Investigating the Relationship between COVID-19 and Mental Health: A Survey of Stress, Loneliness, and Substance Abuse among the US General Population

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Abstract

Background

Health officials have called for more information about the mental or psychological consequences of COVID-19 on individuals, especially in the US general population where COVID rates are remarkably high.

Aims

This exploratory study aimed to understand stress, loneliness and substance abuse among the US general population during the COVID-19 pandemic.

Methods

A cross-sectional study comprising 1,203 respondents to a controlled-access, web-based survey was conducted.

Results

Study results reveal statistically significant differences in stress ($p<0.001$), loneliness ($p<0.001$), and substance (ab)use ($p<0.001$), especially illicit (non-prescription) drug use, between those with COVID-19 or related symptoms and those without. Effect size estimates indicate small to moderate effects, ranging from 0.178 to 0.276, consistent with prior studies based on past outbreaks.

Conclusions

Findings have significant implications for mental health practitioners, community organizations, and federal agencies in terms of policy, practice, and future research.

Background

The emergence of COVID-19, the disease caused by a betacoronavirus named SARS-CoV-2 according to public health experts (Sohrabi, Alsa, O’Neill et al., 2020), in the United States since March 2020 has had a profound and unprecedented effect on daily life. For instance, many schools and colleges were forced to pivot in-face, on-campus activities to ‘online only’ teaching and learning, with many worried about not reopening in the Spring 2021 semester (Wang, Horby, Hayden, & Gao, 2020). COVID-19 has also caused record-breaking rates of unemployment, remote-working, forced displacement or homelessness, and food insecurity (Kumar & Nayar, 2020).

Consequently, the spread of COVID-19 has been declared a global pandemic by the World Health Organization (2020). At the time of this writing, there were more than 19.7 million confirmed coronavirus cases in the US and over 341,000 deaths. Clinical and physical manifestations of COVID-19 range from asymptomatic status to severe acute respiratory problems, fever, loss of taste, and multi-organ dysfunction (Singhal, 2020).
Although the novel coronavirus that causes COVID-19 is a new strain of SARS-CoV-2 about which we know relatively little (Talevi, Socci, Carai, Carnaghi et al., 2020), extensive research on global disasters and epidemics has established that negative effects on mental health are likely (McMahon, Ho, Brown, Miller, Ansumana & Kennedy, 2016; Vyas, Delaney, Webb-Murphy, & Johnson, 2016). For example, Vyas and colleagues reviewed 32 studies involving 26,869 participants and found that certain sociodemographic (e.g., youth, single marital status, low income) characteristics are at greater risk of PTSD, anxiety, depression, and alcohol/drug misuse. Using data from 186 respondents to an internet survey, another analysis found that 25% of the sample worried about contracting Influenza A (i.e., swine flu) and 40% worried about the health of family members, to name a few. Taken together, living through a pandemic may lead to a range of negative emotional reactions such as psychological distress and unhealthy behaviors (e.g., excessive substance use, Pfefferbaum & North, 2020).

To stop further widespread transmission of COVID-19, public health experts and state elected officials have imposed important, yet unfamiliar, restrictive public safety measures. For instance, most states and businesses enforce mandatory face mask-wearing, to reduce transmission risk through airborne or aerosolized infectious droplets (Klapkiv & Dluhopolska, 2020). Coupled with that, individuals are strongly encouraged to follow strict physical distancing, staying at least 6-feet away from others, or to quarantine in isolation when displaying COVID symptoms or awaiting test results (Duan & Zhu, 2020).

There are other protective measures. Some “hot spots,” where COVID-19 prevalence rates are significantly higher than others areas (e.g., New York City, Los Angeles), have imposed stay-at-home mandates that while undeniably important, infringe on personal liberties and present major stressors (e.g., panic buying) that seem to drain the psychological resources of those living through the COVID-19 pandemic (Zhai & Du, 2020). However, social isolation through domicile confinement or quarantine is consistently linked with chronic depression, psychiatric dysfunction, and suicide (Brooks, Webster, Smith et al., 2020; Rubin, 2020). A previous study of hospital staff found that quarantine was the most predictive factor of acute stress and post-traumatic stress disorder (PTSD), even 3 years after SARS (Wu, Fang, Guan et al., 2009).

Psychological reactions to pandemics include emotional distress (e.g., anxiety, stress), loneliness, and maladaptive behaviors such as alcohol abuse and illicit drug use. For instance, recent studies have affirmed “headline stress disorder” characterized by high emotional stress and anxiety associated with consuming endless news reports about the threat and spread of COVID-19 (Dong & Zheng, 2020). Another study found that healthcare workers and SARS patients reported alcohol abuse and drug dependency symptoms (Wu, Liu, Fang & et al., 2008). Similar results were found in epidemiological studies during the H1N1 or “swine flu” influenza outbreak (Goodwin, Gaines, Myers & Neto, 2011).

Psychological reactions to COVID-19 have been documented in recent population-based studies. For example, one study of 1,210 respondents from 194 cities in China found that over half (54%) of study participants reported moderate to severe impacts of the outbreak. Just under a third (29%) reported moderate to severe anxiety symptoms and 17% exhibited depression (Wang, Pan, Wan, Tan, Xu, Ho & Ho, 2020). Similar results have been found in studies of Indian, Ukrainian, and Polish populations (Klapkiv &
Dluhopolska, 2020; Loiwal, 2020), although COVID-19 rates have been alarmingly higher in countries like the US (WHO, 2020).

To recap, prior research on the relationship between national public health disasters and mental health in the US general population exists across two primary disciplines. Psychology scholars have investigated the sensibility of specific public safety restrictions like wearing face masks and physical distancing in addressing COVID-19 (e.g., Kazak, 2020; Song, Xu, Xu, Sun, & Liu, 2020). The weight of empirical evidence from observational studies and randomized controlled trials suggest the effectiveness of such safety measures (McIntrye & Chughtai, 2015).

Public health and medical scholars, on the other hand, have closely examined the frequency and nature of people’s behavioral responses to pandemic crises and overall mental health. For instance, several published studies focus on trends in mental health and wellness rates among global populations (e.g., Loiwal, 2020). In light of rising cases and record-setting deaths, there is considerable concern about COVID-19 impact in the US.

While prior studies are useful in advancing collective understanding of COVID-19 and its impact, studies are needed that connect these two separate lines of inquiry. Very few published studies incorporate measures of mental health and well-being such as anxiety and worrying in national studies of COVID-19 among the US general population. And “little systematic evidence exists on how people are experiencing daily life during the pandemic” (Lades, Laffan, Daly & Delaney, 2020). These are the gaps addressed by the present study.

Aims

The purpose of this study was to measure differences between COVID-19 serostatus and mental health outcomes in the US general population during the COVID pandemic.

Methods

Sample

Study participants were required to be US residents, at least 18 years of age, and willing to volunteer for involvement in this research investigation, in keeping with Institutional Research Board (IRB) guidelines. Ethical approval for this study was granted by the IRB at Walden University (Protocol #051420).

The analytic sample included 1,203 survey respondents. Almost three-fourths of the sample was White/Caucasian (70%) and 26% were underrepresented racial minorities (URMs), including 8% Black, 9% Latinx, and 9% Asian Pacific Islander (API). Slightly over half (51%) were male. Respondents were diverse in terms of sexual orientation: 82% heterosexual, 11% bisexual, 7% gay, lesbian, or otherwise non-heterosexual. Demographic characteristics of participants are summarized in Table 1.
Table 1

**Description of the Study Sample**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>%/M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>- White</td>
<td>70.3</td>
</tr>
<tr>
<td>- Black</td>
<td>7.6</td>
</tr>
<tr>
<td>- Latinx</td>
<td>9.4</td>
</tr>
<tr>
<td>- Asian Pacific Islander</td>
<td>8.6</td>
</tr>
<tr>
<td>- American Indian/Alaskan Native</td>
<td>0.8</td>
</tr>
<tr>
<td>- Other</td>
<td>3.2</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>- Female</td>
<td>48.5</td>
</tr>
<tr>
<td>- Male</td>
<td>50.7</td>
</tr>
<tr>
<td>- Other</td>
<td>0.8</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
</tr>
<tr>
<td>- Heterosexual/straight</td>
<td>81.5</td>
</tr>
<tr>
<td>- Bisexual</td>
<td>11.2</td>
</tr>
<tr>
<td>- Gay</td>
<td>2.9</td>
</tr>
<tr>
<td>- Lesbian</td>
<td>1.7</td>
</tr>
<tr>
<td>- Transgender</td>
<td>0.3</td>
</tr>
<tr>
<td>- Other</td>
<td>2.4</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td></td>
</tr>
<tr>
<td>- High school diploma/GED</td>
<td>31.8</td>
</tr>
<tr>
<td>- Associate’s degree</td>
<td>9.5</td>
</tr>
<tr>
<td>- Bachelor’s degree</td>
<td>37.8</td>
</tr>
<tr>
<td>- Master’s degree</td>
<td>14.9</td>
</tr>
<tr>
<td>- Doctoral degree</td>
<td>3.2</td>
</tr>
<tr>
<td>- Other</td>
<td>2.8</td>
</tr>
<tr>
<td>COVID-19 Status</td>
<td></td>
</tr>
<tr>
<td>- Unknown</td>
<td>8.3</td>
</tr>
<tr>
<td>- No symptoms</td>
<td>68.9</td>
</tr>
<tr>
<td>- Mild symptoms</td>
<td>19.2</td>
</tr>
<tr>
<td>- Serious symptoms</td>
<td>2.5</td>
</tr>
<tr>
<td>- Tested positive (+)</td>
<td>1.1</td>
</tr>
<tr>
<td>Mental Health and Behaviors</td>
<td></td>
</tr>
<tr>
<td>- Loneliness</td>
<td>3.18 (SD=1.27)</td>
</tr>
<tr>
<td>- Overwhelmed/stress</td>
<td>3.30 (SD=1.30)</td>
</tr>
<tr>
<td>- Excessive alcohol drinking</td>
<td>2.19 (SD=1.34)</td>
</tr>
<tr>
<td>- Illicit drug use</td>
<td>1.49 (SD=0.99)</td>
</tr>
</tbody>
</table>

**Data Collection**
Data were collected in the late Spring through Fall of 2020 via a controlled-access, internet-based survey. The survey was developed by the authors using well-established scales and items. The survey was administered by a research firm in the United States to respondents from the general population aged at least 18 years. The sampling strategy consisted of using random location sampling, stratified by region and college/university type.

The survey consisted of 22 items. Survey items were designed to tap constructs related to self-esteem, anxiety, and sense of belonging. Respondents were asked to rate on a 5-point Likert scale the extent to which they agreed with statements like “I feel good about myself” (self-esteem, Rosenberg [1979]), “I feel worried about my future” (anxiety), and “I feel like I matter to others” (belonging, Strayhorn [2019]), based on established measures. Precedent for using these scales was set in a previous study [Author blinded].

Several single item measures were included on the survey to minimize response burden and to provide an efficient means to assess health behaviors and public safety restrictions among the sample (Rolstad, Adler & Ryden, 2011). For instance, respondents were asked to rate the extent to which they agreed with statements like “I feel lonely,” “I drink more often,” or “I use illicit drugs (non-prescription) more often” due to COVID-19. There is evidence to suggest that these items have the capacity to adequately and efficiently assess such emotions or behaviors, performing even better than multi-item questions, especially in community and population-based studies (Bize & Plotnikoff, 2009). All participants have given consent for their data to be used for research purposes.

**Data Analysis**

Data analysis proceeded in three stages. First, all variables were prepared for statistical analysis using several data recoding and cleaning techniques such as testing for missingness. Overall, less than 2% of cases were missing so imputation was not necessary (Allison, 2002). Next, categorical variables were described using frequency rates and percentages, while continuous variables were estimated using descriptive statistics. Means for key continuous variables were compared using independent samples $t$ tests, with follow-up effect size estimates. Effect size is the strength or magnitude of the difference between group means (Cortina & Nouri, 1999).

**Limitations**

As with all investigations, this study was not without limits. One possible limitation relates to the study’s sample and sampling design. As previously mentioned, the sampling strategy consisted of using random location sampling, stratified by region due to the variability in COVID-19 prevalence and risk (WHO, 2020). Though we cannot say that the sample is completely random, it includes a much broader range than prior pandemic studies based on limited convenience samples or single areas (e.g., Goodwin, Gaines, Myers & Neto, 2011). By hosting the survey on a controlled-access site managed by a reputable research firm, the study avoids bias and representativeness issues associated with open-access survey and self-selected respondents (Dillman, 2000).
While the present sample included a diverse range of respondents, it likely differs in observable and unobservable ways from the overall population. Attempts were made to ensure the sample's representativeness, but the study sample was majority White and heterosexual/straight indicating some selection effects. Consequently, results may be more generalizable to those groups than others.

Another possible limit pertains to a measurement issue. In some cases, analyses were not adjusted for some confounding influences that were left unmeasured by the survey instrument. For instance, a previous study indicated that income is associated with anxiety and depression risk (Vyas, Delaney, Webb-Murphy & Johnston, 2016) but income data was not collected in the present study. Thus, findings should be interpreted as exploratory and descriptive with these limitations in mind.

Results

An independent-samples $t$ test was conducted to evaluate the hypothesis that individuals in the US general population with COVID-19 or related symptoms feel lonelier than those with no symptoms. The test was significant, $t(1096)=-3.003, p<0.01$, with results in the expected direction. Individuals testing positive for COVID-19 or with symptoms ($M=3.38, SD=1.25$) rated higher levels of loneliness than those with no symptoms ($M=3.11, SD=1.27$). The 95% confidence interval for the difference in means ranged from $-0.44$ to $-0.09$. The eta square index ($n^2=0.01$) and Cohen's $d$ (-0.21) estimate indicate a small effect size.

Similar results were found in an independent-samples $t$ test conducted to evaluate the hypothesis that individuals with COVID-19 or related symptoms feel more overwhelmed or greater stress than those with no symptoms. The test was significant, $t(1094)=-3.950, p<0.01$, with results in the expected direction. Individuals with COVID-19 or symptoms ($M=3.55, SD=1.24$) rated higher levels of stress than those with no symptoms ($M=3.20, SD=1.31$). The 95% confidence interval for the difference in means ranged from $-0.53$ to $-0.18$. The eta square index ($n^2=0.014$) and Cohen's $d$ (-0.276) estimate indicate a small to moderate effect size.

To examine possible differences in health behaviors, independent-samples $t$ tests were conducted to evaluate the hypotheses that individuals with COVID-19 or related symptoms, compared to those with no symptoms, (a) drank more alcohol than usual or (b) used illicit drugs more often than usual, due to the pandemic. The test for illicit drug use was significant, $t(423.2)=-2.547, p<0.01$, with results in the expected direction. Individuals with COVID-19 or related symptoms ($M=1.61, SD=1.06$) reported using illicit drugs (non-prescription) more often than usual “due to COVID,” compared to those with no symptoms ($M=1.43, SD=0.94$). The 95% confidence interval for the difference in means ranged from $-0.33$ to $-0.04$. The eta square index ($n^2=0.01$) and Cohen's $d$ (-0.178) estimate indicate a small effect size. The test for alcohol use was not significant, $t(439.9)=-1.517, p=0.13$, and thus nothing further will be reported about this analysis. Table 2 presents a full summary of statistical results.
Table 2

Results of Independent-Samples t-tests examining COVID-19 and health outcomes

<table>
<thead>
<tr>
<th>Health Outcome</th>
<th>COVID-19 or Symptoms</th>
<th>No COVID-19 Symptoms</th>
<th>t</th>
<th>p</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loneliness</td>
<td>3.38 (1.25)</td>
<td>3.11 (1.27)</td>
<td>-3.003</td>
<td>0.01</td>
<td>0.21</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>2.30 (1.42)</td>
<td>2.16 (1.32)</td>
<td>-1.517</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>Illicit drug use</td>
<td>1.61 (1.06)</td>
<td>1.43 (0.94)</td>
<td>-2.547</td>
<td>0.01</td>
<td>0.18</td>
</tr>
<tr>
<td>Overwhelmed/stress</td>
<td>3.55 (1.24)</td>
<td>3.20 (1.31)</td>
<td>-3.950</td>
<td>0.01</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Conclusions

The purpose of this study was to elicit data from a sample of the US general population to advance understanding of COVID-19’s impact on mental health, namely loneliness, stress, and alcohol and illicit drug use, among those living through the pandemic. Results suggest several important conclusions. COVID-19 is a betacoronavirus that causes a range of physiological symptoms including severe respiratory ailments (Sohrabi, Alsafi, O’Neill et al., 2020). While the physical health effects of COVID-19 are increasingly documented, results from the current study demonstrate notable differences in mental or psychological health, namely stress, loneliness, and substance use, among those with COVID-19 or related symptoms and those with none. In short, the study found that COVID-19 serostatus is associated with differences in mental health outcomes (loneliness, stress, and substance abuse) among the general US population.

Previous literature showed that health care providers, especially front-line workers, are placed at significant risk of negative psychological impact during pandemics (McMahon, Ho, Brown, Miller, Ansumana & Kennedy, 2016), although less is known about mental health-related effects of COVID-19 within the general US population. Results from the present study provide evidence that contracting COVID-19 or suffering from COVID-related symptoms affects the mental health and substance abuse behaviors of the general US population. Specifically, individuals with COVID or related symptoms report higher rates of loneliness, distress, and illicit (non-prescription) drug use than those with no symptoms. Although those with COVID-19 or related symptoms consumed more alcohol than those with no symptoms, differences were not statistically significant.

Mental health and public safety organizations have released practical guidance about caring for one’s wellness and managing feelings like anxiety and depression. For instance, the American Psychiatric Association (APA) and National Alliance on Mental Illness (NAMI) published tips for personal hygiene and safeguarding one’s mental health with suggested strategies for mitigating anxiety, depression, and stigma (Morganstein, 2020). Results from the current study affirm the importance of such advisories, especially for those testing positive for COVID-19 or individuals suffering from COVID-19 related
symptoms (Signal, 2020) like high fever, chills, body fatigue, muscle aches, or dysgeusia (i.e., loss of taste or smell). NAMI resources range from print materials and reports to online community discussion groups, free peer-to-peer emotional support, virtual counseling, and evidence-based coping strategies.

Results from this analysis suggest the need for support services to help those with COVID-19 or related symptoms alleviate stress, reduce loneliness by increasing connectedness, and curtail alcohol and illicit drug misuse. Stay-at-home orders and physical distancing mandates make it difficult, if not impossible, for people to access health care treatment in-person. Thus, establishing online mental health, telehealth and counseling services through community health organizations, hospitals, and government agencies seem critically important to address this crisis. In light of previous findings showing that pandemics disproportionately affect low-income and/or communities of color (Vyas et al., 2016), support service providers would do well to guarantee affordable access to therapeutics and resources that help to manage stress, loneliness, and substance abuse amid COVID-19 in the US.

This analysis has several implications for policy and practice. In keeping with Cullen, Gulati, and Kelly (2020), we recommend the provision of targeted psychological interventions for communities disproportionately impacted by COVID-19. Given the numbers of individuals reporting anxiety, loneliness, and alcohol/drug use amid the pandemic, we advocate for improved 24/7 access to support services especially those delivered online or via smartphone technologies. Health care providers can offer suggestions for stress management and coping (e.g., structured activities, maintaining routine), connect patients to social services, and counsel patients to seek help or virtual connectedness with others where needed.

Since social media and news reports can be traumatic, triggers, and emotionally distressing (Dong & Zheng, 2020), frequency and dosage of news consumption or “watching” should be monitored and intentionally limited at times. Setting personal limits for COVID-19 news and information consumption, as recommended by recent research (Garfin, Silver, & Holman, 2020) may help to safeguard people's emotional well-being, especially those with COVID-19 or related symptoms. While rest, hydration, and over-the-counter medicines like acetaminophen (Tylenol) are recommended ways to treat COVID-19 at home, panic-scrolling through news headlines on TV or social media is not and may only heighten anxiety, stress levels, and substance misuse.

In summary, results show that differences in stress, loneliness, and substance abuse, especially illicit (non-prescription) drug use, prevail between individuals with COVID-19 or related symptoms and those without in the general US population. Understanding and addressing the mental health needs and substance (ab)use behaviors of COVID-19 infected persons is important. It may be the case that stress, loneliness, and drugs increase susceptibility to COVID infection or prolong recovery. More information is needed, including correlation and more advanced statistical modeling approaches, that test for group differences, controlling for potentially confounding influences, or studies that examine the influence of public safety measures on COVID-19 related outcomes. Future researchers should employ quantitative and qualitative methods judiciously to pursue these directions. In the course of time, it would also be
helpful to design probability-based, longitudinal surveys using complex sampling designs to study the prevalence and distal outcomes of COVID-19 in a broader swath of the US general population.

Declarations

Ethical Approval and Consent to Participate

This study was approved by the institutional review board at Walden University [Protocol XX-8905279] and all respondents provided consent to participate in the survey.

Consent for Publication

All authors mentioned in the manuscript have agreed to authorship and given consent for submission and subsequent publication of the manuscript.

Availability of Supporting Data

Not applicable.

Competing Interests

The author has no competing conflicts of interest, financial or non-financial, and the manuscript, in part or full, has not been submitted or published elsewhere.

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Authors’ Contributions

The paper is sole-authored and, thus, the corresponding author contributed to all parts of the manuscripts and study, from formulation to implementation, analysis, reporting, and submission.

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Authors’ Information (Optional)

Not applicable.

References


