



# Pandemic-Related Stress May Be Associated with Symptoms of Poor Mental Health Among African Americans

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## Abstract

The COVID-19 pandemic has disproportionately affected African Americans and has been a significant source of stress for this population due to increased economic hardship and social isolation. This study characterized the associations between COVID-19 vulnerability (e.g., contracting the illness or losing a loved one), pandemic-related stress, and symptoms of poor mental health among African Americans. The study sample included African Americans ( $N=304$ ) who responded to an online survey. Symptoms of poor mental health were assessed using the PHQ-4, which assessed symptoms of depression and anxiety. Vulnerability to COVID-19 was measured via self-report in three ways: (1) personal vulnerability, (2) family vulnerability, and (3) community vulnerability (i.e., friends, neighbors, and co-workers). Pandemic-related stress was measured by asking participants to rate how difficult it has been to access essential resources and services, manage finances, and plan or attend social events since March 13, 2020. Data were analyzed using multivariable logistic regression. Results showed that COVID-19 vulnerability was not associated with symptoms of depression or anxiety, but pandemic-related stress was consistently associated with symptoms of poor mental health. Study findings highlight the need to monitor and intervene on pandemic-related stress to prevent further psychological distress within this vulnerable and underserved population.

**Keywords** African Americans · Poor mental health · COVID-19 · Stress · Financial insecurity

## Introduction

The COVID-19 pandemic has disproportionately affected African Americans in the USA. Compared with Whites, the risk of hospitalization from COVID-19 is almost three times higher for African Americans, and they are twice as likely to die from the virus [1–4]. These disparities are due, in part, to a greater prevalence of preexisting health conditions, such as obesity, diabetes, heart disease, and respiratory problems, which increase the severity and lethality

of COVID-19 infection [5, 6]. This health crisis has also occurred alongside significant economic hardship [7–9] and social isolation [10] for African Americans, and it is important to understand the extent to which the COVID-19 pandemic and the social and economic challenges associated with the pandemic have affected African Americans' mental health because the pandemic may reinforce or exacerbate persistent inequities for the current and next generation of African Americans in the USA. [11]

It is estimated that about 30% of African Americans know a family member or close friend who died from COVID-19, compared with only 15% of Whites [12]. Death from COVID-19 is often sudden and unexpected, and unexpected death in an otherwise healthy loved one can trigger psychological symptoms of depression and anxiety even among bereaved people with no history of mental illness [13, 14]. A recent study comparing mental health in people bereaved due to COVID-19, natural causes, and unnatural causes found that self-reported mental health was worse in people who lost someone from COVID-19 than from natural causes, such as heart disease, cancer, and chronic lower

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respiratory disease. The severity of poor mental health in bereaved people because of a COVID-related death was no different from the severity of poor mental health in those bereaved because of death from unnatural causes, such as an accident, suicide, or homicide [15]. Other studies have shown that people bereaved because of a COVID-related death experience symptoms of anxiety and depression [16, 17]. Therefore, many African Americans may be struggling with poor mental health, including symptoms of anxiety and depression, because of the sudden and unexpected loss of family members and loved ones from COVID-19.

African Americans have also faced significant economic hardship during the COVID-19 pandemic. A recent study found that even after controlling for preexisting inequities between the African American and White populations, African Americans were three times more likely than Whites to report food insecurity, being laid off, or being unemployed [18]. A study that examined food insecurity and mental health among low-income Americans during the COVID-19 pandemic found that food insecurity increased the risk of depression and anxiety by 257% and 253%, respectively. [19] Similar findings were also observed in other studies investigating the impact of food insecurity on mental health during the pandemic [20, 21]. Uncertainty over one's ability to maintain a steady supply of food or acquire food in the future may be a source of chronic stress that increases symptoms of anxiety and depression [22, 23]. Job loss and unemployment may also exacerbate food insecurity because these circumstances further limit a person's ability to provide resources for themselves and their families [24, 25]. Job loss and sustained unemployment may also contribute to financial insecurity [26], and similar to food insecurity, financial insecurity substantially increases the risk of poor mental health, including symptoms of depression and anxiety [27, 28], likely through heightened levels of stress [29]. Thus, challenges related to securing food and financial resources during the pandemic may contribute to poor mental health among African Americans.

Many African Americans have also reduced social interactions or have become socially isolated during the pandemic. For example, many African American churches, which serve as an important hub for socializing, especially for older African Americans, reduced the number of people who were allowed in the church building at the same time and offered church events online, and some churches even closed down entirely because of COVID-related safety concerns [10]. Further, young adults who became unemployed during the pandemic or who attended school virtually may have experienced social isolation and loneliness [30, 31] because many social activities and gatherings were restricted or canceled in favor of people remaining in their homes. [32, 33]

Most studies have focused on the differential impact of the COVID-19 pandemic on mental health between the

African American and White populations [34, 35]. While these studies are beneficial, there are an incalculable number of social and economic inequities between African Americans and Whites at birth and across the lifespan that may overshadow the challenges that have emerged during the pandemic [36]. Examining the health, economic, and social challenges of the pandemic solely within the African American population alone will provide the opportunity to identify which segments of the population are most vulnerable, which will better inform efforts to ameliorate the impact of the pandemic on mental health within this population [37]. Therefore, the purpose of this study is to determine the extent to which the health, economic, and social challenges associated with the pandemic have impacted the mental health of African Americans. We hypothesize personal vulnerability to COVID-19 (e.g., getting tested and contracting/severity of COVID-19 illness), and family and community vulnerability to COVID-19 (e.g., family/friends/neighbors/co-workers being diagnosed/dying from COVID-19) will be associated with symptoms of poor mental health among African Americans. In addition, we hypothesized that pandemic-related stress, such as difficulties with accessing resources, finances, and attending and planning social events and activities, would be associated with symptoms of poor mental health.

## Methods

These data were collected as part of an ongoing 2-year cohort study focused on African Americans' mental and behavioral health in Oklahoma [38]. The University of Oklahoma Health Sciences Center Institutional Review Board approved this study on December 23, 2020.

## Study Procedures

Recruitment for this study started via Facebook on March 2021 and ended in November 2021. The targeted Facebook marketing campaign focused on Oklahoma residents only and used keywords that broadly reflected African American interests, such as favorite television shows and music genres. Recruitment ads for the cohort study appeared on the Facebook members' web pages, and interested members clicked on the recruitment ad. Facebook members who clicked on the ad were redirected to an online survey tool to briefly screen for study eligibility. Adults were eligible to participate in this cohort study if they (a) were 18 years of age or older, (b) self-identified as Black/African American (adults who identified as Hispanic or multi-racial but also identified as Black/African American were included), and (c) lived in Oklahoma (verified by driver's license uploaded to the survey tool). There were no other inclusion/exclusion criteria.

A total of 2363 adults started the screening process; 51.25% ( $n = 1,211$ ) completed the process. Among those who completed the screening process, 3 people were removed from the sample because they were below the age of 18, 96 adults were removed because they did not self-identify as Black/African American, 1 adult was removed because they completed the screening process twice, and 807 adults failed to upload a copy of their Oklahoma driver's license. The remaining 304 adults (25%) met study criteria and signed an informed consent form before enrolling in the cohort study. Participants completed their first survey immediately after qualifying for the study and were compensated with a \$50 gift card for survey completion. All data utilized in the current study were collected during the initial survey.

## Measures

**Dependent Variable** The primary dependent variable was symptoms of poor mental health, which was assessed using the Patient Health Question-4 (PHQ-4), a validated and widely used scale that assesses symptoms of depression and anxiety [39]. Data from the PHQ-4 was analyzed using the established cut-off scores for depression (2 items) and anxiety (2 items). [39]

**Independent Variables** The independent variables were vulnerability to COVID-19 (i.e., personal, family, and community) and pandemic-related stress. Personal vulnerability to COVID-19 was measured via three items: (1) self-reported history of completing a coronavirus test (yes/no), (2) testing positive for the virus (yes/no), and the (3) severity of COVID-19 symptoms (0 = asymptomatic, 1 = not at all severe, 2 = slightly severe, 3 = somewhat severe, 4 = very severe, 5 = extremely severe). Most participants did not get COVID-19 or had very minor symptoms, so for analysis, we trichotomized the severity of COVID-19 symptoms into “no illness,” “asymptomatic or not at all severe,” and at “least somewhat severe.”

Family vulnerability to COVID-19 was measured by the self-reported history of a family member or a member of their household testing positive for the virus (yes/no), hospitalization (yes/no), and/or death (yes/no). Community vulnerability was measured by the self-reported history of friends, neighbors, and co-workers testing positive for the virus (yes/no), hospitalization (yes/no), and/or death (yes/no). Count variables for family vulnerability (min = 0, max = 3) and community vulnerability (min = 0, max = 3) were created to represent the severity of vulnerability to COVID-19 within the family unit and each participant's social circle.

The research team developed a scale to assess how difficult it had been to engage in the following activities since the start of the COVID-19 pandemic on March 13,

2020: (A) accessing childcare, (B) paying household bills and expenses, (C) buying food, (D) buying masks and hand sanitizer/cleaning products, (E) getting essential medications, (F) making healthcare appointments, (G) acquiring transportation, (H) meeting with close friends and family members, (I) planning family events, and (J) attending community events. Participants were given the following response options for each item: (0) very easy, (1) easy, (2) neutral, (3) difficult, and (4) very difficult. Pandemic-related stress reflected the average score across all item responses, with higher scores representing more pandemic-related stress. Secondly, we also used these items to create three subcategories of pandemic-related stress: (1) difficulty with accessing essential resources and services (items A, E, F, and G); (2) difficulty with finances (items B, C, and D); and (3) difficulty with planning and attending social events (items H, I, and J). Total scores within these subcategories were averaged, with higher scores representing more stress.

**Covariates** Biological sex (males vs. females), age (years), education (years), insurance (insured vs. not insured), and employment status (employed vs. not employed), annual household income ( $\geq \$100,000$  [ref] vs. \$50,000–99,999 vs.  $\geq \$49,999$ ), and homeownership status (own [ref] vs. rent vs. other) were all measured via a self-report and included as covariates in all analyses.

## Analysis Plan

Descriptive statistics were generated for independent and dependent variables and covariates. Multivariable logistic regression analyses were used to examine the association of (1) personal, family, and community vulnerability to COVID-19 with symptoms of poor mental health; (2) the severity of COVID-19 symptoms and family and community vulnerability to COVID-19 with symptoms of poor mental health; (3) pandemic-related stress with symptoms of poor mental health; (4) personal, family, and community vulnerability to COVID-19 and pandemic-related stress vulnerability with symptoms of poor mental health; and (5) of the severity of COVID-19 symptoms and family and community vulnerability and pandemic-related stress with symptoms of poor mental health. Exploratory analyses focused on examining the degree to which each specific subcategory of pandemic-related stress (difficulty with accessing resources; difficulty with finances; and difficulty with planning and attending social events) was associated with symptoms of poor mental health. We also explored gender differences in COVID-19 vulnerability and poor mental health. All analyses were completed in SAS 9.4. [40]

**Table 1** Sample characteristics ( $N=304$ )

Characteristic	$N$ (%) or $M$ (SD)
Age	41.9 (SD = 13.5)
Sex (% female)	238 (78.6%)
Education <sup>a</sup>	
High school diploma, GED, or did not finish high school	28 (9.2%)
Some college, associate's degree or technical school	99 (32.7%)
At least bachelor's degree, postgraduate, or professional school	176 (58.1%)
Healthcare insurance status (% not insured)	29 (9.6%)
Annual household income	
\$0–49,999	144 (47.5%)
\$50,000–99,999	99 (32.7%)
≥ \$100,000	60 (19.8%)
Homeownership	
Own	123 (40.6%)
Rent	141 (46.5%)
Other <sup>b</sup>	39 (12.9%)
Employment status (% not employed) <sup>c</sup>	73 (24.0%)
Anxiety <sup>d</sup> (% yes)	83 (27.3%)
Depression <sup>e</sup> (% yes)	67 (22.0%)
Anxiety and depression (% yes)	54 (17.8%)

All variables had less than 5% missing data

<sup>a</sup>Did not finish high school ( $n=2$ ) and high school or GED ( $n=26$ )

<sup>b</sup>“Other” was defined as living with parents ( $n=27$ ) or other living arrangements ( $n=12$ )

<sup>c</sup>“Not employed” was defined as being out of work for less than one year ( $n=11$ ), out of work for 1 year or more ( $n=7$ ), a homemaker ( $n=3$ ), a student ( $n=12$ ), retired ( $n=23$ ), unable to work ( $n=12$ ), and other ( $n=4$ )

<sup>d</sup>Probable anxiety was based on the recommended cut-off scores for the PHQ-4: a total score  $\geq 3$  for the first 2 PHQ-4 questions suggests anxiety

<sup>e</sup>Probable depression was based on the recommended cut-off scores for the PHQ-4: a total score  $\geq 3$  for the last 2 PHQ-4 questions suggests depression

## Results

### Sample Characteristics

As shown in Table 1, participants were largely female ( $n=238$ , 78.6%) and on average 41.9 years of age (SD = 13.5). Almost 60% ( $n=176$ ) of participants had obtained at least a bachelor's degree, 47.5% ( $n=144$ ) earned an annual household income between \$0 and \$49,999, and 40.6% ( $n=123$ ) owned their residence. Less than 10% of participants were uninsured ( $n=29$ , 9.6%), and 24.0% ( $n=73$ ) were not employed. Based on PHQ-4 scores, 27.3%

( $n=83$ ) of the sample experienced symptoms related to anxiety, and 22.0% ( $n=67$ ) experienced symptoms related to depression. Notably, 17.8% ( $n=54$ ) of participants concurrently experienced symptoms related to both depression and anxiety.

Nearly 76% of participants ( $n=230$ , 75.9%) had taken a COVID-19 test, and of those, 29.6% ( $n=68$ ) tested positive for COVID-19. Of those who tested positive for COVID-19 ( $n=68$ ), 27.9% ( $n=19$ ) self-reported their symptoms were not severe (i.e., asymptomatic or not at all severe), and 72.1% ( $n=49$ ) reported that their symptoms were severe (i.e., slightly severe or more). About 44% ( $n=133$ ) of the sample had a family or household member test positive for COVID-19, 15.5% ( $n=47$ ) had a family or household member hospitalized for COVID-19, and 6.6% ( $n=20$ ) had a family or household member die of COVID-19. Likewise, 83.5% ( $n=253$ ) of the sample had a friend, co-worker, or neighbor test positive for COVID-19; 37.8% ( $n=115$ ) had a friend, co-worker, or neighbor hospitalized for COVID-19; and 24.7% ( $n=75$ ) had a friend, co-worker, or neighbor die of COVID-19.

Since March 13, 2020, 5.9% ( $n=18$ ) of participants have had a very difficult time accessing childcare, 16.8% ( $n=51$ ) had a very difficult time paying household bills and expenses, 11.2% ( $n=34$ ) had a very difficult time buying food, 17.1% ( $n=52$ ) had a very difficult time buying masks and hand sanitizer/cleaning products, 6.9% ( $n=21$ ) had a very difficult time getting essential medications, 12.5% ( $n=38$ ) had a very difficult time making health-care appointments, 5.6% ( $n=17$ ) had a very difficult time accessing transportation, 34.9% ( $n=106$ ) had a very difficult time meeting close friends and family members, 50.7% ( $n=154$ ) had trouble planning family events, and 52.0% ( $n=158$ ) had a very difficult time attending community events. The average pandemic-related stress score was 1.9 (SD = 0.8), and the average scores for the subcategories were 1.2 (SD = 0.9) for difficulty with accessing essential resources and services, 1.9 (SD = 1.0) for difficulty with finances, and 3.1 (SD = 1.0) for difficulty with planning and attending social events. Experiencing more difficulty with accessing essential resources was significantly correlated with experiencing more difficulty with finances ( $r=0.59$ ,  $p<0.01$ ) and with planning and attending social events ( $r=0.30$ ,  $p<0.01$ ). Experiencing more difficulty with finances was also significantly correlated with experiencing more difficulty planning and attending social events ( $r=0.25$ ,  $p<0.01$ ).

### Primary Analysis

As shown in Tables 2, 3, 4, and 5, across all models, neither taking a test for COVID-19, testing positive for COVID-19, nor the severity of COVID-19 symptoms was associated

**Table 2** Prevalence of exposure to factors related to the COVID-19 pandemic

Characteristic	<i>N</i> (%) or <i>M</i> (SD)
Have you ever taken a test for coronavirus (COVID-19)?	
No	73 (24.1%)
Yes	230 (75.9%)
Tested positive for COVID-19	
No	236 (77.6%)
Yes	68 (22.4%)
The severity of COVID-19 symptoms	
No illness	236 (77.6%)
Asymptomatic or not at all severe	19 (6.3%)
At least somewhat severe <sup>a</sup>	49 (16.1%)
Has a family member or a member of your household ever	
Tested positive for COVID-19?	133 (43.9%)
Been hospitalized for COVID-19?	47 (15.5%)
Died of COVID-19?	20 (6.6%)
Have any of your friends, coworkers, or neighbors ever	
Tested positive for COVID-19	253 (83.5%)
Been hospitalized for COVID-19?	115 (37.8%)
Died of COVID-19?	75 (24.7%)
Pandemic-related stress <sup>b</sup>	1.9 (SD=0.8)
Difficulty with accessing essential resources and services	1.2 (SD=0.9)
Difficulty with finances	1.9 (SD=1.0)
Difficulty with planning and attending social events	3.1 (SD=1.0)

All variables had less than 5% missing data

<sup>a</sup> “At least somewhat severe” was defined as having symptoms that required at least bed rest

<sup>b</sup>Pandemic-related stress was based on the responses to the following questions: difficulty with (Q1) accessing childcare, (Q2) paying household bills and expenses, (Q3) buying food, (Q4) buying masks and hand sanitizer/cleaning products, (Q5) getting essential medications, (Q6) making healthcare appointments, (Q7) accessing transportation, (Q8) meeting close friends and family members, (Q9) planning family events, (Q10) attending community events. The scale has three subcategories: difficulty with (1) accessing essential resources and services (Q1, Q5, Q6, and Q7), finances (Q2, Q3, and Q4), and planning and attending social events (Q8, Q9, and Q10). All scores from each scale were averaged, and higher scores indicated greater pandemic-related stress

with symptoms of poor mental health. Likewise, family and community vulnerability to COVID-19 were not associated with symptoms of poor mental health. However, across all models, greater pandemic-related stress was associated with

higher odds of experiencing symptoms related to anxiety, depression, and experiencing symptoms related to both mental health conditions.

## Exploratory Analysis

Logistic regression analyses were conducted to examine the extent to which each specific subscale of the pandemic-related stress scale (difficulty with accessing essential resources and services, difficulty with finances, and difficulty with planning and attending social events) was associated with symptoms of poor mental health. As shown in Table 6, across all models, difficulty with finances was associated with higher odds of experiencing symptoms of poor mental health. However, difficulty with accessing essential resources and difficulty with planning and attending social events were not associated with symptoms of poor mental health after accounting for difficulty with finances and other covariates (see model 2 in Table 6).

## Gender Differences in Study Variables

We also explored gender differences in study variables. In particular, there were no significant differences between women and men concerning age ( $p=0.42$ ), insurance ( $p=0.07$ ), home ownership ( $p=0.38$ ), employment ( $p=0.61$ ), and annual household income ( $p=0.18$ ). However, compared with women, men were more likely to report that they either had a high school diploma, GED, or did not finish high school (20.0% vs 6.3%,  $p<0.01$ ). There were no gender differences in experiencing symptoms related to anxiety ( $p=0.23$ ), depression ( $p=0.83$ ), and experiencing symptoms related to both mental health conditions ( $p=0.88$ ). There were also no gender differences in the prevalence of COVID-19 testing ( $p=0.59$ ), being diagnosed with COVID-19 illness ( $p=0.42$ ), or the severity of COVID-19 illness ( $p=0.07$ ). There were no gender differences in family ( $p=0.89$ ) and community ( $p=0.50$ ) vulnerability to COVID-19 and in pandemic-related stress ( $p=0.16$ ), but men reported greater difficulty accessing essential resources compared with women (1.40 vs. 1.14,  $p<0.01$ ). Last, there were no gender differences in difficulty with finances ( $p=0.66$ ) and with planning and attending social events ( $p=0.82$ ).

Although this study was not powered to explore moderated effects, we conducted analyses stratified by gender to identify possible differential associations between the main study variables to encourage future scientific exploration in this area. These results were largely the same as the primary analysis (data not shown). However, we did find that African American men who were asymptomatic or had COVID-19 symptoms that were not severe had higher odds of experiencing symptoms of depression (aOR = 9.25 [95% CI = 1.45,

**Table 3** The association of COVID-19 vulnerability and pandemic-related stress with symptoms of anxiety

Variables	Model 1 aOR (95% CI)	Model 2 aOR (95% CI)	Model 3 aOR (95% CI)	Model 4 aOR (95% CI)	Model 5 aOR (95% CI)
Have you ever taken a test for coronavirus (COVID-19)?					
No	REF	n/a	n/a	REF	n/a
Yes	0.86 (0.44, 1.69)	n/a	n/a	0.82 (0.41, 1.63)	n/a
Tested positive for COVID-19					
No	REF	n/a	n/a	REF	n/a
Yes	1.20 (0.60, 2.38)	n/a	n/a	1.17 (0.58, 2.35)	n/a
Severity of COVID-19 symptoms					
No illness	n/a	REF	n/a	n/a	REF
Asymptomatic or not at all severe	n/a	1.36 (0.45, 4.09)	n/a	n/a	1.26 (0.41, 3.86)
At least somewhat severe	n/a	1.07 (0.51, 2.23)	n/a	n/a	1.03 (0.48, 2.20)
Family vulnerability to COVID-19	1.20 (0.89, 1.60)	1.20 (0.89, 1.61)	n/a	1.14 (0.85, 1.54)	1.14 (0.85, 1.54)
Community vulnerability to COVID-19	1.08 (0.82, 1.42)	1.09 (0.83, 1.43)	n/a	1.01 (0.76, 1.34)	1.02 (0.77, 1.35)
Pandemic-related stress	n/a	n/a	<b>1.96 (1.33, 2.91)</b>	<b>1.92 (1.29, 2.86)</b>	<b>1.91 (1.28, 2.84)</b>

All models were adjusted for sex (males vs. females), age (years), education (years), and insurance (insured vs. not insured), employment (employed vs. not employed), household income ( $\geq$  \$100,000 [ref] vs. \$50,000–99,999 vs.  $\geq$  \$49,999), and homeownership (own [ref] vs. rent vs. other). All analyses had less than 5% missing data. Significant values were bolded for emphasis

Model 1: the association of personal, family, and community vulnerability to COVID-19 with symptoms of anxiety

Model 2: the association of the severity of COVID-19 illness and family community vulnerability to COVID-19 with symptoms of anxiety

Model 3: the association of pandemic-related stress with symptoms of anxiety

Model 4: the association of personal, family, and community vulnerability to COVID-19 and pandemic-related stress with symptoms of anxiety

Model 5: the association of the severity of COVID-19 illness and family and community vulnerability to COVID-19 and pandemic-related stress with symptoms of anxiety

59.08]) and experiencing symptoms of depression and anxiety (aOR = 8.29 [95% CI = 1.18, 58.39]) than African American men who did not have COVID-19. These associations were not observed for African American women.

## Discussion

This study examined the extent to which vulnerability to COVID-19 and the stressors created by the pandemic were associated with symptoms of poor mental health within the African American population. We hypothesized that COVID-19 vulnerability and pandemic-related stress would be associated with symptoms of poor mental health. COVID-19 vulnerability was not associated with symptoms of poor mental health, but pandemic-related stress was consistently associated with symptoms of poor mental health, which aligns with our second hypothesis. Study findings highlight how pandemic-related stressors may have contributed to symptoms of poor mental health within the African American community.

Despite African Americans being more likely than other populations to be diagnosed with, hospitalized for, and die from COVID-19 [1–4] and to witness close friends and

family members suffer and die from the virus,[41] COVID-19 vulnerability was not associated with symptoms of poor mental health in the current study. A previous study found that the pandemic was not associated with symptoms of poor mental health among African Americans,[42] and another study found that African Americans were less likely to report symptoms of poor mental health during the pandemic than other populations [34]. Findings from this study and past research support the “mental health paradox,” which refers to when African Americans experience no or fewer mental health symptoms despite experiencing more stressors than other racial and ethnic groups. Numerous hypotheses have been proposed to explain this apparent paradox. First, African Americans may have a higher standard of what it means to be stressed than other populations because they have had to endure many persistent structural barriers in society, including stigma, racism and discrimination, and limited educational and economic opportunities. Relatedly, African Americans may conceal or even ignore signs and symptoms of poor mental health despite experiencing severe stress because they fear being stigmatized and isolated by their community [43]. Further, studies have shown that African Americans view depression and other mental health conditions as a personal weakness or character flaw, and these subjective health beliefs are associated with reporting

**Table 4** The association of COVID-19 vulnerability and pandemic-related stress with symptoms of depression

Variables	Model 1 aOR (95% CI)	Model 2 aOR (95% CI)	Model 3 aOR (95% CI)	Model 4 aOR (95% CI)	Model 5 aOR (95% CI)
Have you ever taken a test for coronavirus (COVID-19)?					
No	REF	n/a	n/a	REF	n/a
Yes	0.82 (0.40, 1.68)	n/a	n/a	0.77 (0.37, 1.62)	n/a
Tested positive for COVID-19					
No	REF	n/a	n/a	REF	n/q
Yes	1.39 (0.67, 2.89)	n/a	n/a	1.35 (0.63, 2.88)	n/a
Severity of COVID-19 illness					
No illness	n/a	REF	n/a	n/a	REF
Asymptomatic or not at all severe	n/a	1.39 (0.43, 4.48)	n/a	n/a	1.29 (0.39, 4.28)
At least somewhat severe	n/a	1.26 (0.58, 2.75)	n/a	n/a	1.21 (0.54, 2.71)
Family vulnerability to COVID-19	1.01 (0.73, 1.40)	1.01 (0.73, 1.40)	n/a	0.94 (0.68, 1.32)	0.94 (0.67, 1.32)
Community vulnerability to COVID-19	1.10 (0.82, 1.47)	1.11 (0.83, 1.48)	n/a	1.02 (0.75, 1.37)	1.02 (0.76, 1.38)
Pandemic-related stress	n/a	n/a	<b>2.40 (1.55, 3.72)</b>	<b>2.41 (1.54, 3.78)</b>	<b>2.40 (1.53, 3.74)</b>

All models were adjusted for sex (males vs. females), age (years), education (years), and insurance (insured vs. not insured), employment (employed vs. not employed), household income ( $\geq$ \$100,000 [ref] vs. \$50,000–\$99,999 vs.  $\geq$ \$49,999), and homeownership (own [ref] vs. rent vs. other). All analyses had less than 5% missing data. Significant values were bolded for emphasis

Model 1: the association of personal, family, and community vulnerability to COVID-19 with symptoms of depression

Model 2: the association of the severity of COVID-19 illness and family and community vulnerability to COVID-19 with symptoms of depression

Model 3: the association of pandemic-related stress with symptoms of depression

Model 4: the association of personal, family, and community vulnerability to COVID-19 and pandemic-related stress with symptoms of depression

Model 5: the association of the severity of COVID-19 illness and family and community vulnerability to COVID-19 and pandemic-related stress with symptoms of depression

fewer symptoms of poor mental health [44]. Last, African Americans may possess more positive coping resources than other populations, including greater religiosity and church attendance,[45] greater social support, especially immediate and extended family support [46], and a strong sense of racial identity [47]. However, some coping resources, such as religiosity, may mask symptoms of poor mental health because strongly held religious attitudes may lead to a person using faith to endure significant sources of stress. In other words, a person with strong religious values may conclude their faith is not strong enough when faith does not alleviate their symptoms and may attempt to conceal their symptoms to restore confidence in their faith [44]. Qualitative studies could explore how and why the physical effects of the COVID-19 pandemic, such as sickness, hospitalization, and death, have not contributed to symptoms of poor mental health within the African American population. Insight in this area may help us develop strategies to improve how other populations navigate grief and loss during the pandemic.

On the other hand, study findings indicate that the stressors created by the pandemic, such as difficulty accessing resources, difficulty with finances, and difficulty attending

or planning social events, are associated with symptoms of poor mental health. African Americans have historically faced challenges accessing essential resources and services and maintaining financial security,[48] but the pandemic has exacerbated these issues within this population [18, 49]. The pandemic has also created barriers to using important coping resources for African Americans, such as churches and families. Many African American churches paused in-person services during the pandemic or switched to digital platforms [10], and older family members, who are often important figures within African American families [50], may have died or been harmed because of the virus. Unlike being diagnosed COVID-19, which can be viewed as sudden and acute, African Americans continually contend with stressors created by the pandemic. Although coping may be beneficial to handle sudden and acute stressors from the pandemic, such as illness and death, it may be less effective for handling persistent and ongoing stressors, such as paying monthly bills or buying groceries [51]. Overall, the stressors created by the pandemic may have gradually overwhelmed individuals' ability to cope and adapt and may have contributed to

**Table 5** The association of COVID-19 vulnerability and pandemic-related stress with symptoms of anxiety and depression

Variables	Model 1 aOR (95% CI)	Model 2 aOR (95% CI)	Model 3 aOR (95% CI)	Model 4 aOR (95% CI)	Model 5 aOR (95% CI)
Have you ever taken a test for coronavirus (COVID-19)?					
No	REF	n/a	n/a	REF	n/a
Yes	0.80 (0.37, 1.73)	n/a	n/a	0.75 (0.34, 1.67)	n/a
Tested positive for COVID-19					
No	REF	n/a	n/a	REF	n/q
Yes	1.18 (0.54, 2.60)	n/a	n/a	1.13 (0.50, 2.55)	n/a
Severity of COVID-19 illness					
No illness	n/a	REF	n/a	n/a	REF
Asymptomatic or not at all severe	n/a	1.22 (0.35, 4.27)	n/a	n/a	1.14 (0.32, 4.06)
At least somewhat severe	n/a	1.05 (0.45, 2.42)	n/a	n/a	0.98 (0.41, 2.34)
Family vulnerability to COVID-19	1.18 (0.85, 1.65)	1.18 (0.85, 1.65)	n/a	1.12 (0.79, 1.57)	1.12 (0.80, 1.57)
Community vulnerability to COVID-19	1.12 (0.82, 1.53)	1.13 (0.82, 1.54)	n/a	1.03 (0.75, 1.43)	1.04 (0.75, 1.44)
Pandemic-related stress	n/a	n/a	<b>2.33 (1.46, 3.72)</b>	<b>2.29 (1.42, 3.69)</b>	<b>2.28 (1.41, 3.66)</b>

All models were adjusted for sex (males vs. females), age (years), education (years), and insurance (insured vs. not insured), employment (employed vs. not employed), household income ( $\geq$  \$100,000 [ref] vs. \$50,000–99,999 vs.  $\geq$  \$49,999), and homeownership (own [ref] vs. rent vs. other). All analyses had less than 5% missing data. Significant values were bolded for emphasis

Model 1: the association of personal, family, and community vulnerability to COVID-19 with symptoms of anxiety and depression

Model 2: the association of the severity of COVID-19 illness and family and community vulnerability to COVID-19 with symptoms of anxiety and depression

Model 3: the association of pandemic-related stress with symptoms of anxiety and depression

Model 4: the association of personal, family, and community vulnerability to COVID-19 and pandemic-related stress with symptoms of anxiety and depression

Model 5: the association of the severity of COVID-19 illness and family and community vulnerability to COVID-19 and pandemic-related stress with symptoms of anxiety and depression

**Table 6** The association of perceived difficulties with COVID-19 with symptoms of anxiety and depression

Variables	Anxiety		Depression		Depression and Anxiety	
	Model 1 <sup>a</sup> aOR (95% CI)	Model 2 <sup>a</sup> aOR (95% CI)	Model 1 <sup>a</sup> aOR (95% CI)	Model 2 <sup>a</sup> aOR (95% CI)	Model 1 aOR (95% CI)	Model 2 aOR (95% CI)
Difficulty with accessing resources	1.36 (0.98, 1.88)	0.88 (0.59, 1.33)	<b>1.57 (1.11, 2.23)</b>	1.01 (0.66, 1.55)	<b>1.49 (1.03, 2.16)</b>	0.93 (0.59, 1.47)
Difficulty with finances	<b>1.91 (1.41, 2.59)</b>	<b>1.92 (1.33, 2.75)</b>	<b>2.02 (1.45, 2.81)</b>	<b>1.92 (1.30, 2.83)</b>	<b>2.23 (1.55, 3.20)</b>	<b>2.27 (1.49, 3.46)</b>
Difficulty with planning and attending social events	1.29 (0.97, 1.71)	1.08 (0.79, 1.47)	<b>1.47 (1.06, 2.04)</b>	1.20 (0.84, 1.71)	1.37 (0.97, 1.93)	1.08 (0.74, 1.57)

All models were adjusted for sex (males vs. females), age (years), education (years), and insurance (insured vs. not insured), employment (employed vs. not employed), household income ( $\geq$  \$100,000 [ref] vs. \$50,000–99,999 vs.  $\geq$  \$49,999), and homeownership (own [ref] vs. rent vs. other). All analyses had less than 5% missing data. Significant values were bolded for emphasis

<sup>a</sup>Model 1 examines each subcategory in separate models

<sup>b</sup>Model 2 examines each subcategory simultaneously

symptoms of poor mental health within the African American population. [52]

Perhaps the biggest challenge African Americans have faced during the pandemic is financial insecurity. During the pandemic, African Americans were disproportionately affected by job loss and wage and salary reductions,[18] of which have significantly affected their ability to buy food

and pay household bills. Further, due to the preexisting wealth gap between African Americans and Whites,[53] African Americans may have been less likely to have adequate savings to cover their expenses from work absences when exposed to COVID-19. Therefore, not surprisingly, in 2021, the Household Pulse Survey found that during the pandemic, African American households were more likely



than White households to be food insecure (17% vs. 6%), have trouble paying rent (28% vs. 12%), and covering their household expenses (44% vs. 23%) [54]. The economic challenges caused by the pandemic in some areas have only worsened, with many American families being burdened by higher energy, food, and service prices [55]. These economic changes will disproportionately affect those already the most vulnerable in society, including African Americans, and may have long-term effects on mental health. [56]

Numerous solutions and programs have been put forth at the local, state, and federal levels to alleviate the economic and social burdens placed on individuals and families during the pandemic. The federal and some state governments have used stimulus payments and child tax credits to increase household income. The federal government also increased unemployment benefits for workers laid off during the pandemic. Although these benefits stimulated the purchase of non-essential consumer goods, such as liquor and cigars, research has clearly shown that these government benefits enhanced physical and mental health and reduced food insecurity for millions of Americans, many of whom were low-income families and African Americans [57]. Last, socially distanced and masked small gatherings were strongly encouraged by public health practitioners to alleviate feelings of loneliness. [58]

There are a few limitations of this study. First, the participants in this study were largely female and 41.8 years old on average. Males and older adults are more vulnerable to COVID-19 than females and younger adults, [59, 60] and we previously discussed that it is quite common for African Americans to experience no or fewer mental health symptoms after experiencing significant stress or trauma. Therefore, this sample of African Americans may not have been significantly vulnerable to the mental health impact of the virus. Alternatively, recruitment for this study started 1-year after the pandemic, and many African Americans may have recovered mentally from losing loved ones and people in their community to the COVID-19 illness or from becoming sick themselves but were still actively struggling with the day-to-day difficulties associated with the pandemic.

Second, these data were collected from a non-random sample of individuals recruited primarily through social media. This recruitment method resulted in a sample of highly educated and high-income earning African Americans, which does not reflect the overall demographics of African Americans in Oklahoma. Study findings may be less generalizable to African Americans who experience severe socioeconomic disparities. Relatedly, only about half of the adults who clicked on the survey link finished the screener, and 807 adults who stated they were African American and lived in Oklahoma did not provide a copy of their driver's license, which excluded them from participating in the study. Therefore, this study sample is not representative of

the African Americans in Oklahoma, and study findings may reflect the perspective of African Americans more willing to participate in this research study to provide information about their struggles with the pandemic. Third, a clinical diagnosis of depression and anxiety cannot be determined from the PHQ-4 alone; therefore, the interpretation of study findings should be limited to the symptoms and signs of these mental health conditions. Relatedly, this study did not assess the chronicity of these symptoms, so it is unclear whether these symptoms of poor mental health are persistent or transient. Future studies on this topic should use comprehensive assessments of anxiety and depression and incorporate repeated assessments to track the progression of poor mental health over time. Last, these data are from a cross-sectional study, which does not allow for a determination of causality.

There has been a lack of research examining the mental health of African Americans during the COVID-19 pandemic despite this population suffering disproportionately from this health crisis. This study found that vulnerability to COVID-19, such as contracting the illness or losing a loved one, was not associated with symptoms of poor mental health. In contrast, pandemic-related stress was strongly associated with symptoms of poor mental health. In particular, African Americans have experienced severe financial problems during the pandemic, contributing to symptoms of anxiety and depression. Study findings highlight the need to monitor and intervene on the stressors associated with the pandemic, particularly financial struggles, to prevent further psychological distress within this vulnerable and underserved population.

**Author Contribution** AA designed the parent study. AA and KB formulated the research questions and hypotheses and conducted the secondary data analyses for this study. AA and KB also prepared the 1st draft of the manuscript. All authors revised the 1st draft and approved the final manuscript.

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## Declarations

**Ethics Approval** Informed consent was obtained from all individual participants included in the study. Procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments (or comparable ethical standards). The study procedures were also approved by the Institutional Review Board of the Oklahoma University Health Sciences Center.

**Competing Interests** The authors declare no competing interests.

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