Mental Distress in the United States at the Beginning of the COVID-19 Pandemic

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Objectives. To assess the impact of the COVID-19 pandemic on mental distress in US adults.

Methods. Participants were 5065 adults from the Understanding America Study, a probability-based Internet panel representative of the US adult population. The main exposure was survey completion date (March 10–16, 2020). The outcome was mental distress measured via the 4-item version of the Patient Health Questionnaire.

Results. Among states with 50 or more COVID-19 cases as of March 10, each additional day was significantly associated with an 11% increase in the odds of moving up a category of distress (odds ratio = 1.11; 95% confidence interval = 1.01, 1.21; $P = .02$). Perceptions about the likelihood of getting infected, death from the virus, and steps taken to avoid infecting others were associated with increased mental distress in the model that included all states. Individuals with higher consumption of alcohol or cannabis or with history of depressive symptoms were at significantly higher risk for mental distress.

Conclusions. These data suggest that as the COVID-19 pandemic continues, mental distress may continue to increase and should be regularly monitored. Specific populations are at high risk for mental distress, particularly those with preexisting depressive symptoms. (*Am J Public Health.* 2020;110:1628–1634. https://doi.org/10.2105/AJPH.2020.305857)

See also Cable, p. 1595.

The United States has entered a new historical phase with the rapid spread of the novel coronavirus SARS-CoV-2 and deaths from COVID-19. Data from China suggest that the mental health impacts of COVID-19 are severe.[1] Thus far, there are little data on the mental health impact of the pandemic in the United States. This information is critical, as there is a robust literature on how public health crises, such as SARS or natural disasters, can lead to mental health challenges, including symptoms of acute stress, loneliness, anxiety, and depression.[2] Social distancing recommendations may further increase the likelihood of mental health symptoms, because isolation is known to have detrimental mental health effects.[3]

Early findings from China indicate the serious mental health impact of the COVID-19 pandemic. In one survey with 1210 participants conducted in January and February 2020, 54% rated the psychological impact of the COVID-19 pandemic as moderate to severe, 29% reported moderate-to-severe anxiety symptoms, 17% reported moderate-to-severe depressive symptoms, and 8% reported moderate-to-severe stress levels.[1] Another survey with 52 730 respondents in January and February 2020 reported that almost 35% of the sample experienced psychological distress.[4] This study also found regional differences in psychological distress, with respondents from Hubei province, the epicenter of the COVID-19 pandemic, reporting significantly higher distress. Moreover, people with preexisting mental disorders could be more heavily affected by the COVID-19 pandemic, including possible relapse or exacerbation of psychiatric conditions.[5]

There are marked mental health disparities in the United States that are likely to be exacerbated by this pandemic. For example, serious mental distress is more common in women and in those who are uninsured and is often comorbid with chronic somatic conditions.[6] In addition, those in higher income brackets have lower rates of serious mental distress.[6] Existing research has linked economic hardship with the incidence[7] and progression[8] of mental disorders. Difficulty with finances not only contributes to stress but also is a leading barrier to receiving mental health and substance use disorder treatment.[9] The COVID-19 pandemic has become intertwined with an economic crisis and has resulted in widespread job loss and economic downturn.[10] Information is needed to understand how shifting labor market outcomes, secondary to the COVID-19 pandemic, are potentially exacerbating mental health disparities across the United States. Research from China has already demonstrated that college students whose families had less stable incomes were at increased risk of mental distress because of COVID-19.[11]

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The social isolation, financial hardship, and fear associated with COVID-19 could present a perfect storm for public mental health in the United States. Data are needed to track the impact of the COVID-19 pandemic on mental health, including identifying those in greatest need, to serve as evidence-based information for the public and to marshal resources across local, state, and federal agencies. The current study addresses this need by examining predictors of mental distress in a nationally representative household panel during a period of rapid spread of COVID-19 in the United States.

METHODS

Data for this project came from the Understanding America Study (UAS), a probability-based Internet panel recruited via postal mailings. Eligible participants were selected based on a random selection of addresses drawn from the post office delivery sequence files via a commercial vendor.[12]

The initial panel intake survey includes an age screening; eligible individuals are all adults aged 18 years and older in the contacted household. The UAS panel consists currently of 11 nationally representative sample batches, rolled into the panel between 2014 and 2019. The current analysis used early release (March 17, 2020) data from the UAS 230 wave, which was fielded between March 10 and March 16. This week of data collection paralleled the declaration of COVID-19 as a pandemic by the World Health Organization, of a national emergency by the president of the United States, and the beginning of school and work closures and social distancing recommendations.

All active respondents of the UAS were selected for participation, except Spanish speakers. As such, this survey was made available to 8502 UAS participants. Of the 8502 invited participants, 5325 completed the survey and were counted as respondents (overall response rate of 63%). Of those who were not counted as respondents, 89 started the survey without completing, and 3088 did not start the survey.

Survey weights for UAS account for probabilities of sample selection and alignment to Current Population Survey benchmarks, along socioeconomic dimensions, gender (male or female), race and ethnicity (White, Black, other, Hispanic), age (18–39, 40–49, 50–59, and ≥ 60 years), education (high school or less, some college, or bachelor's degree or more), Census regions (Northeast, Midwest, South, or West), and fraction of Native Americans. The reference population considered for the weights is the US population of adults aged 18 years and older. More information about UAS can be found at https://uasdata.usc.edu/index.php, and specific information about the UAS 230 survey is at https://uasdata.usc.edu/page/COVID-19+Corona+Virus. We used survey weights in all analyses.

Measures

Mental distress and substance use. The primary outcome measure of interest was the 4-item version of the Patient Health Questionnaire (PHQ-4), which has been validated in the general population.[13] This measure asks about the frequency of being bothered by feelings of nervousness, worry, depression, and loss of interest over the past 2 weeks. Response options include not at all (0), several days (1), more than half the days (2), and nearly every day (3). The total score is determined by adding the scores of each of the 4 items. Scores are categorized as normal (0–2), mild (3–5), moderate (6–8), or severe (9–12). A score of 3 or higher for the first 2 items suggests anxiety, while a score of 3 or higher on the last 2 items suggests depression.[14] In an earlier wave of data collection, participants completed the 8-item version of the Center for Epidemiologic Studies–Depression Scale (CES-D 8).[15] We used the number of symptoms a respondent previously endorsed as occurring "much of the time" in the past week as a measure of historical depressive symptoms. The most recent CES-D 8 was used for participants who had multiple CES-D 8 scores from previous waves (49% of sample had CES-D 8 score from June 2019, 32% from June 2017, and 19% from May 2015).

COVID-19 items. Respondents were asked to provide their best estimate of the chance (0%–100%) that they would become infected with COVID-19 in the next 3 months and that they would die if infected. We classified individuals as having a perception of 0%, 1% to 50%, or greater than 50% for both of these questions. We used the category of 0% as the reference group because these variables were zero-inflated.

Participants were also asked whether they had "taken any steps to stay away from other people to avoid infecting them." Response options were yes, no, and unsure. The survey start date (between March 10 and March 16) was used to assess whether calendar time was associated with mental distress.

Other variables. Sociodemographic factors included gender (female or male), age (years), race/ethnicity (White, American Indian or Alaska Native, Asian, Black or African American, Hawaiian or Pacific Islander, Hispanic or Latino, or multiracial), education (high-school degree or below, attended some college or received a 2-year degree, bachelor's degree, or graduate degree), marital status (married, never married, separated or divorced, or widowed); household income (< $20 000, $20 000–$39 999, $40 000–$59 999, $60 000–$99 999, or ≥ $100 000), and currently have a job (yes or no). Lastly, participants were asked to estimate the number of days on which they consumed alcohol and number of days on which they consumed cannabis, both over the past week.

High- and low-count states. We classified states according to whether they had a high or low count of confirmed cases of COVID-19 as of March 10, 2020, the first day the UAS 230 survey was fielded. States were deemed high-count states if they had at least 50 individuals diagnosed with COVID-19. On this date, the mean number of cases per US state was 3.9, with a median of 0. Four states had 50 or more cases as of this date and were classified as high-count: Washington (267 cases), New York (173 cases), California (144 cases), and Massachusetts (92 cases). The remainder of states had 17 or fewer confirmed cases and were termed low-count.[16]

Statistical Analyses

We evaluated associations between PHQ-4 levels (normal, mild, moderate, severe), sociodemographic variables, and COVID-19–related variables by using survey-weighted bivariate tests (χ^2 or analysis of variance). We then used a multivariable ordinal logistic regression model to examine the independent associations between these factors as explanatory variables and categorical

PHQ-4 levels as the outcome. We made the assumption that the increase between each PHQ-4 level (i.e., from normal to mild, from mild to moderate, from moderate to severe) was equivalent. An approximate likelihood-ratio test of the proportionality of odds demonstrated that this assumption was not violated ($\chi^2 = 40.26$; $P = .06$).

The independent variables of interest were date on which the survey was completed (i.e., calendar time), perceived likelihood of becoming infected with COVID-19 in the next 3 months, perceived likelihood of dying if infected, and whether participants took any steps to avoid infecting others. The model further adjusted for demographic factors, substance use in the past week, and previous symptoms of depression (CES-D 8). We then stratified the model by individuals residing in high- or low-count states to examine whether this modified the association between calendar time (date completing the survey) and PHQ-4 score. Because only a small number of states were significantly affected by COVID-19 during the week of data collection, we expected individuals in these high-count states to have greater increases in mental distress relative to individuals in low-count states.

The analysis was restricted to 5065 individuals (95% of n = 5325 respondents) with complete information on all our analytic variables (Table 1). All analyses used the UAS survey weights, allowing these findings to generalize to the adult US population. The analyses were performed in RStudio (version 1.1.383; R version 3.6.1) using the survey package (version 3.37).[17,18]

RESULTS

A total of 5065 adults aged 18 years or older were included in this analysis. After applying the weights, slightly less than half were male (49%), most were aged between 18 and 54 years (61%) and White (64%), half had an income of $60 000 or more, and a quarter did not have any college experience (24%). A summary of sample characteristics is provided in Table A (available as a supplement to the online version of this article at http://www.ajph.org).

PHQ-4 Scores

PHQ-4 scores indicated that the majority of the sample (73.0%) reported a normal level of mental distress; 16.3% reported mild, 6.2% reported moderate, and 4.5% reported severe mental distress. Of all participants, 14.7% met the criteria for anxiety and 9.5% for depression. The frequency of individual PHQ-4 items were similar to 2019 PHQ-4 estimates of the US adult population (Table B, available as a supplement to the online version of this article at http://www.ajph.org).[19]

Correlates of Mental Distress

Unadjusted analyses. In unadjusted bivariate tests, increasing number of days since March 10, 2020, was significantly associated with increased PHQ-4 total scores (i.e., higher mental distress; $P < .001$). Between March 10 and March 16, the proportion of normal PHQ-4 levels decreased from 74% to 64%, and the proportion of mild PHQ-4 levels increased from 13% to 24%. The proportion of individuals with moderate or severe distress remained relatively constant, fluctuating between 3% to 7% and 2% to 7%, respectively (Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

Individuals living in high-count states had significantly higher proportions of mild (19% vs 15%), moderate (7% vs 6%), and severe (6% vs 4%) levels of distress overall as well as over time (Table 2 and Figure B, available as a supplement to the online version of this article at http://www.ajph.org; $P < .05$). The proportion of participants meeting criteria for anxiety was 17% vs 14% and for depression was 11% vs 9% in the high- and low-count states, respectively; this difference was not statistically significant. Individuals with higher perceived likelihood of becoming infected with COVID-19 or dying if they were to become infected were at elevated risk for higher mental distress ($P < .001$). Participants who reported taking steps toward not infecting others or being unsure regarding whether they were taking these steps were more likely to report mental distress ($P < .001$). Greater number of days using cannabis in the past week was associated with increasing mental distress ($P < .001$), though alcohol was not. Previous CES-D 8 score was positively associated with current PHQ-4 score ($P < .001$). Younger age, being female, being separated or divorced, and being never married were significantly associated with greater distress (all $P < .001$). Higher household income and currently having a job were protective against mental distress ($P < .001$).

Adjusted and stratified analyses. Among individuals living in high-count states (Washington, New York, California, Massachusetts), each additional day past March 10 was associated with an 11% increase in the odds of moving up to the next PHQ-4 level (i.e., moving from normal to mild symptoms, from mild to moderate, or from moderate to severe; odds ratio [OR] = 1.11; 95% confidence interval [CI] = 1.01, 1.21; P = .02). This finding was significant when we adjusted for demographic variables (age, gender, race/ethnicity, marital status, education, household income, currently having job), as well as use of cannabis and alcohol in the past week and historical CES-D 8 score.

Among individuals living in low-count states, however, each additional day past March 10 was only associated with a 2% increase in the odds of moving up to the next PHQ-4 level, and this association was not statistically significant (OR = 1.02; 95% CI = 0.95, 1.10; $P = .50$). Higher perceived likelihood of infection (1%–50% vs 0%: OR = 1.89 [95% CI = 1.23, 2.91]; >50% vs 0%: OR = 3.29 [95% CI = 1.97, 5.51]) as well as of dying if infected (1%–50% vs 0%: OR = 1.49 [95% CI = 1.02, 2.17]; >50% vs 0%: OR = 1.83 [95% CI 1.06, 3.16]) were significantly associated with higher mental distress among individuals residing in low-count states (Table 1). In a model including all states (Table C, available as a supplement to the online version of this article at http://www.ajph.org), each additional survey day past March 10 was associated with a 5% increase in the odds of moving up a PHQ-4 level, and this was not significantly significant (OR = 1.05; 95% CI = 0.99, 1.11; $P = .12$).

Perceived likelihood of infection (1%–50%: OR = 1.83 [95% CI = 1.32, 2.52]; >50%: OR = 2.77 [95% CI = 1.82, 4.21]; both $P < .001$), dying if infected (>50%: OR = 1.64; 95% CI = 1.06, 2.54; $P < .001$), and taking steps to avoid infecting others (OR = 1.28; 95% CI = 1.02, 1.60; $P = .03$) were all significantly associated with higher mental distress.

TABLE 1—Multivariable Ordinal Logistic Regression Model Estimating PHQ-4 Levels (Normal, Mild, Moderate, Severe), Stratified by High- and Low-Count US States: March 10–16, 2020

	High COVID-19 Count States, OR (95% CI)	Low COVID-19 Count States, OR (95% CI)
Survey date	1.11 (1.01, 1.21)	1.02 (0.95, 1.10)
Perceived likelihood infection (Ref: 0%)		
1%–50%	1.40 (0.85, 2.31)	1.89 (1.23, 2.91)
> 50%	1.57 (0.74, 3.30)	3.29 (1.97, 5.51)
Perceived likelihood death if infected (Ref: 0%)		
1%–50%	0.83 (0.53, 1.29)	1.49 (1.02, 2.17)
> 50%	1.65 (0.81, 3.38)	1.83 (1.06, 3.16)
Age, y	0.98 (0.97, 0.99)	0.98 (0.97, 0.99)
Female gender (Ref: male)	1.42 (0.98, 2.06)	1.43 (1.10, 1.86)
Race/ethnicity (Ref: non-Hispanic White)		
American Indian/Alaska Native	0.30 (0.01, 7.77)	0.08 (0.01, 0.54)
Asian	0.99 (0.56, 1.73)	0.37 (0.15, 0.94)
Black/African American	0.73 (0.28, 1.88)	0.55 (0.34, 0.88)
Hawaiian/Pacific Islander	0.17 (0.01, 2.27)	0.30 (0.02, 4.66)
Hispanic/Latino	1.02 (0.67, 1.56)	0.79 (0.46, 1.36)
Multiracial	1.01 (0.43, 2.38)	0.80 (0.35, 1.84)
Marital status (Ref: married)		
Never married	1.04 (0.71, 1.52)	1.30 (0.94, 1.81)
Separated or divorced	1.33 (0.77, 2.29)	1.56 (1.10, 2.22)
Widowed	0.34 (0.15, 0.77)	1.63 (0.99, 2.70)
Education (Ref: ≤ high school)		
Some college or 2-y degree	1.20 (0.71, 2.03)	0.91 (0.67, 1.24)
Bachelor's degree	1.60 (0.87, 2.93)	0.97 (0.66, 1.41)
Graduate degree	2.00 (1.00, 4.01)	1.02 (0.68, 1.54)
Household income, $ (Ref: < 20 000)		
20 000–39 999	0.60 (0.33, 1.07)	1.17 (0.76, 1.81)
40 000–59 999	0.76 (0.45, 1.28)	0.86 (0.55, 1.34)
60 000–99 999	0.58 (0.33, 1.02)	0.69 (0.43, 1.10)
≥ 100 000	0.69 (0.40, 1.21)	0.82 (0.50, 1.37)
Currently have job: no (Ref: yes)	1.23 (0.84, 1.82)	1.29 (0.96, 1.74)
No. days cannabis past wk	1.12 (1.02, 1.22)	1.05 (0.98, 1.13)
No. days alcohol past wk	1.01 (0.92, 1.12)	1.07 (1.01, 1.13)
Historical depressive symptoms (CES-D 8)	1.40 (1.30, 1.50)	1.47 (1.38, 1.56)
Took steps to avoid infecting others (Ref: no)		
Unsure	1.23 (0.43, 3.55)	1.76 (0.82, 3.79)
Yes	1.30 (0.91, 1.87)	1.26 (0.96, 1.67)

Note. CES-D 8 = 8-item version of the Center for Epidemiologic Studies–Depression Scale; CI = confidence interval; OR = odds ratio; PHQ-4 = 4-item version of the Patient Health Questionnaire. High-count states are those with 50 or more confirmed COVID-19 cases as of March 10, 2020 (WA, NY, CA, MA). Low-count states are all remaining US states, with fewer than 50 cases. Participants were n = 5065 in total; n = 1940 in high-count states; n = 3125 in low-count states.

The strength of association and significance of other variables varied across these 3 models (high-count, low-count, overall), but, generally, younger age, being separated or widowed, cannabis and alcohol consumption, and previous symptoms of depression were all significantly associated with higher mental distress. Among the low-count states, American Indian or Alaska Native (OR = 0.08; 95% CI = 0.01, 0.54), Asian (OR = 0.37; 95% CI = 0.15, 0.94), and Black or African American (OR = 0.55; 95% CI = 0.34, 0.88) individuals had significantly lower levels of mental distress, relative to non-Hispanic White individuals.

DISCUSSION

Data from this nationally representative panel collected during the initial COVID-19 outbreak in the United States suggest that mental distress is increasing. However, a significant increase in symptoms over 7 days, between March 10 and 16, was only observed in states with a high count of COVID-19

TABLE 2—Mental Distress (PHQ-4 Levels) Over Calendar Time, in High-Count and Low-Count US States: March 10 to 16, 2020

Survey Date	PHQ-4 Level	Frequency, %	
		High-Count States	Low-Count States
Mar 10, 2020	Normal	75.4	73.2
Mar 10, 2020	Mild	10.4	13.3
Mar 10, 2020	Moderate	8.1	7.3
Mar 10, 2020	Severe	6.0	6.2
Mar 11, 2020	Normal	69.5	75.4
Mar 11, 2020	Mild	19.1	13.6
Mar 11, 2020	Moderate	6.2	6.0
Mar 11, 2020	Severe	5.2	5.0
Mar 12, 2020	Normal	71.6	76.2
Mar 12, 2020	Mild	14.3	14.8
Mar 12, 2020	Moderate	9.9	6.5
Mar 12, 2020	Severe	4.1	2.5
Mar 13, 2020	Normal	64.4	73.9
Mar 13, 2020	Mild	22.8	18.1
Mar 13, 2020	Moderate	9.1	6.2
Mar 13, 2020	Severe	3.6	1.8
Mar 14, 2020	Normal	62.3	80.3
Mar 14, 2020	Mild	21.3	15.1
Mar 14, 2020	Moderate	4.9	2.8
Mar 14, 2020	Severe	11.4	1.7
Mar 15, 2020	Normal	69.3	72.1
Mar 15, 2020	Mild	22.8	14.3
Mar 15, 2020	Moderate	1.9	6.0
Mar 15, 2020	Severe	6.0	7.6
Mar 16, 2020	Normal	59.0	65.6
Mar 16, 2020	Mild	24.1	24.3
Mar 16, 2020	Moderate	8.6	5.3
Mar 16, 2020	Severe	8.3	4.8

Note. PHQ-4 = 4-item version of the Patient Health Questionnaire. High-count states are those with 50 or more confirmed COVID-19 cases as of March 10, 2020 (WA, NY, CA, MA). Low-count states are all remaining US states, with fewer than 50 cases.

cases (Washington, New York, California, and Massachusetts). Within these states, individuals responding to the survey at a later date had 10% higher odds (per day) of being in a higher response category, even after we controlled for other factors that also increase the risk of mental distress. Importantly, while the overall distress level of this sample did not differ from a nationally representative sample before the pandemic,[19] these data suggest that, as the pandemic continues, we may see increases in mental distress. Longitudinal data will be important to understand how the mental health of the population changes over the course of the pandemic. Increases in mental distress were also associated with an individual's perception of their personal risk of contracting or dying of COVID-19 in the next 3 months. Individuals who reported taking steps to avoid infecting others, which may reflect a greater awareness of COVID-19 (e.g., through news or social media exposure), also had higher levels of distress.

Certain sociodemographic and behavioral factors are consistently associated with the incidence and prevalence of mental disorders.[20–24] The results of the current study are consistent with these previous findings. Younger age, female gender, and not being married were risk factors, and higher income was protective in some of the models. Our findings emphasize the continued importance of these sociodemographic factors in predicting mental distress. Past-week use of cannabis or alcohol and historical symptoms of depression were all associated with higher distress. This indicates that individuals with a preexisting mental health disorder may be especially vulnerable to distress during this pandemic. We did not have current information on mental health diagnoses or whether individuals were receiving behavioral or pharmacologic treatments at the time of participation. These data will be important for understanding who, among those with a history of mental disorder, is at heightened risk for mental distress during and following the pandemic.

Among the low-count states, American Indian or Alaska Native, Asian, and Black or African American individuals had lower levels of mental distress. This is consistent with a larger body of work demonstrating that, despite higher rates of poverty, poorer physical health, and greater discrimination and stressors, racial and ethnic minorities largely appear to have decreased risk of mental disorders.[25,26] Though explanations for this "paradox" are beyond the scope of this article, we note the critical need for more research on this topic during this pandemic, especially given the rise in anti-Asian sentiment and the disproportionate impact of the pandemic on communities of color.[27,28]

This study has both strengths and weaknesses. In terms of strengths, the data were timely, nationally representative, and specific to the impacts of COVID-19. Furthermore, the outcome was measured with a psychometrically valid instrument.[13] We were also able to incorporate historical data on depressive symptoms, which was valuable for determining if those with preexisting mental health conditions are particularly vulnerable. The greatest limitation was the cross-sectional design, which hindered causal inference. It is

possible that the association between survey date and mental distress is confounded or that the person's mental distress during this data collection week influenced the date on which they chose to complete the survey. Although we adjusted for demographic factors as well as previous depressive symptoms, the potential for bias remains. Lastly, the descriptive and analytic inferences made from this analysis are generalizable to the adult US population under the assumption that nonresponse is unrelated to any factors that were not included in the construction of the survey weights.

We are sensitive to the fact that, as of the writing of this article, the United States has had more than 2 million confirmed cases of COVID-19, so our decision to use a threshold of 50 cases as criteria for labeling states as having a high versus low count may seem problematic. However, our decision to use 50 cases as the threshold was based on the number of cases in US states on the first day of data collection (March 10). Moving forward, analyses that use data collected at later points in the pandemic will have to classify states differently.

It is intuitive that a stressful experience, such as this pandemic, would increase mental distress, given the existing literature on how previous public health crises have had a negative impact on public mental health.[2] Yet, the unprecedented scale and associated mortality of this pandemic, coupled with increases in social isolation and disruptions to life, speak to a potential crisis or "perfect storm."[29] Together, these data reinforce the need for targeted prevention and intervention efforts among groups who are at greatest risk. Our findings also suggest reinforcing public health messages about minimizing substance use and ways to improve resiliency and reduce isolation during this time of great uncertainty. Policies and interventions, such as those that improve mental health education and access to behavioral health treatment via telehealth,[30] online support[31] (e.g., chat-based), or telephone support[32] will be critical in mitigating the effect of the COVID-19 pandemic[33] on mental health. Previous research on the long-term effects of pandemics and quarantining[34] suggests that the end of the crisis does not necessarily bring an end to deleterious mental health effects. Those affected may experience posttraumatic stress disorder, depression, and anxiety months—or even years—afterward.[34] Any interventions created in response to the pandemic must include longer-term follow-up and must be accessible to those who have lost their health insurance and those who have few economic resources to pay for treatment.[35]

The data presented in this article are unique in that they capture the mental health of the US population at an early and critical inflection point in the COVID-19 pandemic. In the United States, the number of confirmed cases was still relatively low in most states and social distancing recommendations and school and work closures were just beginning. The status quo changed drastically from March 10 to March 16, especially in states that were affected first. In the weeks that have followed, transmission increased exponentially, and the lives of most people in the United States have changed in dramatic ways. It is likely that mental health has changed in parallel. As more data are collected and analyzed, it will be critical to understand how the population's mental health is responding to these changes and which individuals and communities are at risk for poor mental health outcomes. AJPH

CONTRIBUTORS

C. Holingue, L. G. Kalb, and J. Thrul conceptualized and designed the study, carried out data analyses, drafted the initial article, and revised the article. K. E. Riehm assisted with data analyses and reviewing the article. D. Bennett and A. Kapteyn designed and implemented the survey. D. Bennett, A. Kapteyn, C. B. Veldhuis, R. M. Johnson, M. D. Fallin, and E. A. Stuart assisted with interpreting results and reviewing the article. All authors approved the final article as submitted and agree to be accountable for all aspects of the work.

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CONFLICTS OF INTEREST

All authors have no potential conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

Informed consent was sought from all participants. Understanding America Study panel procedures have been approved by the University of Southern California institutional review board.

REFERENCES

1. Wang C, Pan R, Wan X, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health*. 2020;17(5):1729. https://doi.org/10.3390/ijerph17051729

2. Huremović D. *Psychiatry of Pandemics: A Mental Health Response to Infection Outbreak*. Cham, Switzerland: Springer; 2019. https://doi.org/10.1007/978-3-030-15346-5

3. Leigh-Hunt N, Bagguley D, Bash K, et al. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health*. 2017;152:157–171. https://doi.org/10.1016/j.puhe.2017.07.035

4. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *Gen Psychiatry*. 2020;33(2):e100213.

5. Yao H, Chen J-H, Xu Y-F. Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry*. 2020;7(4):e21. https://doi.org/10.1016/S2215-0366(20)30090-0

6. Weissman JS, Pratt LA, Miller EA, Parker JD. Serious psychological distress among adults, United States, 2009–2013. US Department of Health and Human Services, Centers for Disease Control and Prevention. 2015. Available at: https://www.cdc.gov/nchs/data/databriefs/db203.pdf. Accessed August 21, 2020.

7. Kiely KM, Leach LS, Olesen SC, Butterworth P. How financial hardship is associated with the onset of mental health problems over time. *Soc Psychiatry Psychiatr Epidemiol*. 2015;50(6):909–918. https://doi.org/10.1007/s00127-015-1027-0

8. Wickrama KAS, Surjadi FF, Lorenz FO, Conger RD, O'Neal CW. Family economic hardship and progression of poor mental health in middle-aged husbands and wives. *Fam Relat*. 2012;61(2):297–312. https://doi.org/10.1111/j.1741-3729.2011.00697.x

9. Mojtabai R, Chen L-Y, Kaufmann CN, Crum RM. Comparing barriers to mental health treatment and substance use disorder treatment among individuals with comorbid major depression and substance use disorders. *J Subst Abuse Treat*. 2014;46(2):268–273. https://doi.org/10.1016/j.jsat.2013.07.012

10. Simpson A. Coronavirus recession looms, its course "unrecognizable." *New York Times*. March 21, 2020. Available at: https://www.nytimes.com/2020/03/21/business/economy/coronavirus-recession.html. Accessed March 22, 2020.

11. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res*. 2020;287:112934. https://doi.org/10.1016/j.psychres.2020.112934

12. Alattar L, Messel M, Rogofsky D. An introduction to the Understanding America Study Internet panel. *Soc Secur Bull*. 2018;78(2):13.

13. Löwe B, Wahl I, Rose M, et al. A 4-item measure of depression and anxiety: validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*. 2010;122(1-2):86–95. https://doi.org/10.1016/j.jad.2009.06.019

14. Kroenke K, Spitzer RL, Williams JBW, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ–4. *Psychosomatics*. 2009;50(6):613–621. https://doi.org/10.1176/appi.psy.50.6.613.

15. Van de Velde S, Levecque K, Bracke P. Measurement equivalence of the CES-D 8 in the general population in Belgium: a gender perspective. *Arch Public Health*. 2009;67(1):15–29. https://doi.org/10.1186/0778-7367-67-1-15

16. Johns Hopkins University. Coronavirus COVID-19 global cases. 2020. Available at: https://coronavirus.jhu.edu/map-faq.html. Accessed March 22, 2020.

17. Lumley T. Analysis of complex survey samples. *J Stat Softw*. 2004;9(8):1–19. https://doi.org/10.18637/jss.v009.i08

18. RStudio: Integrated Development for R. Boston, MA: RStudio Team; 2016.

19. National Cancer Institute. Health Information National Trends Survey - PHQ-4 Total Score. 2020. Available at: https://hints.cancer.gov/view-questions-topics/question-details.aspx?qid=1182. Accessed March 22, 2020.

20. Suokas K, Koivisto A-M, Hakulinen C, et al. Association of income with the incidence rates of first psychiatric hospital admissions in Finland, 1996–2014. *JAMA Psychiatry*. 2019;77(3):274–284. https://doi.org/10.1001/jamapsychiatry.2019.3647

21. Breslau J, Kendler KS, Su M, Gaxiola-Aguilar S, Kessler RC. Lifetime risk and persistence of psychiatric disorders across ethnic groups in the United States. *Psychol Med*. 2005;35(3):317–327. https://doi.org/10.1017/S0033291704003514

22. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):593–602. https://doi.org/10.1001/archpsyc.62.6.593

23. Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month *DSM-IV* disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):617–627. https://doi.org/10.1001/archpsyc.62.6.617

24. Regier DA, Farmer ME, Rae DS, et al. One-month prevalence of mental disorders in the United States and sociodemographic characteristics: the Epidemiologic Catchment Area study. *Acta Psychiatr Scand*. 1993;88(1):35–47. https://doi.org/10.1111/j.1600-0447.1993.tb03411.x

25. Keyes CLM. The Black–White paradox in health: flourishing in the face of social inequality and discrimination. *J Pers*. 2009;77(6):1677–1706. https://doi.org/10.1111/j.1467-6494.2009.00597.x

26. McGuire TG, Miranda J. New evidence regarding racial and ethnic disparities in mental health: policy implications. *Health Aff (Millwood)*. 2008;27(2):393–403. https://doi.org/10.1377/hlthaff.27.2.393

27. Laurencin CT, McClinton A. The COVID-19 pandemic: a call to action to identify and address racial and ethnic disparities. *J Racial Ethn Health Disparities*. 2020:7(3):398–402. https://doi.org/10.1007/s40615-020-00756-0

28. Yancy CW. COVID-19 and African Americans. *JAMA*. 2020;323(19):1891. https://doi.org/10.1001/jama.2020.6548

29. Reger MA, Stanley IH, Joiner TE. Suicide mortality and coronavirus disease 2019—a perfect storm? *JAMA Psychiatry*. 2020; epub ahead of print April 10, 2020. https://doi.org/10.1001/jamapsychiatry.2020.1060

30. Zhou X, Snoswell C, Harding L, et al. The role of telehealth in reducing the mental health burden from COVID-19. *Telemed e-Health*. 2020;26(4):377–379. https://doi.org/10.1089/tmj.2020.0068

31. Liu S, Yang L, Zhang C, et al. Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatry*. 2020;7(4):e17–e18. https://doi.org/10.1016/S2215-0366(20)30077-8

32. Yang Y, Li W, Zhang Q, Zhang L, Cheung T, Xiang Y-T. Mental health services for older adults in China during the COVID-19 outbreak. *Lancet Psychiatry*. 2020;7(4):e19. https://doi.org/10.1016/S2215-0366(20)30079-1

33. Send in the therapists? *Lancet Psychiatry*. 2020;7(4):291. https://doi.org/10.1016/S2215-0366(20)30102-4

34. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395(10227):912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

35. Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *Lancet Psychiatry*. 2020;7(4):300–302. https://doi.org/10.1016/S2215-0366(20)30073-0