



Impact of COVID-19 Stay-at-Home Orders on Health Behaviors and Anxiety in Black and White Americans

Joshua R. Sparks¹ · Maryam Kebbe¹ · Emily W. Flanagan¹ · Robbie A. Beyl¹ · Abby D. Altazan¹ · Shengping Yang¹ · Leanne M. Redman¹

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Abstract

Background In the United States (US), the incidence and severity of COVID-19 infections, hospitalizations, and deaths are higher in Black compared to White residents. Systemic inequities and differences in health behaviors may contribute to disparities in COVID-19 health outcomes. The aim of this study was to examine the impact of COVID-19 stay-at-home orders on changes in health behaviors and anxiety in Black and White adults residing in the US.

Methods Beginning April 2020, the Pennington Biomedical Research Center COVID-19 Health Behaviors Study collected information on changes to employment, income, diet, physical activity, anxiety, and sleep patterns through a global online survey.

Results Of 4542 survey respondents in the US, 7% identified as Black and 93% as White. Prior to the COVID-19 stay-at-home orders, a greater proportion of Blacks compared to Whites reported earning < US\$50,000 per year ($p < 0.0001$). A greater proportion of Blacks reported being laid off, working fewer hours, and working from home following COVID-19 stay-at-home orders ($p < 0.0001$ for all). In the overall sample, eating behaviors improved, physical activity decreased, sleep time prolonged, and anxiety heightened following COVID-19 stay-at-home orders ($p < 0.01$ for all), which were universal between Black and White respondents ($p \geq 0.315$ for all).

Conclusions This study highlights the disproportionate changes to employment and income in Blacks, with no differential impact on health behaviors and anxiety compared to Whites due to COVID-19 stay-at-home orders. As the COVID-19 pandemic continues, disproportionate changes to employment and income status may widen among Blacks and Whites, which may influence health behaviors and anxiety.

Keywords Anxiety · COVID-19 · Employment · Health behaviors · Health disparities · Income

Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2. In the United States (US), the incidence and severity of COVID-19 infections, hospitalizations, and deaths are higher in Black residents compared to White residents [1, 2]. Compared to Whites, Blacks have been almost three times,

five times, and two times more likely, respectively, to contract, be hospitalized, or die from COVID-19 [1, 2].

Recent viewpoints and commentaries lack empirical data but have speculated that systemic inequities and differences in health behaviors may contribute to disparities in COVID-19 health outcomes [3–7]. Viewpoints have also highlighted the disproportionate economic and environmental impacts likely to occur among Blacks in the US due to COVID-19 [3–7]. For example, current evidence suggests that food insecurity has become exacerbated due to the COVID-19 pandemic in a low-income, predominantly African American cohort [8]. Food insecurity in this vulnerable population may be coupled with low-cost, energy-dense processed foods as well as a built environment characterized by living in more polluted and crime-prone neighborhoods, a lack of access to sidewalks, and limited transportation.

Joshua R. Sparks, Maryam Kebbe and Emily W. Flanagan contributed equally to this work.

✉ Leanne M. Redman
Leanne.Redman@PBRC.edu

¹ Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA, USA

Further economic and environmental impacts, including not having the option to continue to work or the privilege to work from home, and access to COVID-19 vaccinations are likely to further affect COVID-19 infection rates, impede recovery from COVID-19, and challenge maintenance of health behaviors during the pandemic [6, 7, 9]. In order to identify health disparities in health behaviors and anxiety between Blacks and Whites, we tested the hypothesis that these metrics would be more negatively and disproportionately impacted by COVID-19 stay-at-home orders among Blacks compared to Whites in a cohort of 4542 US adults.

Methods

The Pennington Biomedical Research Center COVID-19 Health Behaviors Study assessed behavior change in response to COVID-19 stay-at-home orders [10]. From April 3, 2020 to May 3, 2020, this global survey collected anonymous information on individual and household demographics and changes to employment, income, diet (breakfast skipping and consumption of sugar-sweetened beverages, takeout, fast food, fried foods, desserts, fruits, and vegetables), physical activity (minutes/week adjusted for exercise intensity), anxiety, and sleep patterns. To assess health behaviors and anxiety prior to stay-at-home orders, participants were asked to recall using the phrase “before the COVID-19 outbreak in your country or region.” Health behaviors and anxiety during stay-at-home orders were assessed by asking the participants to recall using the phrase “since the COVID-19 outbreak in your country or region.” Diet was assessed using the Rapid Eating Assessment for Participants short version (REAP-s) [11]. Total intensity-adjusted physical activity, presented as metabolic equivalent (MET) minutes per week, was measured using a modified version of the Nurses’ Health Study Physical Activity Questionnaire [12] with METs for physical activity chosen from the Compendium of Physical Activities [13]. Sleep was determined by self-report sleep onset and wake times. Anxiety was evaluated using the generalized anxiety disorder 7-item (GAD-7) scale [14]. These measures were selected to provide a comprehensive representation of typically described lifestyle and mental health domains in participants before and after the pandemic. The specific survey domains are registered and available to the public at PhenX Toolkit (<https://www.phenxtoolkit.org/covid19/>) [15]. Herein, we report results of respondents residing in the US given that stay-at-home orders were not globally universal. Of note, while stay-at-home orders were variable within the US, 41 out of 50 states had implemented state-at-home mandates at the time of study start [16]. Recruitment occurred over 30 days via social media and word of mouth. Ethics approval and electronic consent were obtained [10].

Statistical analyses were performed using SAS version 9.4 (Cary, NC), and $p < 0.05$ determined significance. Demographics were compared using unpaired *t*-tests (continuous variables) and chi-square analyses (categorical variables). General linear models compared change scores from pre- to post-stay-at-home orders between Blacks and Whites including pre-COVID-19 value (crude model) and age, body mass index (BMI), highest degree earned, household income, and household size as covariates (adjusted model). Sensitivity analysis using 1:1 random sampling (1000 iterations) of Blacks and Whites for health behaviors and anxiety was also performed. Post hoc power analysis ($\beta = 0.8$, $\alpha = 0.025$ one-sided) estimated that with a sample of 319 Blacks, the minimal difference for change in eating behaviors is 3.8% when compared to Whites.

Results

Of the US respondents, a total of 125 (2.8%) reported being tested for COVID-19 with 16 (0.4%) reporting testing positive for COVID-19. Blacks accounted for 16.8% ($n = 21$) of those who tested for COVID-19, of whom 12.5% ($n = 2$) tested positive for COVID-19. As the timeline for completion of the COVID-19 Health Behaviors Study, COVID-19 testing, and potential positive COVID-19 test were not accounted for, the few respondents who also reported testing positive for COVID-19 were included in the present analyses.

Of 4542 respondents in the US, 319 (7%) identified as Black and 4223 (93%) as White. Compared to Whites, Blacks were younger (49.5 ± 14.6 versus 52.1 ± 15.6 years), had a higher BMI (31.9 ± 7.5 versus 28.7 ± 6.8 kg/m²), completed fewer years of education (30.4% versus 37.4% completing bachelor’s degree), lived in a household with more dependents (1.0 ± 1.1 versus 0.8 ± 1.1 dependents), and lower household income (40.2% versus 25.2% earning < US\$50,000 per year) ($p \leq 0.03$ for all).

Following stay-at-home orders, most respondents in the overall sample reported being laid off (60.6%), working fewer hours (51.5%), and working from home (35.5%), with no significant correlations expressed between household income and any change in employment status ($0.09 \leq r \leq 0.10$; $p \geq 0.22$ for all). Analysis in the overall sample also provided evidence that eating behaviors improved (+4.9%, $p < 0.01$) due to less breakfast skipping and consumption of takeout, fast food, and fried foods and greater fruit consumption, while sleep time prolonged (+3.2%) ($p < 0.01$ for both). Additionally, physical activity decreased (−4.4%) and anxiety heightened (+95.8%) ($p < 0.01$ for both).

In our crude models, changes (Δ) to eating behaviors (Blacks Δ REAP-S = 1.07 ± 3.16 ; Whites

Δ REAP-S = 0.88 ± 2.7 ; $p = 0.388$), physical activity (Blacks Δ MET-minutes per week = $-152.9 \pm 2,062.1$; Whites Δ REAP-S = -55.8 ± 1210.2 ; $p = 0.315$), sleep time (Blacks Δ hours per day = 0.29 ± 3.02 ; Whites Δ hours per day = 0.26 ± 2.31 ; $p = 0.853$), and anxiety (Blacks Δ GAD-7 = 9.0 ± 14.4 ; Whites Δ GAD-7 = 8.6 ± 13.0 ; $p = 0.388$) were similar between Blacks and Whites (Fig. 1), which persisted in adjusted models ($p \geq 0.106$ for adjusted models). As sample size differences existed between Blacks and Whites, we performed a sensitivity analysis utilizing a random sampling approach of Blacks and Whites, which yielded similar findings for changes in health behaviors and anxiety.

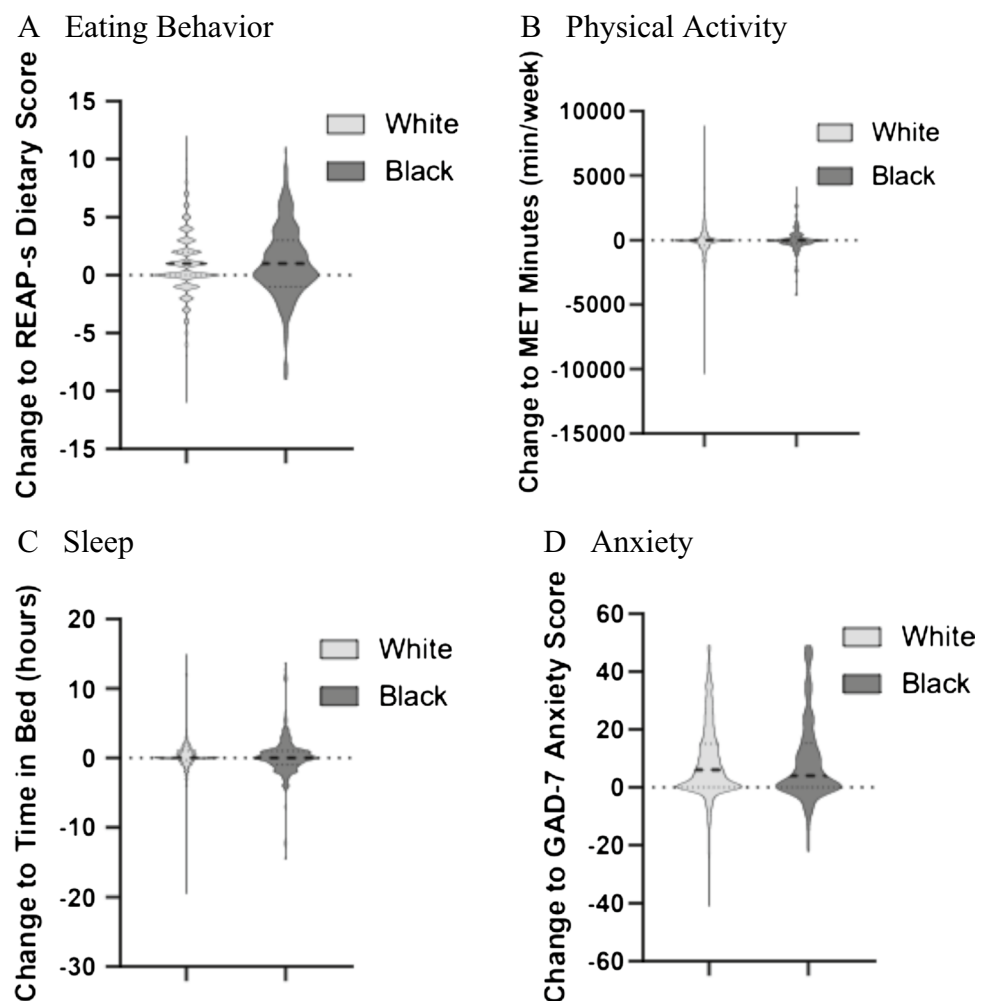
Discussion

In April 2020, COVID-19 stay-at-home orders mandated for approximately 60 days in most regions led to drastic universal changes in health behaviors and anxiety among Blacks and Whites. These results, while contrary to our

hypothesis and prior viewpoints and commentaries [3–7], are plausible because stay-at-home orders were abrupt, and the entire population was forced to adapt simultaneously. Blacks, however, reported a disproportionate reduction in household income and employment loss during the initial COVID-19 stay-at-home orders. These findings were interesting as the presented health behaviors are perceived to be under personal control [17], while employment and income status are factors considered outside of personal control [18]. These startling data further expose systemic inequities among Black Americans at the start of the pandemic.

Although adults across the US were sampled, Blacks may have been underrepresented in our sample (7%) compared to 13% of the US population [19], thereby affecting the generalizability of our interpretations. Additionally, a greater proportion of Whites (10.4–12.1% greater prevalence) reported not working prior to COVID-19 compared to Blacks ($p < 0.0001$ for all). This was unexpected but may be due to greater financial security prior to COVID-19 in Whites and potentially explains the higher proportion of Blacks working from home in response to stay-at-home

Fig. 1 A–D Change in health behaviors and anxiety in response to COVID-19 stay-at-home orders in Black and White respondents. Reports mean change and variance (crude model) in total number of White and Black respondents for change in **A** eating behavior measured with the Rapid Eating Assessment for Participants (REAPs) survey, **B** intensity-adjusted physical activity in metabolic (MET) minutes, **C** sleep time assessed by self-reported time into and out of bed, and **D** anxiety measured with the General Anxiety Disorder 7-Item (GAD-7) scale



orders. While random sampling of Whites and Blacks in sensitivity analyses yielded similar findings for health behaviors and anxiety, follow-up of these health behaviors is warranted to examine the long-term implications of COVID-19 in Blacks.

The COVID-19 Health Behaviors Study was among the first global surveys that collected and published diverse responses from adults at the onset of COVID-19 stay-at-home orders. This survey allowed for examination of health behavior changes and factors protecting against a decline in physical activity in adults during the initial COVID-19 stay-at-home orders in the US [10, 20]. Our survey might not be the only or largest survey to assess varying responses to COVID-19 stay-at-home orders but was the first to collect information on employment and income, while simultaneously collecting information on a variety of health behaviors and anxiety at the onset of COVID-19 stay-at-home orders. Previous studies have since reported negative impacts of COVID-19 stay-at-home orders on college student's mental health [21], weight-related behaviors in individuals with obesity [22], and found race/ethnicity-based factors as an inequity on well-being [23]. Although in-line with previous findings, our results expand upon the aforementioned studies by presenting a collective group of results overall and by race in the same sampled population.

Of note, the present findings are increasingly important as COVID-19 still has a stronghold over our pre-2020 way of life and has persisted for over 1 year [24]. As new variants are being discovered [25], Black Americans being less likely to receive the COVID-19 vaccination [26], as well as new closures to countries outside of the US [27], long-term impacts on health behaviors will likely emerge in those with greater vulnerability to income instability. Additionally, our present study did not aim to examine low-income Whites, which may also be a critically susceptible population as the COVID-19 pandemic persists. However, previous evidence suggests that Black individuals are more vulnerable during the COVID-19 pandemic compared to Whites, especially low-income Blacks [23]. Therefore, it remains prudent to prioritize mental and physical healthcare for our Black communities to halt the perpetual disparity of COVID-19 infection and impaired recovery.

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Author Contribution LMR had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. JRS, MK, and EWF contributed equally to this work. EWF and LMR conceptualized and designed the study. All authors acquired, analyzed, and interpreted presented data and critically reviewed the manuscript for important intellectual content.

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Data Availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Code Availability The SAS version 9.4 codes used for analysis of data presented in this study are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval This study was approved and overseen by the Institutional Review Board at Pennington Biomedical Research Center.

Consent to Participate Upon following the link provided and entering the survey, interested individuals received instructions that detailed the purpose of the study, and after it was verified that they were adults, provided consent to participate.

Competing Interests The authors declare no competing interests.

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