20 (0.78, 1.83)	1.48 (0.97, 2.24)	0.47 (0.31, 0.71)***
Four-year college or university	1.40 (0.93, 2.12)	1.11 (0.73, 1.68)	1.21 (0.80, 1.83)	0.36 (0.23, 0.54)***
Postgraduate or professional degree	1.24 (0.82, 1.88)	1.09 (0.72, 1.67)	1.10 (0.72, 1.67)	0.33 (0.21, 0.50)***
Self-Rated Health				
Poor	1	1	1	1

	Depressive symptoms	Presence of anxiety	Loneliness	Social isolation
	AOR (95% CI)	**AOR (95% CI)**	**AOR (95% CI)**	**AOR (95% CI)**
Fair	0.64 (0.40, 1.04)	0.69 (0.42, 1.15)	0.78 (0.46, 1.33)	0.69 (0.40, 1.21)
Good	0.30 (0.19, 0.47)***	0.35 (0.22, 0.58)***	0.51 (0.30, 0.85)*	0.64 (0.38, 1.10)
Very good	0.18 (0.11, 0.28)***	0.20 (0.12, 0.33)***	0.37 (0.22, 0.62)***	0.48 (0.28, 0.82)**
Excellent	0.10 (0.06, 0.17)***	0.14 (0.08, 0.24)***	0.31 (0.18, 0.54)***	0.38 (0.22, 0.67)**
Had COVID-19				
No	1	1	1	1
Yes, diagnosed with test (recovered)	7.06 (1.13, 44.15)*	4.10 (0.86, 19.55)	1.21 (0.27, 5.47)	0.23 (0.04, 1.22)
Yes, diagnosed with test (still sick)	9.70 (2.26, 41.64)**	3.42 (0.45, 25.67)	1.78 (0.59, 5.34)	0.26 (0.05, 1.27)
Not diagnosed, but recently had symptom	1.32 (0.99, 1.74)	1.51 (1.14, 2.00)**	1.33 (0.97, 1.83)	0.92 (0.66, 1.29)
COVID-19 Worry				
Not at all	1	1	1	1
Slightly	1.44 (0.82, 2.50)	0.91 (0.45, 1.85)	1.61 (0.93, 2.80)	0.57 (0.37, 0.89)*
Somewhat	1.64 (0.97, 2.78)	1.72 (0.90, 3.29)	1.96 (1.15, 3.33)*	0.61 (0.39, 0.93)*
Moderately	2.05 (1.24, 3.37)**	2.71 (1.46, 5.06)**	2.20 (1.32, 3.66)**	0.50 (0.33, 0.75)**
Extremely	3.53 (2.14, 5.80)***	6.22 (3.35, 11.55)***	3.51 (2.12, 5.81)***	0.58 (0.38, 0.88)*

N = 6,873. AOR = adjusted odds ratio; CI = confidence interval.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.