

Research Article

Identifying Psychological Distress Patterns during the COVID-19 Pandemic using an Intersectional Lens

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Objective. We inform an intersectional understanding of differences in psychological distress across the U.S. population during the early months of the COVID-19 pandemic by examining the unique and interactive influences of multiple social variables on levels of psychological distress.

Methods. The March and April 2020 waves of the American Trends Panel (N = 4,560) were analyzed using conditional inference trees and random forests to examine how complex interactions among social status variables influence psychological distress levels.

Results. Age, gender, socioeconomic status, and community attachment most influenced distress in March 2020, while race and ethnicity emerged as influential in April 2020, especially among older men.

Conclusions. The results provide insights into how multiple social statuses interact to shape psychological distress levels. By analyzing distress as a result of multiple pathways, we address theoretical mandates to consider the intersecting influence of social statuses on mental health.

Targeted interventions by mental health specialists are discussed.

Contribution. This study builds upon the extensive and ever-growing literature on the effects that the COVID-19 pandemic has had on health, while specifically approaching the analysis with an intersectional lens and using tree-based statistical modeling to better visualize the differential impact the early months of the pandemic had on mental health.

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Introduction

Alongside the physical disease burden associated with Coronavirus Disease 2019 (COVID-19), there are major concerns that the pandemic may have substantial and long-lasting mental health effects. March and

April 2020 can be characterized as particularly tumultuous due in part to the disruptions in community attachments and general uncertainty surrounding the COVID-19 pandemic. In March, little was known about the novel coronavirus and the social disruptions were seemingly ubiquitous; thus, psychological distress was high, but may have been relatively equal across population subgroups (Daly & Robinson, 2020). By April, it had become clear that older individuals, and Black and Hispanic people, were experiencing disproportionately high rates of hospitalizations and mortality from the virus (Millet et al., 2020; Rodriguez-Diaz, 2020). Further, older adults were especially encouraged to minimize social contact with others, which has proven not only disruptive for community attachments, but also harmful for holistic well-being (Devaraj & Patel, 2021; Fingerman et al., 2021). Moreover, illness, death, and social disruptions related to the pandemic unfolded unevenly across other social categories including gender, socioeconomic status, and geographic location (Collins et al., 2020; Yang et al., 2020), but how these social statuses interacted to produce differences in psychological distress remains unclear. Uncertainty regarding which segments of the population report the highest levels of distress prevents informed targeted interventions by mental health specialists.

The purpose of this study is to determine how interactions among social determinants of mental health are associated with psychological distress levels in March and April 2020. We analyzed nationally representative data using conditional inference trees and random forests in an effort to understand how psychological distress during the COVID-19 pandemic was influenced by intersecting social status variables. This work is informed by both the social determinants of health and the intersectionality frameworks. Taken together, this work offers a better visual exploration of the differential impact the COVID-19 pandemic had on mental health.

Social Determinants of Mental Health (Risk Factors)

A person's mental health is shaped by various overlapping social, economic, and community factors operating at different stages of life. Social determinants of mental health have been identified as including age, gender, race/ethnicity, income, education, and geographic area of residence (World Health Organization [WHO], 2014). More specifically, each determinant is comprised of hierarchically arranged categories with attached social meanings and values, and by extension (dis) advantages. As examples, higher education is associated with a host of health advantages and, although the association eventually plateaus, increasing income is associated with better health (Mirowsky and Ross 2015).

A WHO (2014) report posits that existing evidence points to a need to use an explicit life course approach when studying mental health inequalities because of the differential experience and impact of social determinants of mental health throughout life. A life course view appreciates how social roles, stressors, expectations, and values change with age. For example, following adolescence, contemporary young people are said to transition to adulthood through a period referred to as emerging adulthood or young adulthood (Arnett 2007; Furstenberg et al. 2004). During young adulthood, youth strive to meet the expectations of adulthood – e.g., complete schooling, begin a career, and marry. Thus, adult status is not only a matter of age but also an accumulation of successes in completing certain tasks deemed appropriate for one's age or life stage (Cepa and Furstenberg 2021). In addition, characteristics such as income, gender, and race/ethnicity shape each portion of the life course as they are related to an ability to meet the expectations of each portion of the life course (Silva 2012). For instance, poor and working-class youth are less likely to complete higher education during the transition to adulthood (Silva 2012); and, as stated, variations in educational attainment are related to mental health disparities (Mirowsky and Ross 2015). In sum, social determinants of mental health, and their impacts on health and illness, are shaped by the life course.

Intersectionality

An intersectional perspective suggests that social determinants of mental health are intersecting and are not mutually exclusive categories. Intersectionality is a theoretical framework rooted in Black feminist scholarship. At its core, intersectionality includes a focus on power, social inequality, and privilege tied to the experience of multiple social categories (Cho, Crenshaw, and McCall 2013; Collins and Bilge 2020). In addition to highlighting categorical differences in health outcomes, studies guided by intersectionality require attention to social structure and processes of social inequality (e.g., racism and sexism). For instance, instead of biological sex being the sole determinant of mental health, it is also gender-based discrimination that impacts mental health (Rosenfield and Mouzon 2013). Instead of race, it is racism that shapes mental health (Williams, Lawrence, and Davis 2019) and both gender and race intersect to create intricate differences in experiences and health (). In other words, an explanation of gender disparities in rates of depression that only centers biological sex differences fails to appreciate gender as a social construction and how gender is complexly shaped by other power-defining statuses such as race/ethnicity, socioeconomic class, and sexuality. In sum, intersectionality provides a way of examining social determinants of mental health as intersecting to produce experiences shaped by differences in power and privilege.

Woven into intersectionality scholarship are debates about what constitutes useful methodological approaches and, indeed, whether quantitative analyses have a place in investigations of how intersectional categories shape health (Bowleg and Bauer 2016). The intercategory approach is commonly used in quantitative analyses and includes interaction terms to compare outcomes between intersectionally defined groups (McCall 2005). One issue is that power constraints in traditional regression models require researchers to choose among the available predictors of interest and only test interactions among a subset. To circumvent this issue, decision tree methods, such as conditional inference trees and random forests, are considered promising options that allow for a data-driven approach to estimating predictors of health disparities (Bowleg and Bauer 2016). With the exception of a Masters thesis (i.e., Mahendran, 2020), conditional inference trees and random forests have not been applied within the intersectionality framework but have been used to study health disparities. As an example, Nayak and colleagues (2018) assessed biological, behavioral, and social determinants associated with self-related health (SRH) using classification tree analyses, which allowed them to determine the joint impact of multiple health determinants without first limiting the possible joint effects by researcher decisions.

The COVID-19 Pandemic

The COVID-19 pandemic context presents mental health researchers with an opportunity to investigate the ways social determinants of mental health are associated with differences in psychological distress in the presence of a ubiquitous social-ecological stressor (i.e., COVID-19 pandemic). The social determinants of mental health and intersectionality frameworks suggest that despite a common stressor, the meaning, experience, and health outcomes related to the COVID-19 pandemic are shaped by intersecting social determinants of mental health. Thus far, there is an absence of empirical examinations of how social determinants of health jointly influence psychological distress using nationally representative data. Existing evidence shows that women reported greater increases in psychological distress at the beginning of the pandemic (Riehm et al., 2021), which may be tied to gender differences in the strains placed on the balance of work and family responsibilities (Collins et al., 2020). Young adults and those with incomes of less than \$30,000 also reported greater psychological distress (McGinty et al., 2020; Prout et al. 2020). Yet, previous research prevents an intersectional understanding of how the COVID-19 pandemic influenced psychological distress by either ignoring subpopulation differences, or centering only one health determinant (e.g., gender or age) in estimating psychological distress. This study was completed to address this gap in the literature

Methods

Sample and Data

The March 19–24, 2020 and April 20–26, 2020 waves of the American Trends Panel (ATP) were used for this study. The survey data were collected by the Pew Research Center as a part of an ongoing, online, national, probability-based study of non-institutionalized adults, ages 18 and older, residing in the United States. The survey was conducted in both English and Spanish. The data capture information at an early point in the pandemic—the period after the World Health Organization declared COVID-19 a global pandemic and after the federal government’s initial 15-day stay-at-home /shelter in place order, but before the U.S. became the country with the highest infection rate. The data contain information about respondents’ psychological distress and COVID-19 related stressors. After omitting missing values, the analytic sample size was $N = 4,560$.

Study Variables

The psychological distress measure consisted of five items on a 4-point Likert scale ranging from 1 (*less than 1 day*) to 4 (*5–7 days*). The five psychological distress items were adapted from the GAD-7, CES-D, and Impact to Event Scale-Revised. Respondents were asked, ‘In the past 7 days, how often have you (1) Felt nervous, anxious, or on edge?, (2) Felt depressed?, (3) Felt lonely?, (4) Felt hopeful about the future?, and (5) Had trouble sleeping?’ Item four was reverse coded before creating a sum score of these items, with higher scores representing greater levels of psychological distress. Only participants who responded to all five questions were included in the final sample.

Social determinants of mental health include age, gender, race/ethnicity, education, income, and geographic area of residence; therefore, these are the main study variables of interest. Age was measured in the survey using the following categories: 18–29, 30–49, 50–64, and 65+ years. Gender was self-reported as ‘female’ (1=yes) or ‘male’. The race/ethnicity survey item captured four categories: ‘White (non-Hispanic),’ ‘Black (non-Hispanic),’ ‘Hispanic,’ and ‘Other.’ In the survey, the ‘Other’ category included ‘Asian or Asian American,’ ‘Mixed Race,’ or ‘Some Other Race.’ Attempts to disaggregate the ‘Other’ category were met with analytically insufficient sample sizes; thus, the racial/ethnic groups within the category were all classified as ‘Other’ for the purpose of this study. Educational attainment was reported as ‘Less than high school,’ ‘High school graduate,’ ‘Some college no degree,’ ‘Associate’s degree,’ ‘College graduate/some postgrad,’ or ‘Postgraduate.’ Annual household income was measured as greater than \$75,000, between

\$30,000 and \$75,000, and less than \$30,000. In addition to the abovementioned social determinants of mental health, variables such as community attachment, political party affiliation, and marital status were also explored.

Analytical Methods

Conditional Inference Trees. The primary goal of this study was to examine how complex interactions among social determinants of mental health (e.g., age, race/ethnicity, income, etc.) influenced psychological distress levels during the COVID-19 pandemic. Conditional inference trees, a type of nonparametric supervised learning technique based upon recursive partitioning for multivariable analysis, were utilized to classify psychological distress level through a series of binary, if-then splits with covariate selection at each split determined by permutation-based significance testing (Hothorn, Hornik, et al., 2006). Similar to classification and regression tree (CART) methods as described by Breiman et al. (1984), conditional inference trees split the sample space into homogenous groups using an intuitive decision tree structure that is easily visualized. These methods are nonparametric and, consequently, are appropriate even when model assumptions for traditional parametric statistical approaches such as linear modeling are violated. An additional benefit of utilizing a tree-based model is in the ability to detect and explore complex interaction effects that need not be specified a priori by the researcher. When a tree-based model splits the data on multiple predictor variables, that split represents an interaction effect at specific predictor variable cut points that may be quite different from those interaction effects modeled using typical linear regression techniques. Conditional inference trees also avoid bias in covariate selection by utilizing a significance test procedure for covariate selection at each split. In this manner, splits are informative and only utilize covariates that exhibit the strongest statistical associations with the dependent variable.

Random Forests. To mitigate tree instability (Stobl et al., 2009), a random forest utilizing conditional inference tree base learners was utilized. Random forests are an ensemble learning method shown to reduce prediction variance, improve predictive performance, and provide a measure of variable importance (Strobl et al., 2009). A random forest of 1,000 trees was used to assess the relative importance of each social status variable in predicting psychological distress.

All analyses were conducted in R 3.6.3 (R Core Team, 2020), using the party package (Hothorn, Hornik, et al., 2006; Hothorn, Bühlmann, et al., 2006; Strobl et al., 2007; Strobl et al., 2008).

Results

Descriptive Statistics

Approximately 27% of the sample was age 65 years or older, with 34% between ages 50 and 64 years, 31% between 30 and 49 years, and 8% of the sample between 18 and 29 years. While the majority of the sample was female (55%) and non-Hispanic White (69%), nearly 27% identified as either non-Hispanic Black or Hispanic. Approximately 55% of sample participants reported earning at least a college degree while another 31% reported having at least some college. Approximately half of the sample (49%) reported annual household incomes of more than \$75,000, while 35% reported earning between \$30,000 and \$75,000 per year, and roughly 16% reported earning less than \$30,000 annually.

Conditional Inference Trees

The conditional inference tree for March 2020 is displayed in Figure 1. Classification of psychological distress is based upon a series of covariate splits, beginning at the top of the tree, until the final predicted probabilities of each psychological distress level (low, medium, high) are displayed at the base of the tree in terminal nodes. The terminal nodes at the base of the tree displays predicted probabilities for *low*, *medium*, and *high* levels of psychological distress by homogenous group. The first split is based upon 'Age'. That is, older adults, '50–64' or '65+', have unique patterns of distress that differ from the patterns for younger adults (<50). The next split is based upon gender (labeled 'Sex' in Figure 1), followed by splits along socioeconomic status, community attachments, and age. As an example, men age '50–64' have an approximate predicted probability of .60 for *low* psychological distress, while men 65+ have a predicted probability of approximately .70 for *low* distress. Men 65+, and women 50+ with little-to-no community attachment but incomes exceeding \$75,000, are most likely to experience *low* psychological distress levels. Women below age 50 earning less than \$30,000, as well as women 50+ with little-to-no community attachment and incomes less than \$30,000, have the highest probability of experiencing *high* distress.

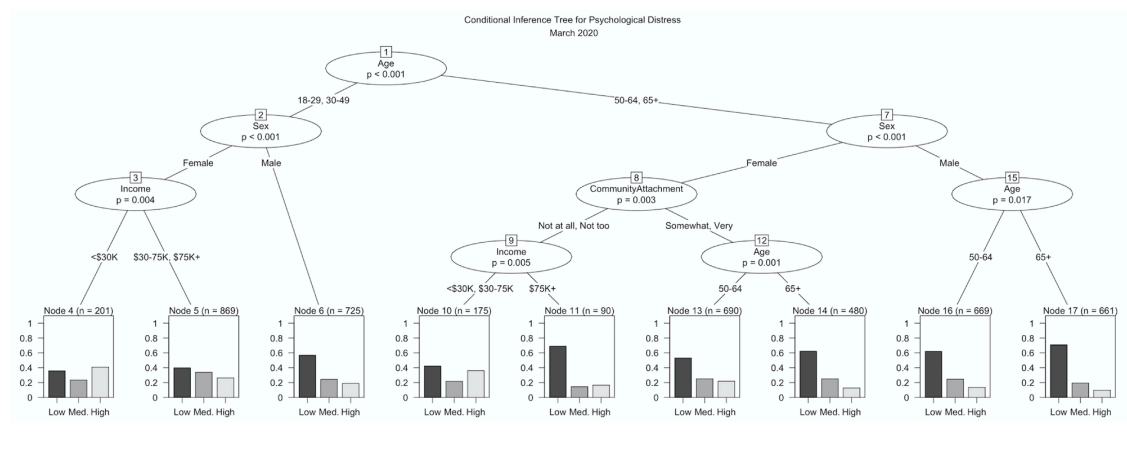


Figure 1. Conditional Inference Tree Predicting Psychological Distress in March 2020

The conditional inference tree for April 2020 is displayed in Figure 2. Men 65+ who identify as white or other race-ethnicity are most likely to experience *low* psychological distress. Women below age 65 without community attachment are most likely to experience *high* psychological distress. Note that men age 65+ who are Black or Hispanic have higher psychological distress than their white counterparts, women 65+ with a high school degree or less have higher psychological distress levels than more educated peers, and men under 65 earning less than \$30,000 have higher psychological distress levels than those with higher incomes.

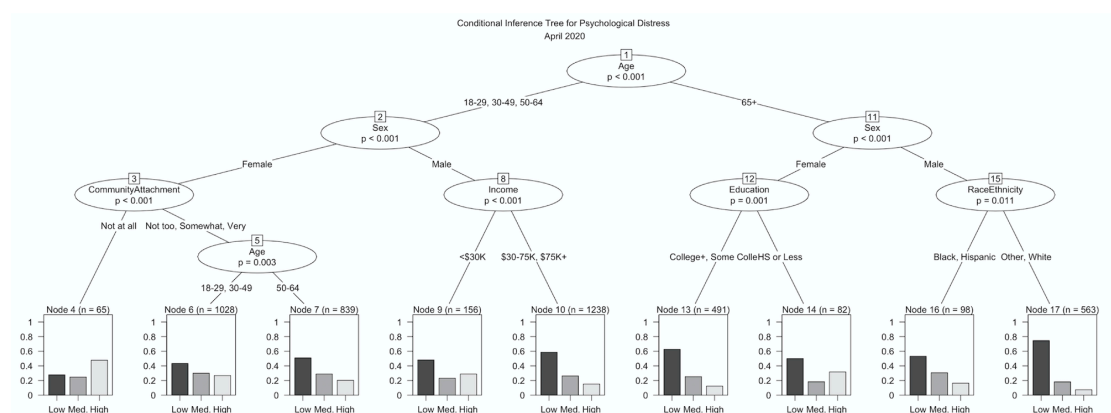


Figure 2. Conditional Inference Tree Predicting Psychological Distress in April 2020

Random Forests

Due to expected instability for any one tree, random forests assessed variable importance using an ensemble of individual trees. Variable importance measures suggested that age, gender, and income were most important in March whereas race-ethnicity, and age emerged as most important in predicting psychological distress by April (see Figure 3).

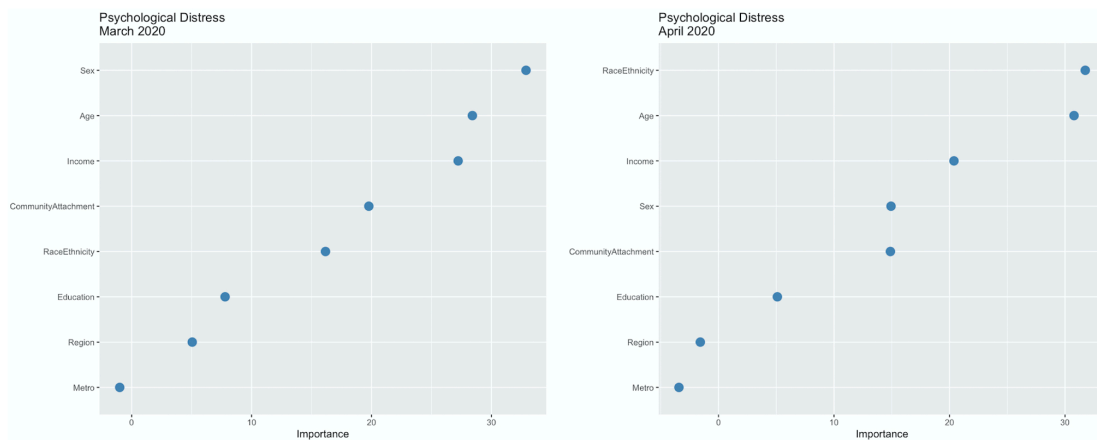


Figure 3. Variable Importance in Predicting Psychological Distress

Discussion

In this study, we examined how complex interactions among social status variables influence population psychological distress levels (low, middle, high) in March and April 2020 of the COVID-19 pandemic. Age, gender, socioeconomic status, and community attachment most influenced distress in March 2020, while race-ethnicity emerged as influential in April 2020, particularly among older men. Previous COVID-19 disparities research focused on age, race-ethnicity, gender, or socioeconomic status individually have missed how each of these statuses are experienced intersectionally, and thus leave questions about which social groups are most vulnerable during the pandemic. Beyond two or three-way interactions common in regression analyses, the models in this study empirically derived which intersections of social statuses produce unique patterns in psychological distress; thus, providing a more nuanced, intersectional understanding of how social locations shape patterns of distress in the U.S. at the beginning of the COVID-19 pandemic.

Of all the potential explanatory variables, age is the most associated with unique patterns of psychological distress such that the probability of high distress is relatively low for older adults, with exceptions for women. Although older adults are vulnerable to illness and death from the virus, psychological distress is generally lower among the older respondents. Older people may have increased contact with friends to help curb feelings of loneliness, anxiety, and depression (Fingerman et al., 2021). Further, the relatively reduced distress among older adults is likely due to age-related changes in proactive coping and consequently fewer negative emotions, better mental health, and less responsiveness to daily stressors (Neubauer et al., 2019). Competing demands related to work, family, and social responsibilities characterizing each portion of the life course can further explain the age differences, specifically the higher probability of greater distress among younger people. The youngest adults are transitioning into adulthood amid a health and economic crisis that may pose long term threats to education and income prospects (Emery et al., 2021). Slightly older young adults are balancing adult roles and responsibilities amid general social and economic uncertainty which can induce role strain and psychological distress (Kämpfen et al., 2020).

In both March and April, the initial split in age leads to subsequent node splits for gender. The results are in line with prior research which finds that women generally report more internalizing symptoms than men (Accortt et al., 2008; Rosenfield & Mouzon, 2013). In the case of distress during the pandemic, splits from age to gender may be explained by life course specific demands, and importantly, gendered divisions of labor and resources that disadvantage women. Specifically, gender differences in psychological distress were likely a consequence of, and exacerbated by, violence against women, increased caregiving duties, and work-family role strains (Collins et al., 2020; UN Women & World Health Organization, 2020). The further splits from gender to other variables underscore the need for not only an acknowledgement of gendered roles across the life course, but also an acknowledgement and understanding of how social statuses complexly intersect to produce unique mental health patterns.

From gender, there are splits to income, community attachments, educational attainment, race-ethnicity, and age. Income differences can be thought of as power differences such that those with higher incomes are able to circumvent restricting policies that may harm mental health. For example, higher income people with children can pay the cost of in-home childcare when schools are closed, thereby relieving themselves of possible work-family conflicts (Lofton, 2021). Economic insecurity, diminished lifetime earnings, along with gendered expectations of financial independence, may explain why low-income young men experienced relatively high distress levels compared to older men (Mendez-Smith & Klee,

2020). Similarly, higher levels of educational attainment are associated with greater psychosocial resources for managing stress and may be the reason for the distress divide among women age 65 and older (Kubzansky, Berkman, & Seeman 2000). Community attachments, or social networks broadly, may be considered sources of social capital. For instance, embeddedness in a social network may facilitate connections to material resources and formal mental health care sources (Gauthier et al., 2020). Lastly, in April, older Black and Hispanic men reported slightly higher distress compared to their peers which may be related to greater exposure to stressors such as decreased social contact, fewer material and social resources, and worries about the health of self, family, and friends given the COVID-19 illness and death racial disparities.

An intersectional lens provides an opportunity to appreciate the nuances in lived experiences and facilitates an understanding of the data-driven splits from age, to gender, to the other social variables in estimating varying levels of psychological distress. Importantly, an intersectional approach encourages an appreciation of power and social inequality (Collins, 2015). Taken together, the results of this study show that one source of social advantage or potential power, like being a man, offers lower distress depending on other social statuses such as income level and race-ethnicity, which are associated with their own differences in power. For instance, among men, the socially disadvantaged – young men earning less than \$30,000 and older Black and Hispanic men – report distress levels that diverge from higher income and White peers in April such that low income and Black and Hispanic men report slightly higher distress. Altogether, advantages of being a man does not operate equally across income and race-ethnicity to consistently benefit mental health during the COVID-19 global health crisis.

Socioeconomic status (income and education) is influential in shaping distress among women as well such that higher socioeconomic status predicts lower distress. Prior research suggest that women report higher distress compared to men (Rosenfield & Mouzon, 2013), but the results of this study suggest that older women with higher levels of education report lower distress than some men. Thus, taking an intersectional view permits a nuanced understanding of which groups are more distressed, and allows for targeted interventions from mental health specialists. While prioritizing women for treatment to alleviate internalizing symptoms, it is also useful to understand that high socioeconomic status women may need less assistance than some low-income men.

In sum, utilizing conditional inference trees, we show that psychological distress patterns at the beginning of the COVID-19 pandemic are associated with complex interactions among social variables. Uncovering the complexities of intersecting social statuses allows for targeted interventions toward

groups of people most likely to report high levels of psychological distress. Targeted interventions to lower distress across the population should center on women living in isolation, people earning a low income, and older Black and Hispanic men. Finally, young people (<50 years old) appear especially vulnerable to increased distress which should be addressed in an effort to curb lifelong mental health problems.

Declarations

Availability of data and materials

Data is publicly available, but data and code can be made available upon request.

Competing interests

The authors declare that they have no competing interests.

Funding

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Compliance with Ethical Standards

The authors declare that they have no conflicts of interest.

The current study utilizes publicly available data originally collected by the Pew Research Center in accordance with all applicable international, national, and/or institutional ethical standards for research involving human subjects and informed consent was obtained from all individual participants involved. Human subjects research was not directly performed by any of the authors.

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