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Research Paper

Coronavirus disease 2019 pandemic associated with anxiety and depression among Non-Hispanic whites with chronic conditions in the US

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ABSTRACT

Keywords: COVID-19 Anxiety Depression Chronic conditions HINTS

Objectives: During the coronavirus 2019 (COVID-19) pandemic, increased anxiety and depression were reported, with mixed findings among individuals of different races/ethnicities. This study examines whether anxiety and depression increased during the COVID-19 pandemic compared to the pre-COVID-19 period among different racial/ethnic groups in the US.

Methods: The Health Information National Trend Surveys 5 (HINTS 5) Cycle 4 data was analyzed. We used the time when the survey was administered as the pre-COVID-19 period (before March 11, 2020, weighted N = 77,501,549) and during the COVID-19 period (on and after March 11, 2020, weighted N = 37,222,019). The Patient Health Questionnaire (PHQ) was used to measure anxiety/depression and further compared before and during COVID-19. Separate multivariable logistic regression analyses were used to determine the association of the COVID-19 pandemic with anxiety/depression after adjusting for age, sex, insurance, income, and education.

Results: A higher percentage of Non-Hispanic whites (NHW) with chronic conditions reported anxiety (24.3% vs. 11.5%, p = 0.0021) and depression (20.7% vs. 9.3%, p = 0.0034) during COVID-19 than pre-COVID-19. The adjusted odds ratio (AOR) of anxiety and depression for NHWs with chronic conditions during the COVID-19 pandemic was 2.02 (95% confidence interval of 1.10–3.73, p = 0.025) and 2.33 (1.17–4.65, p = 0.018) compared to NHWs who participated in the survey before the COVID-19.

Limitations: Limited to the NHW US population. PHQ can only be used as the initial screening tool.

Conclusion: The COVID-19 pandemic was associated with an increased prevalence of anxiety and depression among NHW adults with chronic conditions, but not among people of color.

1. Introduction

On March 11, 2020, the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a global pandemic as the virus quickly spread throughout the United States (US) and the rest of the world (World Health Organization, 2021). According to the Centers for Disease Control (CDC) statistics, by the end of 2020, there were 20,475,900 COVID-19 cases and 385,236 deaths in the United States alone (Centers for Disease Control and Prevention, 2021c; Centers for Disease Control and Prevention, 2021b).

Not only has the COVID-19 pandemic taken a toll on people’s physical health, but it has affected their mental health as well. Due to the pervasive nature of the virus, COVID-19 has disrupted peoples’ daily routines and has contributed to mental health symptoms such as anxiety and depression. Current literature has shown a global psychological impact of COVID-19. In the Republic of Ireland, one study found that participants who suffered from General Anxiety Disorder (GAD) increased from 20% to 27.7%, and depression increased from 22.8% to 27.7%, respectively during the pandemic due to the fear of contracting...
COVID-19 (Hyland et al., 2020). Another study from China found that 28.8% of respondents reported moderate to severe anxiety symptoms, and 16.5% reported moderate to severe depressive symptoms (Wang et al., 2020). In the US, roughly 1 in 4 adults without preexisting mental health conditions, experienced psychological distress symptoms (i.e., anxiety and depression) during the early stages of the pandemic (Holingue et al., 2020). Many factors such as personal and loved one’s health, young age, sleep disruptions, food insecurity, economic insecurity, social isolation, and chronic conditions have contributed to the increased rates of anxiety and depression during the COVID-19 pandemic (Zavlis et al., 2021; Smith et al., 2020; Varma et al., 2021). Specifically, It has been reported that individuals with chronic conditions have higher levels of anxiety and depression than those without chronic conditions. A two-fold increased odds of depression have been reported in patients with diabetes compared to those without diabetes (Anderson et al., 2001). A study in Turkey showed that patients with HIV tended to have higher anxiety and depression levels than those without (Kuman et al., 2020). A meta-analysis study found that higher anxiety occurred among cancer patients during the COVID-19 pandemic than the general population (Ayubi et al., 2021).

Six out of every ten individuals have a chronic condition in the US (Centers for Disease Control and Prevention, 2021a). Those with chronic conditions are at higher risk for COVID-19 infections, hospitalizations, and mortality (Kirby et al., 2021). Thus, the COVID-19 related risk and risk perception can make adults with chronic conditions more vulnerable to anxiety and depression (Alessi et al., 2020; Wong et al., 2020). Some studies have reported the association of chronic diseases to anxiety and depression during the COVID-19 pandemic. In a matched case-control study carried out in Bangladesh, it was found that the prevalence of anxiety and depression symptoms was significantly higher among ones with chronic conditions than those without. This is partially due to the increased risk of death from COVID-19 (Sayeed et al., 2020). Moreover, those with asthma, diabetes, cardiovascular disease symptoms, or any combination of these diseases had higher odds of exhibiting stress, anxiety, and depression symptoms than healthy individuals during the COVID-19 pandemic. Individuals with cardiovascular disease were the most vulnerable to anxiety and depression symptoms (Sayeed et al., 2020). One Brazilian study showed increased anxiety and depression rates among individuals with diabetes due to COVID-19 (Alessi et al., 2020). Another study done in Hong Kong showed higher anxiety and depression rates among individuals with multiple comorbidities due to COVID-19 (Wong et al., 2020).

Furthermore, the differential effects of COVID-19 among individuals of different races/ethnicities may also contribute to varying rates of anxiety and depression among these groups (Goldmann et al., 2021; McKnight-Eily et al., 2021; Goldmann et al., 2021; Owens and Saw, 2021). Some studies reported higher anxiety/depression among Non-Hispanic White (NHW) than people of color (Goldmann et al., 2021; Owens and Saw, 2021). Whereas other studies showed higher stress levels among Hispanic populations during the pandemic than their NHW counterparts (McKnight-Eily et al., 2021; Bui et al., 2021). While those with chronic conditions have higher rates of anxiety and depression, it is not known how different race/ethnic groups are affected by anxiety and depression in the presence of chronic conditions. Therefore, the study’s primary objective is to determine whether the association of COVID-19 with anxiety and depression varied among different race/ethnic groups.

2. Methods

2.1. Study setting

This study was a cross-sectional analysis of secondary data from the National Cancer Institute’s Health Information National Trends Survey 5 Cycle 4 (2020) (HINTS 5) (National Cancer Institution, 2021). HINTS 5 is a survey of a nationally representative sample of US adults used to assess the impact of the health information environment (National Cancer Institution, 2021). The HINTS 5 survey was administered to US adults 18 years and older and was conducted from February 2020 through June 2020 using a self-administered questionnaire with results released in March 2021. Complete data were collected from 3865 respondents with a response rate of 37%, did not include a web option, and was entirely conducted by mail. The primary outcomes of this study were to measure anxiety and depression among participants. Participants who had missing and/or erroneous information for these measures were excluded Fig. 1. details the number of adults excluded. Since HINTS 5 is a publicly available, de-identified database and the regional Institutional Review Board (IRB) determined that this project did not meet the definition of human subject research according to federal regulations (IRB No. 1,705,528–1).

As shown in Fig. 1, we restricted the sample to those with any chronic conditions (diabetes, hypertension, heart disease, lung disease, and cancer). In addition, we also excluded individuals with missing sociodemographic characteristics (i.e., age, sex, education level, income level, insurance status, etc.).

2.2. Measures

2.2.1. Anxiety and depression

We used the PHQ-4 survey items to measure anxiety and depression. The PHQ-4 included two questionnaires for generalized anxiety disorder (GAD-2) and two questionnaires for depression (PHQ-2). The two questions used to screen anxiety on the GAD-2 were: (1) Over the past two weeks, how often have you been bothered by feeling nervous, anxious, or on edge? (2) Over the past two weeks, how often have you been bothered by not being able to stop or control worrying? The two questions used to screen depression on the PHQ-2 were: (1) Over the past two weeks, how often have you been bothered by little interest or pleasure in doing things? (2) Over the past two weeks, how often have you been bothered by feeling down, depressed, or hopeless? The answers were (1) not at all, (2) several days, (3) more than half the days, and (4) nearly every day. If the participant answered not at all, it is scored as “0”, several days scored as “1”, more than half the days scored as “2”, and nearly every day scored as “3”.

We added the scores of two questions of GAD-2 for anxiety and two questions of PHQ-2 for depression to have two final scores. If the final score of GAD-2 or PHQ-2 were equal to or above 3, such individuals were defined as high risk of anxiety or depression. Individuals with a score of 0–2 were defined as low risk of anxiety or depression.

2.3. Key independent variables

2.3.1. COVID-19 pandemic

We created an indicator variable (yes/no) to capture whether the survey was completed before or after the pandemic onset. The date of the pandemic onset was determined by the World Health Organization (2021) We used the pandemic flag created by the survey administrators to indicate pre- and during COVID-19 pandemic phases. The pandemic was declared March 11, 2020, with “1” indicating the COVID-19 period (the survey was received on or after March 11, 2020) and “0” indicating the survey was received prior to the COVID-19 pandemic (i.e., before March 11, 2020).

2.3.2. Race/Ethnicity (NHW vs. people of color)

The survey provides information on Non-Hispanic White (NHW), Non-Hispanic Black (NHB), Hispanic/Latino, and others. However, due to small sample sizes, we grouped NHB, Hispanic/Latino, and others into one category (i.e., people of color).

2.3.3. Other explanatory variables

We included biological (age, sex), socioeconomic status (household income levels, and individual education levels), and access to healthcare
We used five age groups (i.e., 18–34, 35–49, 50–64, 65–74, and 75+); two biological sex groups (male and female); two insurance level groups (yes or no); three household income level groups (less than $50,000 annual household income, $50,000–100,000 annual household income, and above $100,000 annual household income); and four education level groups (less than high school graduate level, high school or its similar level, some college level, and college and above level). Individuals with chronic conditions were further combined into two groups (single versus multiple chronic conditions).

2.3.4. Statistical analysis

Weighted percentages were derived using replicate weights. Significant group differences were tested with Rao-Scott chi-square tests. To analyze the presence of anxiety and depression among NHW versus people of color with chronic conditions, we performed separate multivariable logistic regression analyses for anxiety and depression before and during the COVID-19 pandemic. In these analyses, biological, socioeconomic characteristics, and healthcare access were adjusted. With secondary data, small sample sizes can produce unreliable parameter estimates. Relative standard errors (RSE) were used to ensure the reliability of estimates. RSEs greater than 30% indicate poor reliability. The investigators observed that RSEs were less than 30%, suggesting that our findings do not suffer poor reliability due to sample size. All statistical analyses were conducted by STATA version 14.0 (College Station, USA).

We followed the HINTS 5 guidelines for data analysis (Finney Rutten et al., 2020) and used survey procedures with replicate weights for all analyses.

2.3.5. Reporting guideline

We used the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) for cross-sectional studies as our reporting guideline (von et al., 2007).

3. Results

The final analysis includes 1987 participants (weighted population of 114,723,568) Table 1. summarizes the biological and socioeconomic characteristics of the study population in terms of whether the survey was responded before or during the COVID-19 pandemic. Nearly two-thirds of the surveys were completed during the COVID-19 pandemic. Individuals who completed the survey during the pandemic tended to be younger, and more were Non-Hispanic Black (NHB) or Hispanic. We did not find differences in sex, education levels, insurance status, income levels, or differences in the number of chronic conditions sustained between individuals who responded to the survey before the pandemic from those who responded during the pandemic (Table 1).

### Table 1

|                          | Individuals who responded before the pandemic | Individuals who responded during the pandemic | p-value |
|--------------------------|----------------------------------------------|----------------------------------------------|---------|
| ALL                      | 787 (36.8)                                    | 1201 (63.2)                                  | 0.3744  |
| Sex                      |                                              |                                              |         |
| Male                     | 355 (52.2)                                    | 511 (48.8)                                   |         |
| Female                   | 432 (47.8)                                    | 690 (51.2)                                   |         |
| Age in Years             |                                              |                                              |         |
| 18–34 years              | 40 (8.9)                                      | 73 (14.0)                                    | 0.0095  |
| 35–49 years              | 81 (18.2)                                     | 189 (27.4)                                   |         |
| 50–64 years              | 251 (38.7)                                    | 417 (32.0)                                   |         |
| 65–74 years              | 254 (20.2)                                    | 349 (16.0)                                   |         |
| 75, and older            | 161 (14.0)                                    | 173 (10.6)                                   |         |
| Race/Ethnicity           |                                              |                                              |         |
| Non-Hispanic White       | 557 (76.3)                                    | 692 (62.5)                                   |         |
| Non-Hispanic Black       | 95 (9.2)                                      | 222 (16.3)                                   |         |
| Hispanic                 | 79 (7.0)                                      | 195 (13.5)                                   |         |
| Others                   | 56 (7.6)                                      | 82 (7.8)                                     |         |
| Education                |                                              |                                              |         |
| LT HS                    | 50 (5.8)                                      | 103 (9.1)                                    | 0.2829  |
| HS or similar            | 202 (32.2)                                    | 273 (34.1)                                   |         |
| Some College             | 526 (29.1)                                    | 495 (26.2)                                   | 0.5336  |
| College and above        |                                              |                                              |         |
| Health Insurance         |                                              |                                              |         |
| Yes                      | 768 (94.9)                                    | 1152 (93.7)                                  | 0.9795  |
| No                       | 19 (5.1)                                      | 49 (6.3)                                     |         |
| Income                   |                                              |                                              |         |
| LT 50k                   | 370 (44.0)                                    | 564 (43.3)                                   | 0.9422  |
| 50k–<100k                | 236 (30.9)                                    | 349 (30.9)                                   |         |
| 100k+                    | 181 (25.1)                                    | 288 (25.7)                                   |         |
| Chronic diseases         |                                              |                                              |         |
| One                      | 404 (57.7)                                    | 610 (57.4)                                   |         |
| Multimorbidity           | 383 (42.3)                                    | 591 (42.6)                                   |         |

Note: Based on pooled data of 1987 adult participants. Significant group differences were tested with Rao Scott chi-square tests for weighted data. Weighted Percentages were derived using replicate weights. HS: High School; LT: Less than; wt: weighted.
The prevalence of anxiety and depression was higher among NHWs during the COVID-19 pandemic as compared to the pre-COVID-19 period ($p < 0.05$, Table 2, left panel) across individual items and summary measures. However, such findings were not found among people of color ($p > 0.05$, Table 2, right panel).

After adjusting for biological variables (i.e., age, sex), socioeconomic status variables (income and education), and access to care variables (i.e., health insurance), NHW individuals with chronic conditions who responded during the COVID-19 pandemic were more likely to have anxiety and depression compared to ones who responded before the pandemic. The adjusted odds ratio (AOR) for NHW individuals with chronic conditions during the pandemic having high odds of anxiety was 2.02 with a 95% confidence interval (CI) of 1.10–3.73 ($p = 0.025$). The AOR for NHW individuals with chronic conditions during the pandemic having higher odds of anxiety was 2.33 with a 95% CI of 1.17–4.65 ($p = 0.018$, Table 2). In addition, elderly individuals tended to have a lower odd of both anxiety and depression compared to younger individuals (Table 3). However, when focused on people of color who had chronic conditions, the AOR of this cohort during the pandemic had no significant increased odds of anxiety (AOR = 0.59, 95% CI 0.26–1.34, $p = 0.201$) and depression (AOR = 0.77, 95%CI 0.39–1.52, $p = 0.447$) when compared with ones before the pandemic (Table 4).

### 4. Discussion

In this study, we observed differences between pre-COVID-19 and during-COVID-19 responses by using the natural timing of a nationally representative survey. We found that the COVID-19 pandemic was associated with increased odds of anxiety/depression among NHW individuals with chronic conditions. However, we did not observe a statistically significant association of the COVID-19 pandemic with anxiety and depression among people of color. Our findings suggest that among those with chronic conditions, the association of COVID-19 to depression and anxiety may vary by race/ethnicity.

As stated in the introduction, studies have reported mixed results on the association of race/ethnicity to depression and anxiety (Goldmann et al., 2021; Owens and Saw, 2021; McGuire and Miranda (2008). It reported that, in general, people of color had similar or better mental health compared to NHWs. However, this study was conducted before COVID-19. Studies conducted during the pandemic period also support such findings (Goldmann et al., 2021). A US study using the same tool used in our study to measure anxiety and depression reported that during the COVID-19 pandemic, anxiety/depression was lower among NHB compared to NHW individuals (Goldmann et al., 2021). Another US study conducted during the COVID-19 pandemic using data from Understanding American Study also reached similar findings (Owens and Saw, 2021). A similar pattern has been reported that after 9/11, African American persons living in New York City during the disaster were less likely than NHW to suffer from depressions (Adams et al., 2006).

Our study findings regarding race/ethnicity add to the literature that the relationship between race and mental health is very complex and confirms the “mental health paradox”. While our study did not explore the reasons behind our findings, we rely on explanations from the published literature. For example, people of color may have protective factors such as higher levels of coping resources such as self-esteem, social support, religious attendance, and divine control (Louie et al., 2021), resilience levels (Woodward et al., 2013), and strong ethnic identity (Williams et al., 2012). On the other hand, people of color may be less likely to report depression and anxiety compared to NHWs (Huang et al., 2021). Another possible explanation may be the ability for people of color to withstand adversities due to long-standing issues related to stigma, discrimination, lack of opportunities to move upwards in society (Meraya et al., 2018). NHW may experience higher levels of stress and poor mental health than the NHB’s when NHW’s experience external shocks such as COVID-19 or economic declines as they may feel

### Table 2
Anxiety and depression screening among individuals with chronic conditions prior to and during the COVID-19 pandemic (health information national trends survey – 5, cycle 4).

| Anxiety Screening | N HW (n = 1248) | During | N People of color (n = 739) | During |
|-------------------|-----------------|--------|--------------------------|--------|
|                    | N   | Wt% | N   | Wt% | P | N   | Wt% | N   | Wt% | P |
| **Nervous**       |      |     |      |     |   |      |     |      |     |   |
| Not at all        | 358  | 61.3 | 391  | 49.0 | 0.0142 | 147  | 57.7 | 330  | 65.5 | 0.4545 |
| Several days      | 149  | 28.8 | 196  | 29.8 | 0.0221 | 48   | 23.3 | 125  | 19.1 | 0.6500 |
| More than half the days | 27  | 4.0 | 46  | 10.1 |        | 20   | 11.9 | 27   | 6.8  |        |
| Nearly everyday   | 23   | 5.9 | 58   | 11.1 |        | 15   | 7.2  | 27   | 8.6  |        |
| **Worrying**      |      |     |      |     |   |      |     |      |     |   |
| Not at all        | 406  | 69.1 | 449  | 57.3 | 0.0221 | 147  | 59.4 | 341  | 66.7 | 0.2208 |
| Several days      | 105  | 22.4 | 141  | 23.4 |        | 46   | 24.1 | 98   | 19.4 |        |
| More than half the days | 27  | 4.5 | 56  | 9.8  |        | 15   | 6.5  | 36   | 4.4  |        |
| Nearly everyday   | 19   | 4.0 | 45   | 9.5  |        | 22   | 10.0 | 34   | 6.9  |        |
| **Anxiety GAD-2 score** |      |     |      |     |   |      |     |      |     |   |
| Low risk of anxiety | 498 | 88.5 | 569 | 75.7 | 0.0021 | 186 | 77.4 | 438 | 83.7 |    |
| High risk of anxiety | 59 | 11.5 | 122 | 24.3 |    | 44 | 22.6 | 71 | 16.3 |    |
| **Depression Screening** |      |     |      |     |   |      |     |      |     |   |
| Little interest   | 380  | 68.7 | 434 | 54.8 | 0.0179 | 144 | 53.4 | 329 | 64.8 | 0.2980 |
| Several days      | 119  | 21.3 | 163 | 28.3 |        | 42 | 27.4 | 96 | 22.1 |        |
| More than half the days | 35 | 6.4 | 50 | 7.0 |        | 19 | 8.5 | 43 | 4.7 |        |
| Nearly everyday   | 23 | 3.6 | 44 | 9.9 |        | 25 | 10.8 | 41 | 8.5 |        |
| **Hopeless**      |      |     |      |     |   |      |     |      |     |   |
| Not at all        | 407  | 68.9 | 459 | 60.5 | 0.2567 | 159 | 60.1 | 377 | 70.5 | 0.1904 |
| Several days      | 107  | 22.3 | 155 | 25.4 |        | 47 | 30.3 | 85 | 20.3 |        |
| More than half the days | 28 | 6.4 | 47 | 7.9 |        | 14 | 4.3 | 29 | 5.3 |        |
| Nearly everyday   | 15 | 2.4 | 30 | 6.2 |        | 10 | 5.3 | 18 | 3.9 |        |
| **Depression PHQ-2 score** |      |     |      |     |   |      |     |      |     |   |
| Low risk of depression | 500 | 90.8 | 587 | 79.3 | 0.0034 | 190 | 84.3 | 426 | 86.7 | 0.4648 |
| High risk of depression | 57 | 9.3 | 104 | 20.7 |        | 40 | 15.7 | 83 | 13.3 |        |

Note: Based on pooled data of 1987 adult participants. Significant group differences were tested with Rao Scott chi-square tests for weighted data. Weighted Percentages were derived using replicate weights.
null
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Amy F. Ho: Conceptualization, Writing – review & editing.
Naomi Alanis: Writing – review & editing. Usha Sambamoorthi: Conceptualization, Methodology, Validation, Formal analysis, Resources, Data curation, Writing – original draft, Writing – review & editing.

Declaring of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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