Anticipated mental health consequences of COVID-19 in a nationally-representative sample: Context, coverage, and economic consequences

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ABSTRACT

The COVID-19 pandemic will have long-term consequences due to social and economic disruption. This study aimed to understand the contextual, media, and economic factors associated with anticipated mental health consequences from the COVID-19 pandemic among Americans. A nationally representative survey of 1001 respondents was conducted in April 2020. Chi-square tests and logistic regressions examined anticipated emotional or psychological effects on respondents or members of their households should social distancing measures continue. Specific analyses focused on: 1) *COVID-19 experience* - knowing someone or being infected; living in a state with a high death rate; or state social distancing policies; 2) *media exposure* - source of coronavirus information and time spent on coronavirus news; and 3) *economics* - current economic effects; and anticipated long-term financial effects. 41% of respondents anticipated mental health consequences. Living in a state with a greater COVID-19 death rate (OR 1.73; 95% CI 1.10, 2.72) and anticipating long-term financial difficulties (OR 2.98; 95% CI 1.93, 4.60) were both associated with greater likelihood of anticipated mental health consequences. Those whose primary news source was television, as opposed to print or online, were almost 50% less likely to anticipate mental health challenges (OR 0.52 CI 0.33, 0.81), while those who reported spending two or more hours daily on COVID-19 news were 90% more likely (OR 1.90; 95% CI 1.27, 2.85). Aspects of community health, media consumption, and economic impacts influence anticipated poor mental health from the COVID-19 pandemic, suggesting each domain is relevant to interventions to address the consequences.

1. Introduction

The current pandemic of an acute respiratory disease caused by the novel coronavirus (COVID-19) has disrupted all aspects of normal societal functioning as governments grapple to contain its spread. As of this writing, there are 31,120,980 confirmed cases and 961,656 deaths, nearly one-quarter of which have occurred in the United States alone (2020). First identified in December 2019 in the city of Wuhan, Hubei Province, central China, the virus has since spread to nearly every country around the globe and proliferated through community transmission. Officials have implemented social distancing measures in an effort to slow transmission and "flatten the curve" to reduce the burden of COVID-19 on healthcare systems. These regulatory actions have

forced millions of people to quarantine in their homes and minimize social interaction as non-essential institutions remain closed or operate remotely and/or at limited capacity for the foreseeable future. The consequences of these actions are far reaching, shifting economics, social norms, and health.

Historically, pandemics such as COVID-19 have lasting impacts beyond the viral infection itself in the form of long-term physical and mental health effects. In terms of mental health, studies have documented greater prevalence of symptoms such as anxiety, depression, post-traumatic stress, grief, substance abuse, anger, self-stigmatization, suicidality, and psychosis among survivors, caregivers, healthcare workers, and the general public during and after recent pandemics such as the 2003 severe acute respiratory syndrome (SARS); 2009 swine flu

(H1N1); 2014–2016 West African Ebola virus; and 2015–2016 Zika virus (de Souza et al., 2018; dos Santos Oliveira et al., 2016; Elizarraras-Rivas et al., 2010; Gardner and Moallef, 2015; Gu et al., 2015; Hossain et al., 2020; Huremović, 2019; Jalloh et al., 2018; James et al., 2019; Ji et al., 2017; Lee et al., 2007; Mak et al., 2009; Mohammed et al., 2015; Paladino et al., 2017; Ricci Cabello et al., 2020; Tucci et al., 2017; Wiwanitkit, 2017). A 2008 longitudinal study by Bonanno, et al. among hospitalized SARS survivors identified four trajectories of psychological functioning similar to those observed among survivors of natural hazards: chronic dysfunction, delayed dysfunction, recovery, and resilience (Bonanno et al., 2008). Public health researchers across the world have galvanized to understand the psychological implications of COVID-19 amidst the widespread fear, loss, and disruption it has created in communities worldwide. Several studies have documented elevated rates of anxiety, stress, depression, paranoia, sleep difficulties, domestic violence, and alcohol use associated with COVID-19 (Ahmed et al., 2020; Bradbury-Jones and Isham, 2020; González-Sanguino et al., 2020; Rajkumar, 2020; Rossi et al., 2020; Roy et al., 2020; Wang et al., 2020a; Wang et al., 2020b; Zhang and Ma, 2020). One study of fertility patients in New York City found that among the 50% whose treatment cycles were cancelled, 85% felt moderately to severely upset and 22% rated the feelings as being equivalent to losing a child (Turocy et al., 2020).

Several factors contribute to the mental health status of the population during and after a pandemic. Most prominently, research has shown that "proximity to and survival from life-threatening events (in this case illness) are known risk factors for the development of trauma-based disorders, including acute stress disorder and posttraumatic stress disorder" as is commonly seen among frontline healthcare workers and caregivers of those who are ill (Jun et al., 2020; Levin, 2019; Sritharan and Sritharan, 2020). Existing work has attempted to characterize the current and anticipated challenges for mental health as a result of COVID-19 and its consequences into a conceptual model, which identifies potential for fear, distress, anxiety, depression, sleep disorders, panic attacks, adjustment disorders, and suicidal ideation in the short term, along with long-term post-traumatic stress, grief, and depression (Ransing et al., 2020).

Shorter term consequences are affiliated with media exposure and poor communication, while longer term consequences are expected as a result of economic and personal loss. Psychologists and psychiatrists argue that poor mental health symptoms are exacerbated by extensive media exposure to a constant stream of both accurate and fake news that incite feelings of confusion, uncertainty, and panic (Fiorillo and Gorwood, 2020; Garfin et al., 2020; Hamouche, 2020). According to Brooks et al. (2020), determinants of stress include extended periods of quarantine, fears of contracting infection, feelings of frustration and boredom, insufficient information and supplies, stigma, and financial loss (Brooks et al., 2020). The economic downturn associated with social distancing has forced at least 36 million, or one in five Americans, to file for unemployment benefits in the course of merely six weeks, leaving many without health insurance or means to pay for basic necessities (Chaney and King, 2020). Many of these applicants, who are disproportionately low-income, racial/ethnic minorities, and women, have yet to receive promised financial assistance (Cohen, 2020). Studies of populations during and after pandemics have shown that income loss, inability to work, and inadequate insurance and compensation are strongly associated with acute and chronic emotional distress and psychological disorders (Hamouche, 2020; Mihashi et al., 2009; Tam et al., 2004; Zhang and Ma, 2020). Several U.S. states have begun to reopen their economies to lessen the social and financial burden of the pandemic on their residents. However, the relaxation of social distancing will almost certainly instigate a new rise in COVID-19 cases and deaths.

The current pandemic may be the perfect storm to impact the emotional health of the population. Changes to the ways in which people interact with each other, exposure to the media environment, and threats to economic health have all been found to have vast

consequences on mental health outcomes. What is not yet clear is which of these factors are most influential on emotional health and how, if at all, they interact. This study therefore considered several factors drawn from the literature that may be associated with mental health consequences of COVID-19 for individuals and their family members among a representative sample of Americans. The analyses considered both current experience with the virus, media, and economic loss, as well as anticipated mental health consequences, consistent with the Emotional Epidemic Curve proposed by Ransing et al. (2020) to test the fundamental hypothesis that each of these domains would have an independent effect on mental health consequences of COVID-19. The Emotional Epidemic Curve has two peaks, the first of which is "associated with inadequate communication, misinformation, myths and fake news," where rapid growth in COVID-19 cases may cause a litany of mental health issues, including fear, anxiety, panic attacks, and obsessive-compulsive disorder. The first peak is followed by a dipping point of emotional distress in those countries that demonstrate community resilience. The second peak "can be unpredicted and complex, occurring due to the death of loved ones, economic damage and marked social disruption" with mental health disorders such as post-traumatic stress disorder, depression, suicide, complicated grief bereavement, and relapse of pre-existing mental health disorders (Ransing et al., 2020). The main factors of consideration include personal and geographic context, such as knowing someone who has contracted COVID-19 and state social distancing policies; the extent and sources of information from various media outlets; and economic conditions such as reduced employment and income during the pandemic and anticipated long-term losses extending into the recovery period.

2. Methods

2.1. Sampling and recruitment

The research team provided questions to Social Science Research Services (SSRS) for inclusion in a broader data collection instrument. The SSRS Opinion Panel is a nationally representative probability-based web panel weighted to the adult general population. Data were collected by SSRS between April 8 through April 13, 2020 via the SSRS Opinion Panel ($n = 1001$). Participants were given a $5 electronic gift card by SSRS for their time. SSRS Opinion Panel members were randomly recruited in two ways: (1) from a dual-frame random digit dial (RDD) sample, through the SSRS Omnibus Survey platform; and (2) through invitations mailed to respondents randomly sampled from an Address-Based Sample (ABS). Further information on recruitment is available elsewhere. A total of 2001 invitations were sent to the panel and 1001 completed the survey for a response rate of 50.02%. Further information on SSRS procedures can be found elsewhere (Czyzewicz, 2020).

2.2. Weighting

Data were weighted by SSRS and given to the research team to provide nationally representative and projectable estimates of the U.S. adult population 18 years of age and older using both a base weight assigned at the time the individual joined the online panel depending on how they were recruited (Omnibus or ABS) and a post-stratification weight to balance the demographic profile of the sample to the target population parameters. Data were weighted to marginal distributions of sex, age, education, race/ethnicity, census region, and civic engagement. The sex, age, education, race/ethnicity and region benchmarks were based on the 2019 Current Population Survey data; civic engagement was based on the 2017 Current Population Survey data. Weights were trimmed at the 2nd and 98th percentiles to prevent individual interviews from having undue influence on the final results. Margin of error is $+/- 4.4\%$.

2.3. Measures

2.3.1. Dependent variable

The dependent variable was a dichotomous variable based on responding yes to the survey item: "If social distancing policies like school and work closures continue through the summer, what do you think the long-term consequences will be for your household? There will be significant emotional or psychological effects on you or members of your household." The reference category was responding no to this survey item.

2.3.2. Independent variables

The first independent variables explored were personal and contextual experience with the virus. These categories were defined based on three independent variables: knowing someone infected with the virus (ref. self or family infected, friend infected, not knowing anyone affected); living in a state with a relatively high death rate per 100,000 (ref. state death rate is less than 1000 per 100,000 vs. death rate is greater than 1000 per 100,000); and state social distancing policies categorized as minimal (ref.) (defined as one or fewer of the following policies: non-essential business closure and banning gatherings of any size and bar/restaurant closure), moderate (defined as any two of the following policies: non-essential business closure and banning gatherings of any size and bar/restaurant closure), or maximal (defined as non-essential business closure and banning gatherings of any size and bar/restaurant closure).

Independent variables also included both source and frequency of engagement with media coverage. Primary source of information on coronavirus was based on the response to a survey item asking, "What is your primary source of information on coronavirus?" and an indicator variable was created with the following categories: News media in print/online (ref.), Television, Twitter/Facebook/Word of Mouth, and Other. Time spent on coronavirus news per day was dichotomized as one or fewer hours (ref.) or two or more hours based on the distribution of the raw variable.

To explore the role of economic conditions on anticipated mental health consequences, variables were included for current economic loss due to COVID-19, as well as anticipated losses. An indicator variable of currently experiencing a negative economic impact of coronavirus (including whether the respondent lost employment due to the coronavirus; had work hours cut due to the coronavirus; or had pay cut due to the coronavirus) compared to those experiencing none of these effects was created. Also included was an additional indicator variable of anticipated long-term financial impacts of coronavirus (It will drain savings and/or retirement funds; You will go into debt to pay your bills) compared to no anticipated financial consequences (ref).

2.3.3. Sociodemographic variables

Several additional variables were explored to determine where there were independent effects of context, media, and economics beyond simply sociodemographics. These included age (ref. 18–29, 30–49, 50–64, 65+); race/ethnicity (ref. White, African American, Hispanic, Other including refusals); sex (ref. Male, Female); income (ref. less than $30,000 annually, $30,000–$100,000, and over $100,000); political party (ref. Republican, Democrat, Independent/Other); parental status (ref no child in household, child in household); and ages of children in the household (ref no child under 18, only children under 6, only children ages 6–11, only children ages 12–17, and children of multiple ages). Although both variables pertaining to children were tested in the final models, only the dichotomous parental status variable was chosen for inclusion in multivariate models due to their collinearity.

2.4. Approach

First, chi-squared tests and unadjusted and adjusted logistic regressions were conducted to examine the association between disease context, media coverage, and economic consequences and anticipated mental health consequences. Models were then built based on the hypothesis that each of the three domains would have an independent association with anticipated mental health consequences of the COVID-19 pandemic. Collinearity of variables were checked prior to engagement in model building and no multicollinearity was identified, particularly among the exposure and state-level variables. The first model explored only sociodemographics, then the disease experience context variables were added (Model 2), followed by economic considerations (Model 3), and media coverage (Model 4). All analyses were conducted in Stata 15 (StataCorp, College Station, TX) and weighted using complex survey weights. The Hosmer-Lemeshow test for goodness of fit using Stata's estat gof command was used (Archer and Lemeshow, 2006). Based on prior work by the authors related to demographics and media use, a series of interaction terms related to sociodemographics and source of information, and an interaction term between primary source of information and time spent consuming media related to COVID-19, were also tested (Piltch-Loeb, Merdjanoff, Abramson 2019). These terms were not significant at the $p = 0.05$ level and were thus excluded from further analyses.

3. Results

Overall, 41% of respondents anticipated mental health consequences for themselves or a member of their household if social distancing measures were to continue through the summer. Table 1 presents the population distribution of each of the dependent and independent variables. Twenty-one percent of respondents were ages 18–29, 33% were 30–49, 25% were 50–64 and 20% were 65 years and older. A majority of respondents were female (52%) and White (62%). Slightly more than a quarter (26%) of respondents reported household incomes of $30,000 annually, while 37% earned between $30,000 and $100,000 or more than $100,000, respectively. Most respondents identified as politically Independent/Other (39%), 27% identified as Republican, and 33% identified as Democrat. A majority did not have children living with them in the household (72%), had not been infected with COVID-19 themselves nor knew anyone infected (77%) and lived in a state with a death rate of less than 1000 per 100,000 (76%). Nearly half (47%) lived in states with maximal social distancing policies. Regarding economic conditions, 28% had experienced negative economic consequences, while 36% had gone into debt or drained their savings due to the COVID-19 epidemic. Most respondents received their COVID-19 information from television (46%) or news media in print or online (33%), while only 12% received information from Twitter, Facebook or word of mouth. A majority (53%) reported consuming two or more hours of media daily.

Table 2 shows the results of chi-squared tests of association of anticipated mental health effects with contextual, economic, and media factors. There were associations that increased the proportion of those who anticipated mental health consequences, including age, annual household income, children in the household and those children's ages, knowing someone infected with COVID-19, going into debt/draining savings, and source of information. The two youngest age groups (18–29 and 30–49-year-olds) had the highest proportion of anticipated mental health consequences. Females had a higher proportion of anticipated mental health effects (44%) compared to males (38%). Those with an annual household income of $30,000–$100,000 had a greater proportion of anticipated mental health effects (47%) compared to the lowest (33%) and highest (38%) household incomes. Those with children had a higher proportion of anticipated mental health effects (54%) than those without children in the household. Parents or guardians of children ages 6 to 11 had the highest proportion of anticipated mental health effects (66%), followed by those with children ages 12 to 17 (54%). Knowing someone infected with the disease, whether oneself or a family member (52%) or friend (51%) was associated with anticipated mental health effects. Those who had gone into debt or drained their savings had a

Table 1
Descriptive characteristics of SSRS study sample, $N = 1001$.

	n (weighted %)
Mental health effects to self or household	
No	544 (0.59)
Yes	457 (0.41)
Age[1]	
18–29	164 (0.21)
30–49	383 (0.33)
50–64	250 (0.25)
65+	195 (0.20)
Sex[1]	
Male	469 (0.48)
Female	529 (0.52)
Race/ethnicity	
White	700 (0.62)
African American	71 (0.11)
Hispanic	126 (0.16)
Other/refused	104 (0.11)
Annual household Income[a]	
<$30 k	187 (0.26)
$30-$100 k	372 (0.37)
$100 k+	425 (0.37)
Political party	
Republican	280 (0.27)
Democrat	338 (0.33)
Independent/other	383 (0.39)
Parent	
No children in household	739 (0.72)
Child in household	289 (0.28)
Ages of children in household	
No children in household	726 (0.70)
Only children younger than 6	67 (0.07)
Only children ages 6–11	47 (0.05)
Only children ages 12–17	80 (0.08)
Children of multiple ages	108 (0.11)
Know someone infected	
Self or family	60 (0.07)
Friend	241 (0.16)
No one	700 (0.77)
State death rate	
<1 k per 100 k	746 (0.76)
>1 k per 100 k	282 (0.24)
State social distancing Policies[a]	
Minimal	237 (0.24)
Moderate	297 (0.28)
Maximal	467 (0.47)
Current negative economic consequence	
No	746 (0.72)
Yes	282 (0.28)
Go into debt or drain savings	
No	677 (0.64)
Yes	351 (0.36)
Sources of information on Coronavirus[a]	
News media in print/online	374 (0.33)
TV	425 (0.46)
Twitter/Facebook/word of mouth	104 (0.12)
Other (inc. radio)	96 (0.09)
Time spent on media	
One hour or less	476 (0.47)
Two or more	525 (0.53)

[a] Totals may not add up to N due to missing values.

higher proportion of anticipated mental health effects (57%) than those who had not experienced financial effects. Lastly, those who reported consuming information primarily through news media, Twitter/Facebook, or other sources like the radio had a higher proportion of anticipated mental health effects (49%) than those who primarily watched television for their news (31%).

Table 2 also presents the unadjusted logistic regressions of each variable and the dependent variable of interest. Several independent factors increased the likelihood of reporting anticipated mental health effects. Females were 27% more likely than males (95% CI 0.89, 1.81); middle income earners were 78% more likely than lower income respondents (95% CI 1.07, 2.95); Democrats were 55% more likely than

Table 2
Bivariate Analysis and Unadjusted Regressions of Anticipated Mental Health Effects.

	Mental health effects to self or household			
	No (%)	Yes (%)	OR (SE)	95% CI
Age				
18–29	0.50	0.50	1.0 (ref)	
30–49	0.48	0.52	1.10 (0.28)	0.67, 1.82
50–64	0.70	0.30	0.43 (0.12)	0.25, 0.74
65+	0.72	0.28	0.41 (0.13)	0.22, 0.74
Sex				
Male	0.62	0.38	1.0 (ref)	
Female	0.56	0.44	1.27 (0.23)	0.89, 1.81
Race/ethnicity				
White	0.60	0.40	1.0 (ref)	
African American	0.58	0.42	1.09 (0.38)	0.55, 2.18
Hispanic	0.61	0.39	0.96 (0.25)	0.58, 1.59
Other/refused	0.53	0.47	1.31 (0.36)	0.76, 2.26
Annual household income				
<$30 k	0.67	0.33	1.0 (ref)	
$30-$100 k	0.53	0.47	1.78 (0.46)	1.07, 2.95
$100 k+	0.62	0.38	1.24 (0.31)	0.76, 2.03
Political party				
Republican	0.66	0.34	1.0 (ref)	
Democrat	0.55	0.45	1.55 (0.36)	0.98, 2.46
Independent/other	0.58	0.42	1.40 (0.32)	0.89, 2.18
Parent				
No children in household	0.64	0.36	1.0 (ref)	
Child in household	0.46	0.54	1.97 (0.45)	1.26, 3.08
Ages of children in household				
No children in household	0.58	0.42	1.0 (ref)	
Only children younger than 6	0.51	0.49	1.33 (0.35)	0.79, 2.23
Only children ages 6–11	0.34	0.66	2.65 (0.83)	1.44, 4.89
Only children ages 12–17	0.46	0.54	1.59 (0.38)	1.00, 2.53
Children of multiple ages	0.49	0.51	1.42 (0.28)	0.96, 2.10
Know someone infected				
Self or family infected	0.48	0.52	1.0 (ref)	
Friend or acquaintance infected	0.49	0.51	0.79 (0.32)	0.36, 1.75
Don't know anyone infected	0.62	0.38	0.49 (0.18)	0.23, 1.02
State death rate				
Less than 1 k per 100 k	0.61	0.39	1.0 (ref)	
Greater than 1 k per 100 k	0.52	0.48	1.45 (0.29)	0.98, 2.16
State social distancing policies				
Minimal	0.64	0.36	1.0 (ref)	
Moderate	0.56	0.44	1.38 (0.35)	0.84, 2.28
Maximal	0.59	0.41	1.23 (0.29)	0.78, 1.95
Current negative economic consequence				
No	0.61	0.39	1.0 (ref)	
Yes	0.54	0.46	1.35 (0.27)	0.91, 1.99
Go into debt or drain savings				
No	0.68	0.32	1.0 (ref)	

(continued on next page)

Table 2 (*continued*)

	Mental health effects to self or household			
	No (%)	Yes (%)	OR (SE)	95% CI
Yes	0.43	0.57	2.82 (0.54)	1.94, 4.09
Sources of coronavirus information				
News media in print/online	0.51	0.49	1.0 (ref)	
TV	0.69	0.31	0.46 (0.09)	0.31, 0.69
Twitter/ Facebook/word of mouth	0.51	0.49	0.98 (0.31)	0.53, 1.83
Other (inc. radio)	0.51	0.49	0.99 (0.33)	0.52, 1.89
Time spent on media				
One hour or less	0.61	0.39	1.0 (ref)	
Two or more	0.57	0.43	1.18 (0.21)	0.83, 1.68

OR = Odds Ratio; SE = Standard Error; CI = Confidence Interval.

Republicans (95% CI 0.98, 2.46); and those who had reported going into debt or draining their savings were nearly three times (OR 2.82; 95% CI 1.94, 4.09) more likely than those who did not to anticipate mental health consequences. Those with children in the household were 97% more likely than those without children (95% CI 1.26, 3.08) and those with children ages 6 to 11 were over twice as likely (OR 2.65; 95% CI 1.44, 4.89) to anticipate mental health consequences. Only two factors were protective: the two oldest age groups of 50–64 (OR 0.43; 95% CI 0.25, 0.74) and 65+ (OR 0.41; 95% CI 0.22, 0.74) were nearly 60% less likely than the youngest group (18–29) to anticipate mental health consequences, while those whose main source of information was television were more than 50% less likely than print or online news media consumers to report anticipated mental health consequences (OR 0.46; 95% CI 0.31, 0.69).

Table 3 shows five models that explore the relationship between demographics, virus experience, economic considerations, and media experience. Each model is described below.

Model 1 includes only demographics. Age, income, and political party were associated with the outcome of interest.

Model 2 adds virus experience to demographic factors. Demographic relationships were relatively unattenuated, and there were no notable associations for viral experience, which included knowing someone infected, living in a state with a high death rate, or having a certain degree of state level social distancing policies.

Model 3 includes demographics, viral experience, and economic experience. Adding economic experience attributable to the virus to demographics and viral experience showed several associations with the outcome of interest.

Model 4 includes demographics, viral experience, and media. Age and income are the only notable demographic factors.

Model 5 is the full model that includes demographics, viral experience, economic experience, and media. This model identified associations between age, income, political party, state death rate, anticipated economic consequences, primary source of information, and time spent on media on anticipated mental health challenges. Compared to younger adults (18–29), 50–64-year-olds (OR 0.39; 95% CI 0.21, 0.73), and those 65 and older (OR 0.40; 95% CI 0.20, 0.78) were less likely to anticipate adverse mental health consequences. Those in the middle-income bracket of $30,000–$100,000 (OR 2.03; 95% CI 1.17, 3.52) were twice as likely to anticipate mental health challenges, and Democrats were 70% more likely than Republicans to anticipate mental health challenges as a result of social distancing (OR 1.69; 95% CI 1.01, 2.84). Living in a state with a higher death rate from coronavirus was associated with an over 70% increase in anticipated mental health challenges (OR 1.73; 95% CI 1.10, 2.72). People who anticipated going into debt or

having their savings drained nearly three times more likely to anticipate mental health consequences (OR 2.98; 95% CI 1.93, 4.60). Compared to those whose primary source of information was news in print or online, those whose primary source was television were almost 50% less likely to anticipate mental health challenges (OR 0.52; 95% CI 0.33, 0.81), and people spending two or more hours a day on COVID-19 news were 90% more likely to anticipate mental health challenges (OR 1.90; 95% CI 1.27, 2.85). Table 4 shows the results of the goodness of fit tests for the weighted multivariate logistic regression models. Full models were better fit compared to demographic only models.

4. Discussion

The goal of this analysis was to understand the influence of personal and geographic context, media coverage, and economic consequences of the COVID-19 pandemic on anticipated mental health consequences for adults living in the United States. These factors have each been found to be associated with mental health consequences in prior pandemics, but few analyses have teased out these components to try and understand how each aspect of the pandemic experience may impact anticipated mental health consequences. It is important to distinguish these characteristics in order to inform future interventions in the policy, media, and economic sectors that could mitigate poor mental health outcomes. These results suggest that there are four potential mechanisms that are currently shaping anticipated mental health consequences of the COVID-19 pandemic: witnessing the communal effects of the virus by living in a state with a high death rate; main source of information and time spent on COVID-19 coverage; and anticipated household economic consequences. These results are consistent with Ransing, et al.'s Emotional Epidemic Curve, where peaks in mental health issues and disorders are associated with contextual factors such as widespread local COVID-19 transmission and death, proliferation of myths and fake news, and economic damage (Ransing et al., 2020). As each factor is associated with greater anticipated mental health consequences, each is a critical intervention pathway that policymakers, healthcare providers, and government officials can target to improve the potential long-term psychological consequences of this epidemic on U.S. adults.

There are possible explanations for the demographic related findings presented here. Older adults tend to report lower levels of anxiety and psychological distress than younger age groups. This can be attributed to the inoculation hypothesis, which posits that older adults exhibit greater resilience to collective stressors due to their life histories of challenging experiences and arsenal of coping mechanisms (Merdjanoff et al., 2018). Those who are middle-income are more than twice as likely to anticipate mental health consequences compared to lower income individuals. To identify if this finding was explained away by an interaction with anticipated economic loss, an interaction term between the two was tested, but was not significant. This result could therefore be attributed to fewer governmental supports being available for this group, or the possible precarious nature of changing financial means, such that they do not anticipate going into debt, but may need to make financial sacrifices (OECD, 2019). Though we did not find statistical significance, we still hypothesize that there may be an underlying factor that relates to the precarious nature of the situation for middle income families who are struggling to maintain their quality of life and economic health, whereas lower income adults who may be more likely to work in service industry jobs or as essential workers are less impacted. Democrats report higher likelihood of mental health consequences compared to Republicans. It was explored whether this may occur as a result of "blue states" reporting higher cases of coronavirus, thus reflecting the death rate finding where those living in states with greater than 1000 cases per 100,000 were over 70% more likely to anticipate poor mental health. However, the finding was not explained away when including an interaction term between death rate and political party.

Recent findings suggest that widespread media coverage of collective traumas like 9/11, the Ebola outbreak, and the Boston Marathon

Table 3
Multivariate Logistic Regression of Anticipated Mental Health Effects.

	Demographics only		Demographic & virus experience		Demographic, virus experience, & economic considerations		Demographic, virus experience, & media		Demographic, virus experience, economic considerations, & media	
	OR (SE)	95% CI	OR (SE)	95% CI	OR (SE)	95% CI	OR (SE)	95% CI	OR (SE)	95% CI
Age										
18–29	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
30–49	0.94 (0.25)	0.55, 1.60	1.03 (0.28)	0.61, 1.75	1.02 (0.27)	0.61, 1.73	1.03 (0.28)	0.60, 1.77	1.03 (0.28)	0.60, 1.76
50–64	0.41 (0.12)	0.23, 0.73	0.43 (0.13)	0.24, 0.77	0.41 (0.12)	0.23, 0.72	0.42 (0.13)	0.22, 0.78	0.39 (0.12)	0.21, 0.73
65+	0.35 (0.11)	0.19, 0.64	0.38 (0.12)	0.20, 0.70	0.42 (0.14)	0.22, 0.80	0.36 (0.12)	0.19, 0.68	0.40 (0.14)	0.20. 0.78
Sex										
Male	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
Female	1.26 (0.23)	0.88, 1.81	1.29 (0.24)	0.90, 1.86	1.16 (0.22)	0.80, 1.70	1.39 (0.27)	0.96, 2.03	1.27 (0.25)	0.86, 1.87
Race/ethnicity										
White	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
African American	0.86 (0.31)	0.42, 1.76	0.80 (0.31)	0.37, 1.71	0.72 (0.28)	0.34, 0.54	0.78 (0.32)	0.34, 1.76	0.68 (0.29)	0.30, 1.56
Hispanic	0.60 (0.16)	0.35, 1.03	0.64 (0.17)	0.38, 1.09	0.56 (0.16)	0.32, 0.96	0.68 (0.19)	0.39, 1.18	0.59 (0.17)	0.34, 1.03
Other/refused	1.10 (0.31)	0.64, 1.91	1.10 (0.30)	0.64, 1.89	1.02 (0.29)	0.59, 1.77	1.03 (0.29)	0.59, 1.79	0.94 (0.26)	0.54, 1.62
Annual HH income										
<$30 k	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
$30-$100 k	2.10 (0.56)	1.25, 3.53	1.90 (0.51)	1.12, 3.23	1.96 (0.54)	1.14, 3.37	1.98 (0.54)	1.16, 3.39	2.03 (0.57)	1.17, 3.52
$100 k+	1.54 (0.41)	0.92, 2.60	1.32 (0.36)	0.78, 2.24	1.54 (0.43)	0.90, 2.66	1.36 (0.38)	0.79, 2.34	1.59 (0.45)	0.91, 2.77
Political party										
Republican	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
Democrat	1.75 (0.47)	1.03, 2.96	1.69 (0.45)	1.01, 2.85	1.68 (0.45)	0.99, 2.86	1.66 (0.43)	1.00, 2.77	1.69 (0.45)	1.01. 2.84
Ind/other	1.36 (0.33)	0.84, 2.20	1.26 (0.31)	0.79, 2.03	1.19 (0.29)	0.74, 1.93	1.19 (0.29)	0.74, 1.91	1.14 (0.28)	0.71, 1.84
Parent										
No children in hh	1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
Child in hh	1.49 (0.35)	0.95, 2.36	1.51 (0.35)	0.96, 2.38	1.49 (0.34)	0.95, 2.34	1.51 (0.36)	0.94, 2.42	1.49 (0.35)	0.94, 2.35
Know someone infected										
Self or family			1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
Friend			0.82 (0.34)	0.36, 1.87	0.80 (0.34)	0.35, 1.82	0.89 (0.39)	0.38, 2.09	0.85 (0.37)	0.37, 1.98
No one			0.56 (0.22)	0.26, 1.20	0.53 (0.21)	0.24, 1.16	0.63 (0.25)	0.29, 1.39	0.60 (0.24)	0.27, 1.31
State death rate										
<1 k per 100 k			1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
>1 k per 100 k			1.48 (0.33)	0.96, 2.29	1.55 (0.35)	0.99, 2.42	1.64 (0.37)	1.05, 2.57	1.73 (0.40)	1.10, 2.72
State social distancing policies										
Minimal			1.0 (ref)		1.0 (ref)		1.0 (ref)		1.0 (ref)	
Moderate			1.45 (0.38)	0.87, 2.44	1.43 (0.37)	0.85, 2.38	1.48 (0.41)	0.86, 2.54	1.46 (0.39)	0.86, 2.47
Maximal			1.09 (0.27)	0.67, 1.78	1.01 (0.25)	0.61, 1.65	1.08 (0.28)	0.65, 1.78	0.99 (0.25)	0.60, 1.63
Current econ loss										
No					1.0 (ref)				1.0 (ref)	
Yes					0.89 (0.20)	0.57, 1.38			0.87 (0.19)	0.56, 1.34
Go into debt or drain savings										
No					1.0 (ref)				1.0 (ref)	
Yes					2.80 (0.61)	1.82, 4.29			2.98 (0.66)	1.93, 4.60
Sources of corona. Info										
News media in print/online							1.0 (ref)		1.0 (ref)	
TV							0.55 (0.12)	0.36, 0.84	0.52 (0.12)	0.33, 0.81
Twitter/Facebook/Word of mouth							0.69 (0.25)	0.34, 1.41	0.70 (0.24)	0.36, 1.37
Other (inc. radio)							0.92 (0.30)	0.49, 1.73	0.91 (0.28)	0.50, 1.68
Time spent on med.										
One hour or less							1.0 (ref)		1.0 (ref)	
Two or more							1.79 (0.37)	1.20, 2.68	1.90 (0.39)	1.27, 2.85

OR = Odds Ratio; SE = Standard Error; CI = Confidence Interval.

Table 4
Goodness of Fit Tests for Weighted Multivariate Regression Models.

	Demographics only	Demographic & virus experience	Demographic, virus experience, & economic considerations	Demographic, virus experience, & media	Demographic, virus experience, economic considerations, & media
Goodness-of-fit test	2.67	0.58	0.52	0.45	0.66
p-Value	0.0046	0.8120	0.8611	0.9059	0.7475

bombing can lead to increased stress symptoms (Garfin et al., 2020; Thompson et al., 2017). Additionally, people with the highest levels of concern about coronavirus may be seeking out more media coverage, which can amplify their distress (Garfin et al., 2020). Our results support these findings, as those who reported consuming two hours or more of COVID-19 media coverage had a greater likelihood of anticipating psychological distress. However, those who relied on television as their primary source of information were less likely to anticipate these consequences. This may be due to the way in which people engage with television as a media medium. Television is a more passive form of media, whereby people may not be retaining content to the same degree as when reading print news (Piltch-Loeb et al., 2018). It is important to note that it was tested whether there was an association between living in an area with high COVID-19 death rates and consuming more media, as well as economic consequences and consuming more media, but there were no bivariate relationships. An additional hypothesis may be that particular sociodemographics are more likely to trust in pandemic information, consume more media, and anticipate both the physical and mental health consequences of the event. These hypotheses are impossible to disentangle in this study alone.

It is also important to highlight what this study did not find. The anticipated psychological impacts of COVID-19 are neither related to knowing someone with the virus nor state policies with stringent social distancing guidelines such as the closure of non-essential businesses and bars/restaurants or banning gatherings of any size. While these factors have received significant attention—and rightfully so—these results suggest that they are not the only drivers that must be explored in relation to the mental health consequences of the epidemic.

This study has several limitations. The dependent variable of interest was anticipated mental health challenges, not current mental health challenges, which reflects the potential for a perceived ongoing burden rather than something that is realized. There is an assumption here that that perception is meaningful for those experiencing it and for public health and policy officials. While respondents were asked about their changes in income, they were not asked about changes to their work routines, including remote work, discontinuation of working activities due to lockdown measures, or higher workload due to COVID-19, a factor that has been shown in other research to impact pandemic-related mental health (Rossi et al., 2020). Additionally, respondents were not asked to report on their own or other household members' pre-existing mental health conditions, such as history of clinical anxiety or depression, which could influence anticipated mental health consequences. It is also important to note that pre-existing and anticipated mental health states could be influenced by the mental health services infrastructure that exists within a respondent's state of residence; however, there were not enough observations by state to fully consider this unobservable variable that may have biased results. Several measures were indicator variables, without quantifiable specificity, which may limit the implications of the study. The cross-sectional nature of this study also precludes the ability to ascertain how the influence of contextual, economic, and media factors change and subsequently affect anticipated mental health outcomes as the COVID-19 crisis continues to evolve on a nearly daily basis. It is likely that the psychological implications of the epidemic will change as case counts grow, economic stagnation remains protracted, and the American public alongside the scientific community learns more about the virus's spread and efforts to develop vaccines and treatments.

The psychological reach of COVID-19 extends beyond traditionally understood impacts, and researchers must continue to explore how viral exposure, media consumption, and individual economic impact relate to mental health consequences to most effectively plan future interventions. Key among these findings is the independent contribution of each domain, suggesting multiple factors must be considered in the future. The impacts of this epidemic on the nation's mental health must continue to be investigated, especially as the country enters new phases of mitigation, recovery and preparedness.

Author statement

RPL conceptualized the manuscript, lead data analysis, and did the majority of the writing. AAM provided key methodological and theoretically additions and contributed to writing. GYM contributed to data analysis, writing, and editing.

References

Ahmed, M.Z., Ahmed, O., Aibao, Z., Hanbin, S., Siyu, L., Ahmad, A., 2020. Epidemic of COVID-19 in China and associated psychological problems. Asian J. Psychiatr. 51, 102092.

Archer, K.J., Lemeshow, S., 2006. Goodness-of-fit test for a logistic regression model fitted using survey sample data. Stata J. 6, 97–105.

Bonanno, G.A., Ho, S.M., Chan, J.C., Kwong, R.S., Cheung, C.K., Wong, C.P., Wong, V.C., 2008. Psychological resilience and dysfunction among hospitalized survivors of the SARS epidemic in Hong Kong: a latent class approach. Health Psychol. 27, 659–667.

Bradbury-Jones, C., Isham, L., 2020. The Pandemic Paradox: The Consequences of COVID-19 on Domestic Violence (J Clin Nurs n/a).

Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, G.J., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet 395, 912–920.

Chaney, S., King, K., 2020. Over 3.8 Million Americans Filed for Jobless Benefits Last Week as States Struggle With Coronavirus Claims Surge. Wall Street Journal.

Cohen, P., 2020. Jobless numbers are 'eye-watering' but understate the crisis. New York Times. Accessed at https://www.nytimes.com/2020/04/23/business/economy/unemployment-claims-coronavirus.html.

Czyzewicz, E., 2020. Coronavirus Joint Venture 2020 Methodology Report (SSRS).

dos Santos Oliveira, S.J.G., de Melo, E.S., Reinheimer, D.M., Gurgel, R.Q., Santos, V.S., Martins-Filho, P.R.S., 2016. Anxiety, depression, and quality of life in mothers of newborns with microcephaly and presumed congenital Zika virus infection. Archiv. Women's Mental Health 19, 1149–1151.

Elizarraras-Rivas, J., Vargas-Mendoza, J.E., Mayoral-Garcia, M., Matadamas-Zarate, C., Elizarraras-Cruz, A., Taylor, M., Agho, K., 2010. Psychological response of family members of patients hospitalised for influenza a/H1N1 in Oaxaca, Mexico. BMC Psychiatry 10, 104.

Fiorillo, A., Gorwood, P., 2020. The consequences of the COVID-19 pandemic on mental health and implications for clinical practice. Eur. Psychiatry 63, e32.

Gardner, P.J., Moallef, P., 2015. Psychological impact on SARS survivors: critical review of the English language literature. Can. Psychol. 56, 123–135.

Garfin, D.R., Silver, R.C., Holman, E.A., 2020. The novel coronavirus (COVID-2019) outbreak: amplification of public health consequences by media exposure. Health Psychol. 39, 355–357.

González-Sanguino, C., Ausín, B., Castellanos, M.Á., Saiz, J., López-Gómez, A., Ugidos, C., Muñoz, M., 2020. Mental health consequences during the initial stage of the 2020 coronavirus pandemic (COVID-19) in Spain. Brain Behav. Immun. 87, 172–176.

Gu, J., Zhong, Y., Hao, Y., Zhou, D., Tsui, H., Hao, C., Gao, Q., Ling, W., Lau, J.T., 2015. Preventive behaviors and mental distress in response to H1N1 among university students in Guangzhou, China. Asia Pac. J. Public Health 27, NP1867–79.

Hamouche, S., 2020. COVID-19 and employees' mental health: stressors, moderators and agenda for organizational actions. Emerald Open Res. 2.

Hossain, M.M., Sultana, A., Purohit, N., 2020. Mental health outcomes of quarantine and isolation for infection prevention: a systematic umbrella review of the global evidence. Available at SSRN 3561265.

Huremović, D., 2019. Mental health of quarantine and isolation. In: Huremović, D. (Ed.), Psychiatry of Pandemics. Springer International Publishing, Cham, pp. 95–118.

Jalloh, M.F., Li, W., Bunnell, R.E., Ethier, K.A., O'Leary, A., Hageman, K.M., Sengeh, P., Jalloh, M.B., Morgan, O., et al., 2018. Impact of Ebola experiences and risk perceptions on mental health in Sierra Leone, July 2015. BMJ Glob. Health 3, e000471.

James, P.B., Wardle, J., Steel, A., Adams, J., 2019. Post-Ebola psychosocial experiences and coping mechanisms among Ebola survivors: a systematic review. Tropical Med. Int. Health 24, 671–691.

Ji, D., Ji, Y.J., Duan, X.Z., Li, W.G., Sun, Z.Q., Song, X.A., Meng, Y.H., Tang, H.M., Chu, F., et al., 2017. Prevalence of psychological symptoms among Ebola survivors and healthcare workers during the 2014-2015 Ebola outbreak in Sierra Leone: a cross-sectional study. Oncotarget 8, 12784–12791.

Jun, J., Tucker, S., Melnyk, B.M., 2020. Clinician mental health and well-being during global healthcare crises: evidence learned from prior epidemics for COVID-19 pandemic. Worldviews Evid.-Based Nurs. 17 (3) https://doi.org/10.1111/wvn.12439.

Lee, A.M., Wong, J.G., McAlonan, G.M., Cheung, V., Cheung, C., Sham, P.C., Chu, C.M., Wong, P.C., Tsang, K.W., et al., 2007. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can. J. Psychiatr. 52, 233–240.

Levin, J., 2019. Mental health Care for Survivors and Healthcare Workers in the aftermath of an outbreak. Psychiatry Pandemics 127–141.

Mak, I.W., Chu, C.M., Pan, P.C., Yiu, M.G., Chan, V.L., 2009. Long-term psychiatric morbidities among SARS survivors. Gen. Hosp. Psychiatry 31, 318–326.

Merdjanoff, A.A., Piltch-Loeb, R., Friedman, S., Abramson, D.M., 2018. Housing transitions and recovery of older adults following hurricane Sandy. J. Gerontol. Ser. B 74, 1041–1052.

Mihashi, M., Otsubo, Y., Yinjuan, X., Nagatomi, K., Hoshiko, M., Ishitake, T., 2009. Predictive factors of psychological disorder development during recovery following SARS outbreak. Health Psychol. 28, 91–100.

Mohammed, A., Sheikh, T.L., Gidado, S., Poggensee, G., Nguku, P., Olayinka, A., Ohuabunwo, C., Waziri, N., Shuaib, F., et al., 2015. An evaluation of psychological distress and social support of survivors and contacts of Ebola virus disease infection and their relatives in Lagos, Nigeria: a cross sectional study–2014. BMC Public Health 15, 824.

OECD, 2019. Under Pressure: The Squeezed Middle Class. OECD Publishing, Paris.

Paladino, L., Sharpe, R.P., Galwankar, S.C., Sholevar, F., Marchionni, C., Papadimos, T. J., Paul, E., Hansoti, B., Firstenberg, M., et al., 2017. Reflections on the Ebola public health emergency of international concern, part 2: the unseen epidemic of posttraumatic stress among health-care personnel and survivors of the 2014-2016 Ebola outbreak. J. Global Infect. Dis. 9, 45–50.

Piltch-Loeb, R., Merdjanoff, A.A., Abramson, D.M., 2018. How the US population engaged with and prioritized sources of information about the emerging Zika virus in 2016. Health Secur. 16, 165–177.

Rajkumar, R.P., 2020. COVID-19 and mental health: a review of the existing literature. Asian J. Psychiatr. 52, 102066.

Ransing, R., Adiukwu, F., Pereira-Sanchez, V., Ramalho, R., Orsolini, L., Schuh Teixeira, A.L., Gonzalez-Diaz, J.M., da Costa, M.P., Soler-Vidal, J., et al., 2020. Early career psychiatrists' perspectives on the mental health impact and care of the COVID-19 pandemic across the world. Asian J. Psychiatry 102085.

Ricci Cabello, I., Meneses Echavez, J.F., Serrano-Ripoll, M.J., Fraile-Navarro, D., Fiol de Roque, M.A., Pastor Moreno, G., Castro, A., Ruiz Perez, I., Zamanillo Campos, R., et al., 2020. Impact of viral epidemic outbreaks on mental health of healthcare workers: a rapid systematic review. medRxiv, 2020.04.02.20048892.

Rossi, R., Socci, V., Talevi, D., Mensi, S., Niolu, C., Pacitti, F., Di Marco, A., Rossi, A., Siracusano, A., et al., 2020. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. An N=18147 web-based survey. medRxiv, 2020.04.09.20057802.

Roy, D., Tripathy, S., Kar, S.K., Sharma, N., Verma, S.K., Kaushal, V., 2020. Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. Asian J. Psychiatr. 51, 102083.

de Souza, L.E.C., de Lima, T.J.S., Ribeiro, E.M., Pessoa, A.L.S., Figueiredo, T.C., Lima, L. B.P., 2018. Mental health of parents of children with congenital Zika virus syndrome in Brazil. J. Child Fam. Stud. 27, 1207–1215.

Sritharan, J., Sritharan, A., 2020. Emerging mental health issues from the novel coronavirus (COVID-19) pandemic. J. Health Med. Sci. 3.

Tam, C.W., Pang, E.P., Lam, L.C., Chiu, H.F., 2004. Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. Psychol. Med. 34, 1197–1204.

Thompson, R.R., Garfin, D.R., Holman, E.A., Silver, R.C., 2017. Distress, worry, and functioning following a Global Health crisis: a National Study of Americans' responses to Ebola. Clin. Psychol. Sci. 5, 513–521.

Tucci, V., Moukaddam, N., Meadows, J., Shah, S., Galwankar, S.C., Kapur, G.B., 2017. The forgotten plague: psychiatric manifestations of Ebola, Zika, and emerging infectious diseases. J. Global Infect. Dis. 9, 151–156.

Turocy, J.M., Robles, A., Hercz, D., D'Alton, M., Forman, E.J., Williams, Z., 2020. The emotional impact of the asrm guidelines on fertility patients during the covid-19 pandemic. medRxiv, 2020.03.29.20046631.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C.S., Ho, R.C., 2020a. 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 17.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., McIntyre, R.S., Choo, F.N., Tran, B., Ho, R., et al., 2020b. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. Brain Behav. Immun. 17 (5) https://doi.org/10.3390/ijerph17051729.

Wiwanitkit, V., 2017. Mental health of Zika virus-infected mother and mother of newborn with microcephaly. Indian J. Psychol. Med. 39, 546.

Zhang, Y., Ma, Z.F., 2020. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. Int. J. Environ. Res. Public Health 17, 2381.