

RESEARCH ARTICLE

Suicidal ideation and thoughts of self-harm during the COVID-19 pandemic: The role of COVID-19-related stress, social isolation, and financial strain

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Abstract

Background: There are significant concerns about mental health problems occurring due to the coronavirus disease 2019 (COVID-19) pandemic. To date, there has been limited empirical investigation about thoughts of suicide and self-harm during the COVID-19 pandemic.

Methods: A national survey was conducted May 2020 to investigate the association between mental health symptoms, social isolation, and financial stressors during the COVID-19 pandemic and thoughts of suicide and self-harm. A total of 6607 US adults completed an online survey; survey criteria included an age minimum of 22 years old and reported annual gross income of \$75,000 or below. Statistical raking procedures were conducted to more precisely weight the sample using US Census data on age, geographic region, sex, race, and ethnicity.

Results: COVID-19-related stress symptoms, loneliness, and financial strain were associated with thoughts of suicide/self-harm in multivariable logistic regression analyses, as were younger age, being a military veteran, past homelessness, lifetime severe mental illness, current depressive symptoms, alcohol misuse, and having tested positive for COVID-19. Greater social support was inversely related to thoughts of suicide/self-harm whereas running out of money for basic needs (e.g., food), housing instability (e.g., delaying rent), and filing for unemployment or disability were positively related.

Conclusions: Public health interventions to decrease risk of suicide and self-harm in the wake of the COVID-19 pandemic should address pandemic-related stress, social isolation, and financial strain experienced including food insecurity, job loss, and risk of eviction/homelessness.

KEYWORDS

COVID-19 pandemic, financial strain, social isolation, stress, suicidal ideation

1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic and its repercussions have profoundly impacted healthcare systems, economies, and the health and well-being of people around the world (Kickbusch et al., 2020; McKee & Stuckler, 2020). In addition, the virus has raised serious concerns about potential effects of COVID-19 on mental health. Commentators have described public panic, depression, anxiety, and stress from concerns about infection, illness, and death (Bao et al., 2020; Gunnell et al., 2020; Reger et al., 2020; Taylor et al., 2020a). Social distancing measures could lead to social isolation, exacerbating stress and vulnerability for mental illness (Hagerty & Williams, 2020; Torales et al., 2020). To the extent COVID-19 increases debt (Meltzer et al., 2011; Richardson et al., 2013), unemployment (Blosnich et al., 2019; Chang et al., 2013), and homelessness (Ayano et al., 2019; Culhane et al., 2019), this pandemic may correspondingly elevate suicide risk.

From these concerns, experts have postulated that social isolation, financial strain, and mental health symptoms—including stress and fear of COVID-19 itself—could raise suicide rates, calling suicide mortality and COVID-19 “a perfect storm” (Reger et al., 2020). Importantly, suicide was a leading cause of death in the United States (US), and the suicide rate was rising, even *before* the COVID-19 pandemic (Stone et al., 2018). A sizable body of research has identified numerous risk factors for suicidal ideation, including major depression (Franklin et al., 2017), which could be exacerbated by the pandemic. Furthermore, social isolation in response to stay-at-home orders may exacerbate mental health issues and, most critically, increase suicide risk (Hagerty & Williams, 2020; Reger et al., 2020; Torales et al., 2020). Finally, higher suicide rates recorded during previous widespread unemployment in the Great Depression and home foreclosures in the recent Great Recession (Chang et al., 2013; Reeves et al., 2012; Stuckler et al., 2009) show the potential for suicide rates to rise during the COVID-19 crisis due to widespread lack of living stability and job security (Ettman et al., 2020).

Because of the recency of the COVID-19 pandemic, empirical investigation of COVID-19-related suicidal ideation and thoughts of self-harm is scant. We address this in the current study, surveying the psychosocial well-being of a large national sample of middle and low-income US adults in May 2020 in the midst of the crisis. Based on theoretical suppositions for pandemic-related increases in risk for suicide (Reger et al., 2020), we hypothesized that COVID-19-related mental health symptoms, social isolation, and financial strain would be associated with thoughts of suicide/self-harm during the pandemic.

2 | METHODS

2.1 | Participants and procedure

The sample was recruited using Amazon's Mechanical Turk (MTurk) platform, a survey methodology which has been used widely by social

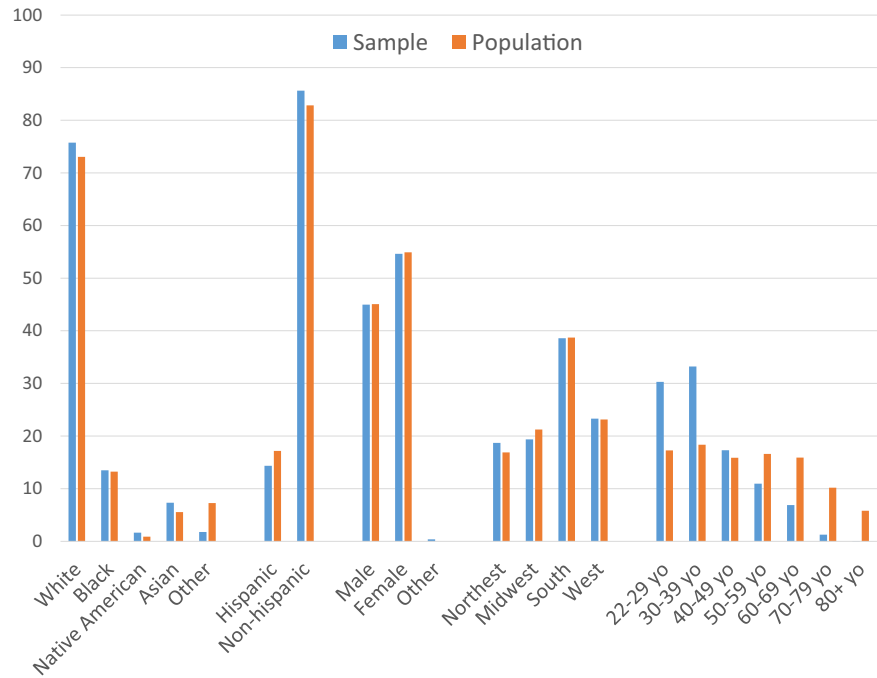
science researchers (Behrend et al., 2011; Sheehan & Pittman, 2016). MTurk is an online platform designed to allow individuals (known as requesters) to pay other individuals (known as workers/participants) for completing small online tasks called Human Intelligent Tasks (HITs) (Shank, 2016). Requesters have the ability to assign many participants to work on the same HIT, while restricting each participant to only complete the HIT once. Studies have found that MTurk participants tend to be more demographically diverse than traditional Internet or college student samples, and data obtained using MTurk are at least as reliable as those obtained by traditional survey methods (Buhrmester et al., 2011). A recent study found a majority of US participants are new to the platform each year and are relatively inexperienced as research participants (Robinson et al., 2019). Using this methodology and selection criteria including a minimum age of 22 years and a reported annual gross income of \$75,000 or below, we recruited a national sample of 6607 US adults. This was selected because those in the lower and middle class would likely have more financial strain during COVID, and this cut-off was used by the US federal government for determining who received stimulus checks.

Our study was described as an MTurk HIT “to understand COVID-19's impact on people's health.” To maximize data quality, we only allowed US residents with a HIT approval rate of 50% or above and with at least 50 previously approved HITs to view/access the current study, meaning that participants were only permitted to take the survey if they had demonstrated a track record of providing valid data on at least 50 previous surveys. To further establish data integrity, items from the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) (Greene, 2000) validity scales were included in the survey battery. After providing informed consent, participants completed a brief screener about age and income before being directed to a third-party website (i.e., Qualtrics) to complete a 15- to 20-min online survey. All tasks were completed on the same day, and participants were compensated \$0.75 for completing the HIT. Data were collected in May 2020—4 months after the first CDC-confirmed US COVID-19 case and 2 months after the World Health Organization declared COVID-19 a global pandemic. This study was approved by the Institutional Review Boards at Duke University and the University of Texas, San Antonio.

A total of 9760 respondents initially agreed to participate in the study, of which 6961 (71.3%) met age and income eligibility criteria as assessed by a brief screener in the beginning of the survey. Data from 155 eligible participants were removed due to their failing MMPI-2 validity check items; data from an additional 199 participants were removed because they reported annual pretax income greater than \$75,000 on the demographic questionnaire. Thus, analyses were conducted using valid data from the remaining 6607 eligible participants (67.7% of all respondents) who completed all study procedures.

Figure 1 illustrates how the final sample's demographic characteristics compares to the most recent data available at the US Census Bureau (i.e., the 2018 American Community Survey [ACS]) for adults matching the same inclusion criteria (≥ 22 years old and $\leq \$75,000$ personal annual income).

FIGURE 1 Demographics of study sample compared to general population based on data from the United States Census Bureau, age minimum of 22 years old and reported annual gross income of \$75,000 or below



Comparisons showed our sample was 55.02% female, 44.98% male, and 0.38% other, very similar to the ACS which was 54.92% female and 45.08% male (US Census Bureau, 2018a)

Regarding race/ethnicity, our sample was 75.3% White, 13.6% Black, 1.7% Native American/Alaskan Native, 7.7% Asian/Pacific Islander, and 1.8% “Other,” with 14.5% identifying as Hispanic. The ACS sample was comparable: 73.1% White, 13.3% Black, 0.9% Native American/Alaskan Native, 5.6% Asian/Pacific Islander, and 7.3% “Other” (US Census Bureau, 2018b), with 17.2% identifying as Hispanic (US Census Bureau, 2018c).

Our sample had a mean age of 37.9 years, while the ACS had a mean age of 49.5 years (US Census Bureau, 2018a).

Regarding US geographic region, 38.6% of our sample were in the South, 18.7% in the Northeast, 19.4% in the Midwest, and 23.3% in the West. This closely corresponded to the ACS, 38.7% were from the South, 16.9% from the Northeast, 21.2% from the Midwest, and 23.2% from the West (US Census Bureau, 2018d).

2.2 | Measures

Demographic variables analyzed included age, race/ethnicity, education level, marital status, employment, annual income, and history of military service. For gender, we asked “what is your gender?” and provided choices “female,” “male,” and “other.” Participants were also asked about their COVID-19 status (i.e., had ever tested positive). History of homelessness was assessed with the question: “Have you ever been homeless (i.e., don’t have a stable night-time residence, such as staying on streets, in shelters, cars, etc.)?” (0 = no; 1 = yes).

Social variables examined included loneliness, measured with the UCLA Loneliness Scale—Short Form (Russell et al., 1980) assessing:

feeling left out, isolated, and lacking companionship. Each item was scored on a scale of 1 (*hardly ever*) to 3 (*often*), summed to yield a total score (higher scores indicate greater perceived loneliness). Internal consistency was good in the sample (Cronbach’s $\alpha = .81$). Perceived social support was measured with the Medical Outcomes Study (MOS) Social Support Survey (Short Form) (Sherbourne & Stewart, 1991) which consists of 6 items measured on a 5-point Likert scale ranging 1 (*none of the time*) to 5 (*all of the time*), summed to yield a total score (higher scores indicate greater social support). Internal consistency was excellent in the current sample (Cronbach’s $\alpha = .90$).

Financial variables examined financial strain, which was assessed by multiple items. First, participants indicated whether they ran out of money to pay for any of the following in the past month: rent/mortgage, utilities, food, transportation, clothing, or medical care (0 = none; 1 = any). Second, participants were asked about job loss during the pandemic, “Have you filed for unemployment or disability benefits in the past month?” (0 = no; 1 = yes). Third, housing instability was assessed by “Were you late on your mortgage this past month?”, “Are you currently at risk of being evicted?” and “Have you delayed paying your rent because of the moratorium/ban on evictions?” (0 = no; 1 = any).

Mental health variables examined stress symptoms tied to the COVID-19 pandemic because traumatic reactions have been observed in past pandemics (Hawryluck et al., 2004; Taylor et al., 2020b). In this regard, we administered a modified version of the commonly used posttraumatic stress disorder Checklist for DSM-5 (PCL-5) (Bovin et al., 2016). Participants were asked to indicate the degree to which they had experienced each of the 20 stress symptoms over the past month using a scale of 0 (*not at all*) to 4 (*extremely*) while “Thinking about your experience with COVID-19 and

TABLE 1 Sample characteristics

	Mean	SD	Skewness	Kurtosis	Min	Max
Age	37.94	12.64	0.87	-0.05	22	89
Income	34,266.80	22,974.64	0.005	-1.16	0	75,000
COVID-19-related stress symptoms	27.25	21.68	0.45	-1.02	0	80
COVID-19-related distress/dysfunction	1.07	1.08	0.87	0.08	0	4
UCLA Loneliness Scale	5.60	1.90	0.15	-1.02	3	9
Social support (MOS)	20.87	6.08	-0.37	-0.57	6	30
Depressive symptoms (PHQ2)	2.17	1.87	0.43	-0.95	0	6
Alcohol use (AUDIT-C)	2.67	2.50	0.90	0.27	0	12
	Frequency	Percent				
Married	3818	57.79				
Military veteran	816	12.35				
Post-high school education	6056	91.66				
Filed for unemployment	1402	21.22				
Housing instability	655	9.91				
Lacks money for basic needs	2100	31.78				
History of homelessness	1346	20.37				
Lifetime SMI	1568	23.73				
COVID-Positive	354	5.36				

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; COVID-19, coronavirus disease 2019; MOS, Medical Outcomes Study; PHQ-2, Patient Health Questionnaire-2 item; SMI, severe mental illness.

the current situation." Internal consistency of the COVID-19 modified PCL-5 was excellent (Cronbach's $\alpha = .98$). A supplementary PCL-5 item on distress and dysfunction due to these COVID-19-related stress symptoms was measured with "Did these reactions cause you distress or result in a failure to fulfill obligations at home, work, or school?" using the same 0–4 scale and 1-month time frame. Please note that we selected the PCL because it explicitly links stress symptoms to a specific circumstance whereas general anxiety measures do not afford explicit links to specific circumstances like the COVID-19 pandemic.

Mental health history was assessed with the question, "Has a doctor or nurse ever told you that you have any of the following conditions (check all that apply)?" and severe mental illness (SMI) was operationalized as endorsing a lifetime history of psychotic disorder, bipolar disorder, or major depressive disorder. The three-item version of the Alcohol Use Disorders Identification Test (AUDIT-C) (Bush et al., 1998) was used to assess alcohol use quantity/frequency. The Patient Health Questionnaire-2 (PHQ-2) depression screening tool was used to assess frequency of depressed mood and anhedonia over the past 2 weeks (Kroenke et al., 2003).

Regarding thoughts of suicide and self-harm, participants were asked, "Over the last 2 weeks, how often did you consider hurting yourself, felt suicidal, or wish that you were dead?" using a 0 (*not at all*) to 3 (*nearly every day*) scale. In the analyses below, because we were primarily interested in whether the aforementioned variables had an association with any reported thoughts of self-directed violence, suicidal ideation was dichotomized (0 = no thoughts of suicide/self-harm endorsed; 1 = any thought of self-harm or suicide endorsed).

2.3 | Statistical analysis

Analyses were conducted using SAS 9.4. To maximize the generalizability of our findings, we used a SAS Macro for raking procedures (Izrael et al., 2000) to create sample weights representative of the US population using data from the US Census Bureau consistent with our inclusion criteria for age (≥ 22 years) and income ($\leq \$75,000$) to more precisely weight the sample using US Census data on age, geographic region, sex, race, and ethnicity. After characterizing the study sample, unweighted and

weighted bivariate Spearman correlations were estimated to determine bivariate associations between thoughts of suicide/self-harm and other study variables.

Multivariable analyses, unweighted and weighted, were conducted in which thoughts of self-harm was regressed onto variables in demographic, financial, clinical, and social domains. Interactions were run to determine if the effects of isolation or financial distress had greater impacts on thoughts of suicide/self-harm for younger versus older, male versus female, white versus nonwhite race, Hispanic versus non-Hispanic ethnicity, and participants with/without existing SMI. Finally, we aimed to demonstrate how three major domains of variables combine to increase odds of endorsing thoughts of suicide/self-harm. To do this, predicted probability of thoughts of suicide/self-harm was calculated as a function of loneliness (i.e., scoring above the median on the loneliness scale), financial strain (i.e., endorsing running out of money for basic needs, filing for unemployment, or experiencing housing instability), and COVID-19-related distress/dysfunction (i.e., rating “moderately” or higher on the PCL-5 item).

3 | RESULTS

Sample characteristics are depicted in Table 1. In addition to demographics described above, 58% were married, 12.4% were military veterans, and 92% had at least a high school education. Financially, 21.2% reported filing for unemployment or disability in the past month, 9.9% reported housing instability, 31.8% reported running out of money to cover at least one basic need, and 20.4% reported a past history of homelessness. Clinically, 23.7% reported a lifetime history of severe mental illness, 5.4% endorsed testing positive for COVID-19, and 31.0% reported past-2-week thoughts of suicide/self-harm.

Table 2 displays correlations between thoughts of self-harm and demographic, financial, and clinical/social factors. For unweighted correlations, small to moderate positive correlations were found for all demographic and financial variables except for age, annual income, and post-high school education. For unweighted correlations with clinical status and social support variables, small to moderate correlations with thoughts of suicide/self-harm were found for all social and clinical status variables except social support. Of note, depressive symptoms, stress symptoms linked to COVID-19, and distress/dysfunction related to COVID-19 all demonstrated strong, positive correlations with thoughts of suicide/self-harm. Weighted correlations yielded parallel results.

Multivariable logistic regressions are presented in Table 3. Overall model fit in the unweighted regression analysis was statistically significant ($\chi^2 = 4151.23$; degrees of freedom [df] = 20; $p < .001$). Significant covariates associated with thoughts of suicide/self-harm included younger age, male sex, being married, status as a military veteran, housing instability, money to cover basic needs, filing for unemployment/disability, lifetime SMI, depressive symptoms, alcohol use, stress symptoms related to COVID-19, distress/

dysfunction related to COVID-19, social support, and loneliness. Overall model fit for the weighted regression analysis was also statistically significant ($\chi^2 = 6495.93$; $df = 20$; $p < .001$) with the pattern of significant associations between ideation and candidate covariates unchanged relative to unweighted results.

Examining thoughts of suicide/self-harm, we found significant interactions between financial strain and being male ($\chi^2 = 51.52$; $df = 1$; $p < .001$), above the median age of 35 years ($\chi^2 = 9.12$; $df = 1$; $p = .003$), non-White ($\chi^2 = 9.06$; $df = 1$; $p = .003$), and Hispanic ($\chi^2 = 24.53$; $df = 1$; $p < .001$). The effect of loneliness on thoughts of suicide/self-harm was also greater for participants who were non-White ($\chi^2 = 10.04$; $df = 1$; $p = .002$), male ($\chi^2 = 3.9$; $df = 1$; $p = .05$), and above the median age of 35 years ($\chi^2 = 22.90$; $df = 1$; $p < .001$). Although there were no significant interactions between SMI with financial strain, being lonely had a greater impact on suicide/self-harm among those without SMI ($\chi^2 = 9.92$; $df = 1$; $p = .002$).

Based on the estimated models, the predicted probability of thoughts of suicide/self-harm was estimated as a function of loneliness, financial strain, and COVID-19-related distress and dysfunction, individually and in various combinations (Figure 2). Estimated probability of thoughts of suicide/self-harm among participants who did not endorse any of these three variables was an estimated 4%. In sharp distinction, estimates among participants concurrently endorsing all three variables, probability of thoughts of suicide/self-harm increased to an estimated 82%—an approximate twenty-fold increase compared to participants with none of these three variables.

4 | DISCUSSION

This US-based national survey found that COVID-19-related mental health symptoms, social isolation, and financial strain were associated with thoughts of suicide/self-harm during the early months of the pandemic, consistent with domains of suicide risk factors postulated by others (Gunnell et al., 2020; Reger et al., 2020; Taylor et al., 2020a). Additional variables in the current study related to thoughts of suicide/self-harm included receipt of a positive COVID-19 test result, younger age, being married, reporting a military background, and endorsing greater alcohol use. Among tested covariates, an index of COVID-19-related stress symptoms exhibited the highest correlation to thoughts of suicide/self-harm. This finding corresponds to mental health concerns related to public panic, depression, and stress related to infection, illness, and death stemming from the pandemic (Bao et al., 2020; Taylor et al., 2020a).

Historically, pandemics and disasters have disproportionately impacted poor and vulnerable populations, including those with mental health problems (Davis et al., 2010; Tsai & Wilson, 2020). This may be partly due to disparities in economic resources, access to preventive healthcare, and psychosocial determinants of health (Nicogossian et al., 2012; Warnecke et al., 2008). There may also be neurobiological pathways by which stress and poor mental health can result in weakened immune systems, which increases risk for contracting infectious diseases (Blume et al., 2011). Thus, while

TABLE 2 Bivariate correlations with thoughts of suicide/self-harm

Factors	Correlation with thoughts of suicide/self-harm (unweighted)		Correlation with thoughts of suicide/self-harm (weighted)	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Demographic				
Age	-0.16	<.001	-0.29	<.001
Sex (male)	0.18	<.001	0.19	<.001
Race (non-White)	0.14	<.001	0.16	<.001
Ethnicity (Hispanic)	0.20	<.001	0.29	<.001
Married	0.13	<.001	0.20	<.001
Military veteran	0.33	<.001	0.28	<.001
Post-high school education	0.05	<.001	0.05	<.001
Financial				
Filed for unemployment	0.31	<.001	0.35	<.001
Housing instability	0.42	<.001	0.47	<.001
Lacks money for basic needs	0.49	<.001	0.54	<.001
History of homelessness	0.39	<.001	0.42	<.001
Annual income \geq \$35K	-0.05	<.001	-0.04	<.001
Clinical/social				
COVID-19-related stress symptoms	0.64	<.001	0.70	<.001
COVID-19-related distress and dysfunction	0.53	<.001	0.57	<.001
COVID-19 positive	0.31	<.001	0.33	<.001
UCLA Loneliness Scale	0.40	<.001	0.41	<.001
Social support (MOS)	-0.08	<.001	-0.07	<.001
Lifetime SMI	0.30	<.001	0.34	<.001
Depressive symptoms (PHQ-2)	0.60	<.001	0.63	<.001
Alcohol use (AUDIT-C)	0.29	<.001	0.34	<.001

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; COVID-19, coronavirus disease 2019; MOS, Medical Outcomes Study; PHQ-2, Patient Health Questionnaire-2 item; SMI, severe mental illness.

COVID-19 may negatively affect mental and emotional well-being, poor mental and psychosocial functioning may also increase risk for COVID-19.

Lower perceived social support and greater perceived loneliness were significantly related to greater thoughts of suicide/self-harm in both bivariate and multivariable analyses, consistent with the Interpersonal Theory of Suicide (Joiner, 2007), which posits that suicide risk is increased, in part, when individuals feel a lack of connection with others (thwarted belongingness). Our findings indirectly support concerns that social distancing measures and isolation stemming from stay-at-home orders may diminish important social connections, which could potentially elevate risk of suicidal ideation and thoughts of self-harm (Hagerty & Williams, 2020; Reger

et al., 2020; Torales et al., 2020). It is unclear how long COVID-19 social distancing orders will remain in place, but our findings suggest that social isolation (which would be expected to increase over prolonged social distancing measures) could potentially serve as a suicide risk factor for predisposed individuals. While the cross-sectional design of the study precludes assessing pre/post COVID-19 changes in both social isolation and suicide risk, the current findings highlight this as an important focus for subsequent research.

Pandemic-related financial strain was also linked to thoughts of suicide/self-harm in our survey. The rapid decline in the market economy and temporary work-stoppage of businesses has introduced financial and housing insecurity for millions of Americans. In a latent class analysis, Taylor et al. (2020a) specifically showed that panic buying correlated

TABLE 3 Multivariable logistic regression of demographic, financial, and clinical/social factors associated with thoughts of suicide/self-harm

Factors	Thoughts of suicide/self-harm (unweighted)			Thoughts of suicide/self-harm (weighted)		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Demographic						
Age	0.97	0.96, 0.98	<.001	0.97	0.97, 0.98	<.001
Sex (Male)	2.02	1.71, 2.38	<.001	2.14	1.83, 2.50	<.001
Race (non-White)	1.21	1.00, 1.46	.054	1.20	1.01, 1.44	.042
Ethnicity (Hispanic)	1.15	0.91, 1.44	.245	1.18	0.97, 1.43	.095
Married	1.61	1.35, 1.93	<.001	2.04	1.72, 2.41	<.001
Military veteran	1.68	1.23, 2.29	.001	1.60	1.23, 2.07	<.001
Post-high school education	1.01	0.75, 1.36	.946	1.06	0.81, 1.38	.700
Financial						
Filed for unemployment	1.26	1.02, 1.55	.030	1.28	1.05, 1.57	.014
Housing instability	2.16	1.50, 3.12	<.001	2.74	1.95, 3.86	<.001
Lacks money for basic needs	1.89	1.58, 2.26	<.001	1.99	1.68, 2.36	<.001
History of homelessness	1.30	1.04, 1.61	.020	1.24	1.02, 1.52	.033
Annual income ≥\$35K	0.90	0.76, 1.07	.223	0.89	0.76, 1.05	.157
Clinical/social						
COVID-19-related stress symptoms	1.05	1.04, 1.05	<.001	1.05	1.04, 1.05	<.001
COVID-19-related distress and dysfunction	1.16	1.06, 1.28	.002	1.18	1.08, 1.29	<.001
COVID-19 positive	1.91	1.15, 3.16	.012	1.95	1.20, 3.19	.008
UCLA Loneliness Scale	1.07	1.01, 1.13	.021	1.11	1.05, 1.17	<.001
Social support (MOS)	0.97	0.95, 0.98	<.001	0.97	0.96, 0.99	<.001
Lifetime SMI	1.65	1.37, 1.97	<.001	1.71	1.44, 2.03	<.001
Depressive symptoms (PHQ-2)	1.51	1.42, 1.60	<.001	1.57	1.49, 1.66	<.001
Alcohol use (AUDIT-C)	1.04	1.01, 1.08	.012	1.07	1.03, 1.10	<.001

Note: Unweighted final model: $\chi^2 = 4151.23$, $df = 20$, $p < .001$; Weighted final model: $\chi^2 = 6495.93$, $df = 20$, $p < .001$. Please note all variables are entered together in each model.

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; CI, confidence interval; COVID-19, coronavirus disease 2019; *df*, degrees of freedom; MOS, Medical Outcomes Study; OR, odds ratio; PHQ-2, Patient Health Questionnaire-2 item; SMI, severe mental illness.

with COVID-19 stress symptoms. The financial impact of COVID-19 has been significant: The US Census Bureau, which currently tracks the economic impact of the pandemic, estimates that one-half of all Americans have experienced loss in employment income, over a quarter of Americans have or are experiencing housing insecurity, and 10% have or are incurring food insecurity, all as a result of the pandemic (US Census Bureau, 2020). Considering financial, housing, and food insecurity were all significantly associated with thoughts of suicide/self-harm in our study, continued hardships along these domains could foreshadow a national public health crisis of increased suicides related to COVID-19 (Ettman et al., 2020).

4.1 | Limitations

Without longitudinal data, our cross-sectional survey design precludes drawing inferences about the directionality or causality of detected associations. Although our use of an existing validated measure (i.e., PCL-5) as a basis for COVID-19 pandemic-related stress could be seen as a study strength, our novel adaptation of this measure means we cannot assume identical psychometric properties, as evidenced by our high internal consistency in the current sample. While we examined the link between COVID-19 pandemic-related stress and thoughts of suicide and self-harm, there are other

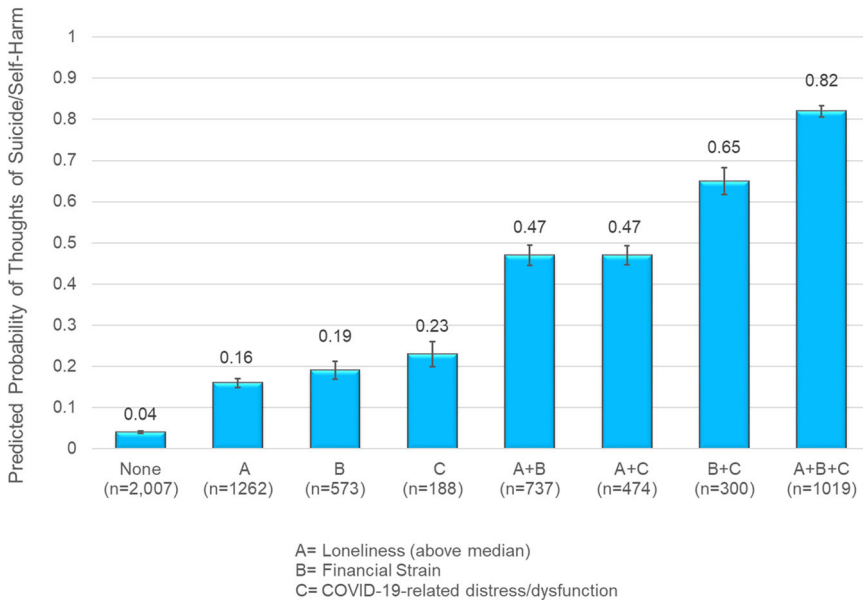


FIGURE 2 Predicted probability of thoughts of suicide/self-harm, as a function of loneliness, financial strain, and COVID-19-related distress/dysfunction. *Note:* loneliness was defined as scoring above the median on the UCLA Loneliness Scale. Financial strain was defined as endorsing filing for unemployment/disability, running out of money for basic needs, or experiencing housing instability. COVID-19-related distress/dysfunction was defined as rating “moderately” or higher on the PCL-5 item: “Did these reactions cause you distress or result in a failure to fulfill obligations at home, work, or school?”

plausible mental health factors (e.g., generalized anxiety, depressive symptoms) that might also be associated with COVID-19 pandemic-related stress and should be addressed in future research.

The current study also does not specifically measure suicidal behavior, only ideation. Further, the study did not account for lifetime suicidal thoughts/behaviors, meaning that the direction of these relationships is unclear and the magnitude of effects may be inaccurate. The item we measured captures both active and passive suicidal ideation, along with thoughts of self-harm without wish to die not all reflective of suicidal thoughts. Additionally, this measure did not account for severity of suicidal thinking. Given the use of a broad definition of thoughts of suicide and self-harm, conclusions about whether COVID-19-related factors relate to actual suicidal behavior is thus limited. Our findings provide a potential focus for further research.

Although we recruited a heterogeneous sample from all major geographic regions of the United States, our analyses did not use stratified sampling. It follows that the sample may not be nationally representative, and thus that prevalence and epidemiological values derived from this study should be interpreted with caution. Rates of SMI and thoughts of self-harm/suicide were relatively high and weighting did not account for these variables. We selected participants with track records of providing valid data through the MTurk platform, but it may be that the data does not generalize to less experienced MTurk participants or to adults who do not participate in MTurk at all. Male gender was shown to be associated with thoughts of suicide/self-harm, which is unusual in population-based surveys; nevertheless, males have been shown to have higher rates of suicide during periods of economic hardship, such as in the 2008 Great Recession (Chang et al., 2013; Haw et al., 2015).

In sum, Figure 1 illustrates that the demographic makeup of our sample of US residents aged at least 22 years old and earning less than \$75,000 pretax annual income was largely representative of this segment of the US population with respect to geographic region

and sex, and only marginally different with respect to race and ethnicity, according to US Census data. As an additional measure, we applied raking (weighted sample balancing) procedures to more precisely align the sample according to 2018 US Census Bureau data estimates of age, geographic region, sex, race, and ethnicity among our target population (Izrael et al., 2000). This survey takes a preliminary step toward understanding variables linked to thoughts of suicide and self-harm among US residents during the unprecedented pandemic.

5 | CONCLUSION

This study provides empirical support for the hypothesis that loneliness, financial strain, and mental health conditions are related to thoughts of suicide/self-harm in the context of the COVID-19 pandemic. The findings suggest that in addition to usual mental health-related issues, healthcare professionals should address social isolation and financial stressors arising from the COVID-19 pandemic when assessing and managing suicide risk. It is important to note, however, that interventions must balance public health and personal economic considerations. If the former is prioritized over the latter, potentially a greater proportion of US adults could contract and subsequently experience adverse health, social, and economic effects of the Coronavirus. Another important point to note is that delivery of mental health care has demonstrated a remarkable shift to virtual service platforms in response to the COVID-19 pandemic with the potential for timely leveraging of increased access to suicide prevention and management services (Gunnell et al., 2020; Kalin et al., 2020). Our work highlights the need for policymakers addressing the COVID-19 pandemic to target mental health and social isolation, as well as bolster socioeconomic well-being through job creation, housing relief, and financial education. Such multicomponent intervention and prevention efforts could

prove instrumental to enhancing psychosocial well-being and reducing suicide risk in the wake of the COVID-19 pandemic.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ETHICS STATEMENT

The research described in this article was approved by the Institutional Review Boards at Duke University and the University of Texas Health Science Center at Houston.

PEER REVIEW

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