# Is Declining Mental Health in the U.S. a White Phenomenon? Racial Disparities in Mental Health from 1997 to 2018

**Abstract**

Recent studies have documented deteriorating mental health among non-Hispanic whites of low socioeconomic status. However, little is known about whether these mental health trends vary by race and ethnicity. In this study, I analyzed psychological distress among non-Hispanic whites, blacks, U.S-born Hispanics, and foreign-born Hispanics ages 25 to 64 using 22 years of data (1997-2018) from the National Health Interview Survey (N = 425,556). Regression analyses revealed three part trends in mental health, with unique patterns throughout for non-Hispanic whites in the most recent period. Starting in 1997, psychological distress initially decreased for all groups, while in 2002 it began to increase for all groups. Starting in 2012, however, racial/ethnic groups began to sharply diverge. Although distress decreased or remained the same among minorities, it increased sharply among non-Hispanic whites. Furthermore, the determinants of these trends began to diverge as well. Among minorities, decline in distress since 2012 was driven by improvements in socioeconomic status. Among non-Hispanic whites, however, the economic recovery played much less of a role. Race-stratified analyses suggested that declining mental health among non-Hispanic whites was driven by anxiety symptoms among the better-educated rather than socioeconomic deterioration among the disadvantaged.

**Keywords** Mental health; Racial and ethnic inequalities; Trends

## Introduction

Alarming recent trends in substance abuse and an increase in deaths from suicide have raised concerns about Americans' mental health. Life expectancy in the United States increased by only 0.08 years between 2010 and 2016, which was the smallest 5-year increase since 1970 (Ho & Hendi, 2018). This pattern is concerning given that the U.S. was only ranked 30$^{th}$ in the world in life expectancy in 2010—already much lower compared to other high-income countries (WHO, 2017). Recent studies have found these adverse mortality trends to be concentrated among midlife, non-Hispanic whites of low socioeconomic status (SES) (Stein, Gennuso, Ugboaja, & Remington, 2017; Squires & Blumenthal, 2016; Case & Deaton, 2015). The term "deaths of despair" (Case & Deaton, 2015) has been used to describe the roles that rising trends in drug and alcohol deaths and suicide play in mortality increases among non-Hispanic whites (Stein et al., 2017; Monnat, 2018; Case & Deaton, 2015). Scholars have speculated that changes in socioeconomic conditions since the mid-1990s, including rising income inequality, wage stagnation for the working class, and deterioration in employment opportunities are the key factors underlying these deaths of despair (Case & Deaton, 2015, Glei, Goldman, & Weinstein, 2019; Glei, Goldman, & Weinsten, 2018).

Despite recent focus on widening SES disparities in life expectancy and associated trends in substance use and drug-related deaths, little attention has been paid to whether these patterns are mirrored by changes in mental health (Goldberg, Glei, & Weinstein, 2018; Weinberger et al., 2018; Case & Deaton, 2015). This paucity of studies is surprising since SES disparities have been linked to poor mental health (Kessler & Bromet, 2013; Mutaner et al., 2004; Lorant et al., 2003), and poor mental health has been linked to substance abuse and suicide mortality (Weinberger et al., 2018; Hawton, Comabella, Haw, & Saunders, 2013). The few existing studies

on trends in Americans' mental health have found mixed evidence, with some results underscoring increases in depression prevalence (Weinberger et al., 2018) and negative affect (Goldman et al., 2018), while others have found little change in mental health among non-Hispanic whites since the early 2000s (Mojtabai & Jorm, 2015).

While these studies have laid the foundation for extending the deaths of despair literature to consider mental health, several key gaps remain. First, the majority of these studies have focused on non-Hispanic whites, raising the question of whether evidence of worsening mental health over time has indeed been most severe for this group. Second, less attention has been paid to whether changes in SES conditions may help explain trends in mental health. Third, most studies focus on a relatively short time period (10 years or less), predominately on those years surrounding the economic shock of the Great Recession (2007-2009). It is possible that Americans' mental health was already deteriorating long before the Great Recession, leading to undue weight being placed on the recession as the primary catalyst of distress. The present study seeks to extend prior research by examining trends in mental health among non-Hispanic whites, blacks, U.S-born Hispanics, and foreign-born Hispanics over a 22-year time period (1997 to 2018). I pay particular attention to whether long-term changes in SES may help explain the observed trends in mental health, and whether the contributions of these SES conditions to mental health vary by race and ethnicity.

## Background

### Socioeconomic Conditions and Mental Health

Among the array of chronic stressors that people may confront in their daily lives, there is probably none more pivotal than economic hardship (Kahn & Pearlin, 2006). Economic hardship not only acts as a stressor for individuals, but places a substantial burden on their livelihood and

the achievement of most basic needs. Exposure to financial hardship has been repeatedly linked to a multitude of mental health outcomes among adults, including depressive symptoms and anxiety (Ferraro & Su, 1999; Kahn & Pearlin, 2006; Mirowsky & Ross, 2001; Wilkinson, 2016). For example, on the individual-level, job loss has been linked to an increase in depressive symptoms, especially among workers with lower education and a lack of financial resources to buffer against sudden change in employment (Riumallo-Herl et al., 2014). On the macro-level, mental health symptoms generally rise when macroeconomic conditions worsen (Wilkinson, 2016; Modrek et al., 2013). Economic downtowns have been linked to increased mental health inpatient and outpatient visits, as well as an upsurge in antidepressant usage (Modrek et al., 2013). Therefore, it is not surprising that much of the current literature on recent trends in Americans' mental health has focused on the immediate years preceding and following the Great Recession (2007 – 2009) (Wang, Wang, & Halliday, 2018; Wilkinson, 2016; Mehta et al., 2015). For example, using the 2006 and 2010 Health and Retirement Study (HRS), Wilkinson (2016) found that financial strain was a robust predictor of worsening anxiety and depressive symptoms for Americans ages 51 and older. Mehta and colleagues (2015), using the 2005 to 2012 National Health and Nutrition Examination Survey (NHANES), found that the time periods surrounding the Great Recession were accompanied by a significant and sustained increase in major depression prevalence. This increase was particularly high among individuals with less than a high school education and those whose household incomes were below the national poverty threshold. Overall, these results suggest that the mental health of these vulnerable populations may be most affected during time periods of economic distress.

However, recent evidence suggests that Americans' mental health was deteriorating long before the financial shock of the Great Recession. In their study using longitudinal data from the

Midlife Development in the U.S. Study (MIDUS), Glei and colleagues (2019) found that SES disparities in economic distress increased by nearly as much during the 1995/1996 to 2004/2005 time period as they did during the period in which the Great Recession occurred. Therefore, the economic factors driving trends in mental health may have already been in motion prior to the Great Recession. Indeed, using data collected over a longer period, Case and Deaton (2015) employed the Kessler 6 (K6) questionnaire of psychological distress and a question about "days mental health was not good" to suggest growing mental distress since the 1990s among midlife, non-Hispanic whites. Moreover, while several studies have examined the short term effects of the Great Recession on mental health, Americans' mental health may still be declining long after the recession officially ended in 2009. In their study on trends in depression prevalence from 2005 to 2015, Weinberger et al., (2018) found that depression among American adults continued to significantly increase between 2009 and 2015. This result was surprising since studies suggest that more recent spells of economic hardship have a greater impact on depressive symptoms than those experienced in the more distant past (Kahn & Pearlin, 2006). While the effects of financial hardship on health are long-lasting, they tend to weaken over time, suggesting that mental health would improve in the years following the recession (Kahn & Pearlin, 2006). Therefore, while the Great Recession is a useful event for studying links between macroeconomic shocks and health, recent evidence underscores the need to evaluate trends in Americans' mental health over a longer time period.

One recent study used two cross-sectional waves (1995/1996 and 2011 to 2014) of MIDUS to examine whether mental health has indeed deteriorated among Americans since the mid-1990s (Goldman et al., 2018). Results showed that negative affect, as measured by the K6, increased among non-Hispanic whites of low-SES across all age groups. Taken together, their

results suggest that mental health among low-SES, non-Hispanic whites has worsened since the 1990s and that, in contrast to the deaths of despair literature, heightened mental distress is not purely a midlife phenomenon. Although this study lends support for taking a longer-term view of trends in mental health, the focus on non-Hispanic whites raises the question of whether other groups have also experienced worsening mental health over time.

## Race/Ethnic Differences in Mental Health

Many explanations for rising despair among non-Hispanic whites would seem to apply as much or perhaps even more to other race/ethnic groups. Goldman et al. (2018) found that blacks fared better than non-Hispanic whites on most mental health measures between the late 1990s and 2010s, though the small sample of blacks prevents any definitive conclusions. Weinberger and colleagues (2018) found no significant change in depression among blacks or Hispanics, suggesting that only non-Hispanic whites experienced an increase in depression prevalence from 2005 to 2015. In a recent study using the 2003 to 2013 Panel Study of Income Dynamics (PSID), Wang et al., (2018) found that the Great Recession predicted worse mental health among non-Hispanic whites, but not blacks. Results from these studies are surprising given that the Great Recession financially hit racial minorities harder than non-Hispanic whites, and the black-white differentials in wages have persisted (Wilson & Rodgers, 2016). The recession notably exacerbated the relatively higher rates of poverty that characterized black families (Glei et al., 2019; Wilson & Rodgers, 2016). For example, household income in 2011 was 7% lower for non-Hispanic whites (from $59,604 in 1999), but 16.8% lower for blacks (from $37,747 in 2000) (DeNavas-Walt et al., 2012).

One explanation for this apparent disparity is how economic fortunes are appraised rather than the objective factors of the Great Recession. This distinction has implications both for

understanding why economic misfortune may not always produce higher distress and, further, which kinds of distress it might produce. For non-Hispanic whites, whose family incomes are significantly higher than minorities on average, a key feature of the Great Recession appears to have been *perceived* deterioration of household finances and *perceived* difficulty living on current income (Glei et al., 2019). Indeed, studies have shown that blacks were more optimistic than non-Hispanic whites about future economic recovery for themselves and the national economy (Taylor et al., 2010). This optimism may reflect dissimilarities in how different groups evaluate financial stress. Literature on racial differences in mental health has long revealed that blacks and Hispanics, despite higher exposure to stress, tend to have lower rates of adverse mental health outcomes, such as major depression, compared to non-Hispanic whites (Williams, 2018; Breslau et al., 2005). Race/ethnic differences in stress appraisal, particularly how upsetting stressors may be, is an explanation for these disparities in mental health. In their study using the 2006 HRS, Brown and colleagues (2018) found that while blacks and Hispanics were two to three times more likely to experience financial hardship, they were less-likely to feel upset by such hardship compared to non-Hispanic whites.

Social comparison may also play a role, including comparisons between generations (Cherlin, 2016). In particular, blacks and Hispanics may compare their current SES to the previous generation of blacks and Hispanics whose socioeconomic well-being was much worse off, therefore protecting their own mental health. Another implication of the idea that perceptions are critical is that current socioeconomic fears may manifest more in anxiety than depression. The concept of psychological distress combines the symptoms of depression and anxiety (Kessler et al., 2002), though the literature on the consequences of the Great Recession suggests the recession may have induced more fear about the future and, thus, anxiety, than reflection on

the past and, thus, depression. Even those who successfully recovered from the recession may be scarred by the experience and worry about the possibility of another. Recent evidence suggests that, although non-specific psychological distress consists of both anxiety and depression components, measures of non-specific distress can nonetheless be fruitfully separated into depressive symptoms and anxiety symptoms (Ko & Harrington, 2016; Bessaha, 2017).

**The Present Study and Research Questions**

The present study builds on existing research to examine trends in mental health over 22 years (1997-2018) among non-Hispanic whites, blacks, U.S.-born Hispanics, and foreign-born Hispanics ages 25 to 64. This research investigates whether mental health among non-Hispanic whites has indeed been deteriorating since the 1990s, whether changes in SES is driving this trend, and whether this trend is also evident among blacks and Hispanics. The contributions of this study are threefold.

First, the deaths of despair literature has focused on non-Hispanic whites because this group is most frequently implicated in concerns about rising premature mortality. However, it is possible that other race/ethnic groups have also experienced declining mental health.

Second, less attention has been paid to whether the role of SES conditions for mental health trends is the same for all race/ethnic groups. The focus on non-Hispanic whites has revealed that mental health is poor and worsening among those with a less than high school education and those whose family incomes are below the national poverty line. However, SES may operate differently for blacks and Hispanics, especially since they tend to have less education and a higher risk of poverty compared to non-Hispanic whites.

Third, most studies focus on a relatively short time period (10 years or less), mostly on the years proceeding and following the Great Recession, with Goldman et al. (2018) serving as a

notable exception. The present study is one of the first studies to investigate Americans' mental health over a more than 20-year time span. Examining mental health over 22 years allows a broad-gauged assessment of both the levels and trends in mental health.

**Data and Methods**

This study used data from the 1997-2018 National Health Interview Survey (NHIS) (National Center for Health Statistics, 2019). The NHIS, fielded by the National Center for Health Statistics (NCHS) and the Centers for Disease Control and Prevention, is an annual cross-sectional, nationally-representative survey of the non-institutionalized U.S. population. I used the publically available version of the NHIS from the Integrated Public Use Microdata Series (2012) at the University of Minnesota (http://www.ihis.us/ihis). The NHIS has been conducted annually since 1957 and included the K6 since 1997. The NHIS employs a repeated cross-section interview design using a multistage sampling procedure, which samples initially from 428 primary sampling units, within which smaller areas and then individual households are then selected. Due to oversampling, sampling weights are needed for generalizability.

The analytic sample was limited to non-Hispanic white, black, U.S.-born Hispanic, and foreign-born Hispanic women and men ages 25 to 64 who were designated as part of the survey's "sample adult" group, were interviewed between January 1997 and December 2018, and answered the K6 questions. The "sample adult" group is a random subsample of 43% of all adult NHIS respondents. This group was administered all of the health and SES measures used here. Of the 439,394 "sample adults" ages 25-64 who identified as white, black, or Hispanic, 432,234 (98%) answered the K6. The sample was further limited to respondents who had complete information on the demographic and SES questions, resulting in a final sample of 425,556.

Measures

*Mental distress.* The outcome of interest is mental distress, which was measured using the Kessler 6 (K6) Non-Specific Psychological Distress Scale (Kessler et al., 2002), a composite instrument of 6 items assessing how often an individual felt sad, nervous, restless, hopeless, worthless, or "that everything was an effort" during the past 30 days. Each item is scored from 0 ("none of the time") to 4 ("all of the time"). Combined scores from the 6 items on this scale range from 0 to 24. According to past research, values of 5-12 may be indicative of moderate mental distress (Prochaska et al., 2012), while scores of 13 and higher have been shown in clinical calibration studies to be associated with severe mental illness (Kessler et al., 2010). However, clear standards for optimal K6 scoring have yet to emerge (Russ et al., 2012). Therefore, in this study the K6 is kept continuous (range: 0-24). Cronbach's alpha for the six-item scale was 0.86.

*Anxiety and Depressive symptoms.* The initial model of the K6 set forth by Kessler and his colleagues (2002) was based on general community samples that showed evidence for a one-factor, unidimensional, structural model using principal axis factor analysis. However, evidence has emerged showing good model fit for a two-factor model of anxiety and depressive symptoms (Ko & Harrington, 2016; Bessaha, 2017). Following this model, I divided the K6 into two separate scales reflecting anxiety and depressive symptoms. Anxiety symptoms were measured using responses to the two questions: "Did you feel nervous?" and "Did you feel restless or fidgety?", which were summed as a scale ranging from 0-8. Cronbach's alpha for the two-item scale was 0.77. The depressive symptoms component of the K6 was measured using responses to the remaining four questions: "Did you feel that everything was an effort?", "Did you feel so

sad that nothing could cheer you up?", "Did you feel worthless?", and "Did you feel hopeless?" Responses to these questions were summed as a scale ranging from 0-16. Cronbach's alpha for the four-item scale was 0.84.

*Demographic characteristics.* Age was included as a categorical variable broken into 10-year age groups: 25-34, 35-44, 45-54, and 55-64. Sex was coded as male (yes/no). Race and Hispanic ethnicity were self-reported. I limited the sample to non-Hispanic whites, non-Hispanic blacks, and Hispanics. Respondents were asked they were born in the U.S. (yes/no). I used this variable to categorize Hispanics into foreign-born and U.S.-born respondents. My final race/ethnicity variable therefore included the four categories: non-Hispanic whites, non-Hispanic blacks, U.S.-born Hispanics, and foreign-born Hispanics.

*Socioeconomic characteristics.* NHIS education categories were combined to reflect less than high school diploma, high school graduate or equivalent, some college or associate's degree, and bachelor's degree and above. As a short-term indicator of material well-being, household income was measured using the ratio of total household income to the household composition, expressed as a percentage of a year-specific federal poverty line. It was categorized as below poverty line (reference), 1-1.9 times the poverty line, 2-3.9 times, and 4 times and above. As a long-term measure of well-being, home ownership was included as a binary variable equal to 1 if the respondent currently owns a home. With respect to employment, I used information from the year preceding the interview to slightly reduce the risk of endogeneity. I categorized respondents as having worked all year, part of the year (1-11 months), or none of the year. I also controlled for current employment status, coded as employed, unemployed, or not in the labor force. Finally, I included marital status as married or cohabitating, divorced or separated, widowed, or never married to reflect the possibility of a two-income household.

*Time.* Time was included as a continuous variable (range: 1-22) representing each year of the survey minus 1996, the year preceding the survey.

Analysis

I used the sampling weights for pooled data by using the strata and primary sampling units supplied by the NHIS. Since years of data included in this study were from three sample design periods, all weights were adjusted per the guidelines suggested by the NCHS (National Center for Health Statistics, 2019).

Analyses proceeded in three parts. In the first part, I estimated trends in mental distress using weighted and design-adjusted ordinary least squares (OLS) regression on age, sex, and race/ethnicity. I included linear, quadratic, and cubic variables for time after preliminary analyses revealed non-linear time trends in mental distress. I interacted these three time variables with race/ethnicity in order to see whether time trends in mental distress varied among groups.

In the second part, I broke the time trend into three splines in order to analyze whether contributors to time trends in mental distress varied depending on time period. Based on results from Part 1, I placed knots at 2002 and 2011, which allowed me to examine differences in the slope in mental distress for three different time periods: 1997-2002, 2003-2011, and 2012-2018. The interpretation for each of the spline coefficients is the change in the slope over each of the respective time periods. Each spline variable was interacted with race/ethnicity. The SES variables were then added in order to examine whether changes in socioeconomic conditions explained any of the spline coefficients for the four race/ethnic groups. Post-hoc Wald tests were used to test coefficients for group comparisons where needed.

In the third part, I ran a sub-group analysis focusing on trends in mental distress among non-Hispanic whites. Since prior literature has documented adverse mortality trends among low-

SES, non-Hispanic whites, each of the three splines were interacted separately with education, employment status, and the household income-to-poverty-ratio categories in order to see if trends in mental distress were indeed worse for individuals with low-SES. Finally, I ran the same models, but with the anxiety and depressive symptom components of the K6 as separate outcomes. This strategy allowed me to examine whether my findings were sensitive to the anxiety and depressive symptom components of mental distress.

**Results**

Descriptive Statistics

Unweighted frequencies are presented in Table 1 for the full sample and stratified by non-Hispanic white, non-Hispanic black, U.S.-born Hispanic, and foreign-born Hispanic. The sample was 65% non-Hispanic white, 15% black, 8% U.S.-born Hispanic, and 12% foreign-born Hispanic. The mean K6 score was 4.86 for the full sample, 5.00 for non-Hispanic whites, 4.50 for blacks, 5.01 for U.S.-born Hispanics, and 4.44 for foreign-born Hispanics. Regarding SES characteristics, 15% of the sample had less than a high school education. This was predominately driven by foreign-born Hispanics (52%) compared to U.S-born Hispanics (19%), blacks (17%), and non-Hispanic whites (8%). About a quarter of the sample had a high school diploma, and this was similarly distributed among the four groups. About 30% of the sample had some college, with non-Hispanic whites (31%), blacks (33%), and U.S.-born Hispanics (34%) having similar percentages, but fewer foreign-born Hispanics (16%) reported some college education. Finally, 28% of the sample had a BA degree or above, with non-Hispanic whites having the highest education (35%) followed by blacks (20%), U.S.-born Hispanics (13%), and foreign-born Hispanics (11%). About 15% of the sample had household income that was below the poverty line, with the largest numbers among foreign-born Hispanics (31%) and blacks (25%).

More than twice as many blacks and Hispanics were living below the poverty line compared to non-Hispanic whites (9%). The highest proportion of households with income-to-poverty ratios greater than four times the poverty-line occurred among non-Hispanic whites (48%) followed by U.S. born Hispanics (27%), blacks (24%), and foreign-born Hispanics (12%). About 67% of non-Hispanic whites were home owners, followed by U.S-born Hispanics (49%), blacks (40%), and foreign-born Hispanics (38%). About 73% of the sample was currently employed, with these percentages being quite similar across race/ethnic groups. Finally, about 67% of the sample worked 12 months in the prior year.

Regression Analysis

Table 2 presents the overall trend in mental distress, controlling for age, sex, and race/ethnicity. Interestingly, the linear time trend revealed that mental distress was decreasing across the 22-year time period ($b = -0.1261$, $p < 0.001$). However, the significant quadratic ($time^2$) and cubic terms ($time^3$) for time further revealed that mental distress then increased ($b = 0.0117$, $p < 0.001$) and decreased again ($b = -0.0002$, $p = 0.001$). Compared to non-Hispanic whites, blacks ($b = -0.6106$, $p<0.001$), U.S.-born Hispanics ($b = -0.1097$, $p = 0.013$), and foreign-born Hispanics ($b = -0.5863$, $p<0.001$) all had lower initial levels of mental distress in 1997. **Figure 1** shows mental distress over time based on estimates from Model 1 of Table 2.

Model 2 included interactions between each time variable and race/ethnicity. The interaction between time and race/ethnicity revealed that U.S.-born Hispanics experienced a larger initial decrease in mental distress compared to non-Hispanic whites ($b = -0.2845$, $p <0.001$). The interaction between $time^2$ and race/ethnicity showed that U.S.-born Hispanics ($b = 0.0262$, $p < 0.001$) and foreign-born Hispanics ($b = 0.0143$, $p = 0.018$) then experienced larger increases in mental distress compared to non-Hispanic whites. The interaction between $time^3$ and

race/ethnicity once again showed that U.S.-born Hispanics (b = - 0.0007, p = 0.001) and foreign-born Hispanics (b = -0.0005, p < 0.001) experienced a larger decrease in mental distress compared to non-Hispanic whites. The trend in mental distress among blacks was not statistically different from that of non-Hispanic whites for any of the time variables. **Figure 2**, which reflects the results from Model 2, shows the race/ethnic stratification of mental health trends over time. Interestingly, mental distress appeared to decrease for all racial groups except non-Hispanic whites from around 2012 onwards. Indeed, in race-stratified analyses (results not shown), time$^3$ was significant and negative for all groups except non-Hispanic whites (p = 0.254), suggesting that the upward trend in mental distress seen in Figure 1 was primarily driven by non-Hispanic whites. Overall, results show non-linear time trends in mental distress with notable heterogeneity by race/ethnic group.

Spline Analysis

Given the non-linear time trends in mental health shown in **Figure 2**, I next broke the 22-year time period into three time periods for the purpose of the spline analysis: 1997-2002 (Spline 1), 2003-2011 (Spline 2), and 2012-2018 (Spline 3). Using a spline also allowed me to easily investigate race/ethnic-specific trends over an otherwise complex three-part series. Table 3 presents results from the spline analysis for the three time periods where each spline is interacted with race/ethnicity. These coefficients reflected the change in the slope for mental distress for each of the three time periods and by race/ethnicity.

Similar to the results from the models shown in Table 2, Model 1 in Table 3 shows that the coefficients for the interaction between Spline 1 and race/ethnicity is negative for all groups, while the coefficients for the interaction between Spline 2 and race/ethnicity is positive for all groups. However, the interaction between Spline 3 and race/ethnicity revealed that non-Hispanic

whites continued to experience an increase in mental distress ($b = 0.0613$, $p < 0.001$), while blacks ($b = -0.0524$, $p = 0.053$), and foreign-born Hispanics ($b = -0.0817$, $p = 0.010$) experienced a decrease in mental distress over the 2012 to 2018 time period. In Model 2 I began adding SES variables in order to examine how much SES conditions may account for these race/ethnic-specific trends in mental distress. By adjusting for relevant factors, we are able to evaluate any changes in the magnitudes of the interactions. Table 1 in the Appendix shows the changes in the key SES variables over the observation period for each of the three time periods stratified by race/ethnicity. Despite these differences, there is very little change in the coefficients for the interactions between the splines and race/ethnicity after adding education in Model 2. Other adjustments are more consequential. Model 3 includes marital status, family income-to-poverty ratio, and the employment variables. Among the coefficients for the interaction between Spline 3 and race, only the coefficient for non-Hispanic whites ($b = 0.1183$, $p < 0.001$) remains significant after the inclusion of the SES variables, suggesting that SES largely accounts for trends in mental distress among minority groups from 2012 to 2018. Interestingly, after adding the SES variables the coefficient for non-Hispanic whites not only remained positive, but was nearly twice the size as in Model 1, indicating a suppressor relationship. Were it not for the higher average level of SES among the non-Hispanic white population, the relative deterioration in their mental health would have been worse.

Non-Hispanic White Subgroup Analysis

In subgroup analyses I further explored these patterns among non-Hispanic whites, examining whether trends in mental distress varied by different SES characteristics, with a particular focus on 2012 to 2018 where non-Hispanic whites were the most notable outlier. In preliminary analyses (results not shown) I ran a series of models where I interacted each spline

with education, household income-to-poverty-ratio categories, and employment status. Since O found little variation in mental distress trends by household income-to-poverty-ratio categories or employment, I chose only to show the results for education in Table 4. Model 1 shows education interacted with each spline, controlling for age and sex. Model 2 includes the remainder of the SES variables. In Model 1, non-Hispanic whites with less than a high school education ($b = 1.225$, $p < 0.001$) and some college ($b = 0.223$, $p = 0.046$) have higher mental distress compared to those with a high school education. However, having a BA degree or higher was associated with less mental distress compared to those with a high school education ($b = -0.258$, $p = 0.021$). The interactions between education and Spline 1 and Spline 2 were not significant, suggesting that there was no difference in the change in mental distress between those with a high school education and other education groups for those two time periods. The interaction between Spline 3 and education revealed that the less than high school group experienced a steeper decrease in mental distress compared to those with a high school education ($b = -0.136$, $p=0.008$). However, respondents with a BA degree or higher experienced a sharper increase in mental distress compared to those with a high school degree ($b = 0.106$, $p = 0.001$). Although the less than high school group had overall higher levels of mental distress, the time trend shows decreasing mental distress for this group for the 2012 to 2018 time period. In contrast, the BA degree and higher group has a steep upward slope in mental distress for the 2012 to 2018 time period, suggesting potential convergence with the less-educated groups in the future. Model 2 further included the full set of SES variables. Although the coefficient for BA degree and above for Spline 3 was slightly reduced, it remained statistically significant ($b = 0.072$, $p = 0.014$), suggesting that higher-educated groups are contributing to the overall upward

trend in poor mental health among non-Hispanic whites. **Figure 3** shows the results from the spline analysis for non-Hispanic whites by education.

I ran the same models separately by the depression and anxiety symptoms components of the K6. Table 5 shows results for depressive symptoms for non-Hispanic whites with education interacted each spline. Similar to the results for mental distress, Model l shows that, compared to those with a high school education, those with a BA degree or above experienced a steeper increase in depressive symptoms (b = 0.038, p = 0.008) during 2012 to 2018 time period. After the inclusion of the SES variables in Model 2, none of the interactions between the splines and education remained significant, suggesting that these SES measures was largely accounting for disparities in trends in depressive symptoms by education among non-Hispanic whites.

Table 6 shows the same set of results, but for the anxiety symptoms component of mental distress. In Model 1, the interaction between Spline 3 and education revealed that non-Hispanic whites with a less than high school education experienced a sharper decrease in anxiety symptoms compared to those with a high school diploma (b = - 0.055, p = 0.005). However, those with some college (b = 0.021, p = 0.030) and a BA degree and above (b = 0.033, p = 0.001) experienced a steeper increase in anxiety symptoms compared to those with a high school diploma. **Figure 4** shows the results from the spline analysis for non-Hispanic whites by education for anxiety symptoms. Unlike the results for depressive symptoms, these results remained significant in Model 2 after including the other SES variables, suggesting that the upward trend in mental distress among non-Hispanic whites from 2012 to 2018 was being driven by increased anxiety among the better-educated. In sum, non-Hispanic whites with less than a high school education have the highest levels of mental distress, depressive symptoms, and anxiety symptoms. However, trends in anxiety symptoms are less explicable than trends in

depressive symptoms. Well-educated non-Hispanic whites may be worrying about the future, even if their incomes and overall wealth have recovered.

**Discussion**

Prior studies have focused on recent stagnation in life expectancy among low-SES, non-Hispanic whites with less attention paid towards whether this trend mirrors changes in mental health. The few studies that have examined trends in mental health have focused almost exclusively on non-Hispanic whites during the years surrounding the Great Recession. Therefore, we know little about whether non-Hispanic whites' mental health was already declining prior to the recession, whether their mental health rebounded following economic recovery, and whether blacks and Hispanics have also experienced adverse trends in mental health. The present study addressed these gaps by examining trends in mental distress among non-Hispanic whites, blacks, U.S-born Hispanics, and foreign-born Hispanics over a 22-year time period (1997 to 2018). I paid close attention to whether changes in SES helped explain the observed trends in mental health, and whether the contributions of changes in SES to mental health varied by race/ethnic group. My results revealed complex, non-linear trends in mental health where changes in socioeconomic factors largely accounted for these trends among all groups except non-Hispanic whites. Increasing mental distress among non-Hispanic whites appears to be driven by rising anxiety symptoms among the higher-educated, even though their financial circumstances have largely recovered.

Consistent with results from Case and Deaton (2015) and Goldman et al. (2018), I found evidence that non-Hispanic whites' mental health was already deteriorating in the early 2000s prior to the Great Recession. However, my results also differed in two key ways: mental health was actually improving from 1997 to around 2002, and similar patterns in mental health were

also evident among blacks and Hispanics. It was surprising that mental health began to worsen among all groups around 2002 given the emphasis of previous studies on the Great Recession as a macroeconomic shock to Americans' mental health. One explanation is that there was an economic recession in the U.S. from March to November, 2001 that may have negatively affected mental health. Another explanation is that fear and economic uncertainty following the September 11, 2001 terrorist attacks negatively influenced Americans' mental health (Silver et al., 2013; Stein et al., 2004). It is possible that these macro-level shocks individually or jointly acted as a catalyst that set Americans' mental distress on an upward trajectory that was further accelerated by the Great Recession. Indeed, more proximate measures of SES (i.e., employment status) instead of distal measures (i.e., education) helped explain these trends for all race/ethnic groups, lending support to previous research that has tied current socioeconomic conditions to mental health (Wilkinson, 2016; Kessler & Bromet, 2013; Kahn & Pearlin, 2006).

Mental health recovered in the years following the Great Recession for all groups except non-Hispanic whites, with more proximate measures of SES once again largely explaining this trend for racial minorities. This may seem counterintuitive since studies have shown that blacks and Hispanics were disproportionately affected by the economic challenges of the Great Recession (McKernan et al., 2014). However, negative effects of financial hardship on mental health tend to weaken over time (Kahn & Pearlin, 2006), and blacks were generally more optimistic than non-Hispanic whites about future economic recovery for themselves during the recession (Taylor et al., 2010). It is also possible that mental distress began to decrease among racial minorities because their livelihoods were most strongly tied to the labor market. In the case of foreign-born Hispanics, their employment patterns tend to be more volatile over the business cycle, suggesting that they register sharper economic losses in the early stages of recessions, but

rebound quicker in the recovery (Kochhar, Espinoza, & Hinze-Pifer, 2010). However, although non-Hispanic whites' economic and employment conditions also recovered in the years following the end of the recession, their mental health has not rebounded.

Although the continued increase in mental distress among non-Hispanic whites is consistent with previous studies (e.g., Weinberger et al., 2018; Goldman et al., 2018), explanations for this persistent distress remains unclear. Perhaps the economic shock of the Great Recession had a sustained impact on the mental health of non-Hispanic whites because they were unaccustomed to dealing with the sudden loss of employment and financial security. Brown and colleagues (2018) hypothesize that groups who experience more frequent exposures to stressors may develop more effective coping mechanisms than groups who have experienced little hardship in their lives. Similarly, Glei and colleagues (2018) found that non-Hispanic whites expressed higher levels of *perceived* financial strain compared to minorities, even after adjustment for objective measures of economic and employment conditions. Therefore, while non-Hispanic whites' objective measures of SES have recovered, they may still feel worried about their subjective financial situation.

Alternatively, this long-term upswing in mental distress may reflect that non-Hispanic whites feel that their social and economic standing has been threatened by gains in SES among racial minorities (Metzl, 2019; Cherlin, 2019). "Status anxiety" may help explain why non-Hispanic whites increasingly perceive their subjective financial situations as much worse than their objective financial situations (Glei et al., 2018). Increased income inequality can heighten status anxiety, which can, in turn, influence an individual's mental health via emotional responses (Layte & Whelan, 2014). As Wilkinson (2016) points out, the mental health effects of economic hardships may be easier to tolerate in the context of widespread challenges shared by

everyone. People may have more difficulty accepting their situations when they think others are making better or faster progress. Indeed, Hochschild (2016) describes how working class, non-Hispanic whites may feel anxious when they perceive that other people are getting ahead when they are falling behind. Non-Hispanic whites may be comparing their present economic and social status to that of their parents or grandparents, drawing the conclusion that they are much worse off. In particular, this may be the case among working class, non-Hispanic whites because job prospects have steadily waned since the 1970s for those with less education (Cherlin, 2016).

In contrast to Hochschild's (2016) emphasis on status anxiety among the working class, my results revealed that the persistent upward trend in mental distress among non-Hispanic whites was likely driven by increasing anxiety among the highly-educated. The steep upward trend in mental distress and anxiety symptoms among the highly-educated is unexpected and puzzling. That changes in SES accounted for trends in depressive symptoms for all education groups, but not for anxiety symptoms suggests that trends in depression are more explicable than trends in anxiety. Depressive symptoms among non-Hispanic whites might have recovered from the Great Recession because their finances eventually improved, but they might be worried about another financial downturn. Even well-resourced people can worry about their socioeconomic position, especially if they are unaccustomed to a sudden loss in financial security (Brown et al., 2018; Wilkinson, 2016). However, I am not discounting the dire mental health trends among less-educated, non-Hispanic whites. In line with previous studies (e.g., Case & Deaton, 2015), I found that the level of mental distress of non-Hispanic whites with less than a high school education was higher than all other education groups across the entire 22-year time span. The trend in mental distress for this group looks much like the mental health trends of blacks and Hispanics, especially the downward trend in mental distress post-2012. It could be that, similar

to the case of blacks and Hispanics, the mental health of less-educated, non-Hispanic whites is closely tied to the labor market in that their mental health suffered greatly during the Great Recession, but then began to recover in the years following economic recovery.

**Limitations**

There are limitations of this study worth noting. First, it is unclear in which direction the causal arrow goes: deteriorating mental health may be the cause or consequence of decline in income. The present study was able to explore trends, though it was not able to explore intra-individual changes. Second, I was unable to address other aspects of despair related to mortality, particularly opioid use. Future research is needed on this potential connection, especially research that can also address trends. Finally, although the K6 is a useful and comprehensive measure of non-specific psychological distress, it would be useful to explore other measures of distress as well, especially measures that might capture emotional suffering better among racial/ethnic minorities (Barnes & Bates, 2017).

**Conclusion**

Recent literature has focused on the rise in substance abuse and suicide mortality as being at the heart of recent life expectancy stagnation, particularly among non-Hispanic whites, with less attention paid towards the intrinsic role that mental health plays in wellbeing. Scholars have highlighted income stagnation and economic inequality as the key factors underlying the observed trends in substance abuse and premature mortality among non-Hispanic whites. However, while this income-based explanation may be adequate to account for the observed trends in mental distress among racial minorities and non-Hispanic whites prior to 2012, my findings suggest more complexity below the surface. All racial/ethnic groups experienced an upswing in mental distress in the years preceding the Great Recession, with changes in

socioeconomic factors largely accounting for these trends. However, mental health recovered in the years following the Great Recession for all groups except highly-educated, non-Hispanic whites. Increasing mental distress among non-Hispanic whites appears to be driven by rising anxiety among the higher-educated, even though their financial circumstances have largely recovered, suggesting that other social factors may be driving this trend. In many ways, breaking mental distress among non-Hispanic whites into anxiety and depressive symptom components raised more questions than it answered. While my results do support previous studies that have documented deteriorating mental health among non-Hispanic whites, the sharp increase in mental distress, specifically anxiety symptoms, among the highly-educated challenges the deaths of despair literature to focus on more than the socioeconomically disadvantaged.

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**Table 1** Summary statistics adults (25-64 years old), 1997 to 2018, unweighted.

| Variable | Full Sample % (N= 425,556) | Non-Hispanic White % (N=278,317) | Black % (N=65,091) | U.S.-Born Hispanic % (N=32,258) | Foreign-Born Hispanic % (N=49,890) |
|---|---|---|---|---|---|
| Mental health | | | | | |
| K6 Mental Distress | M: 4.86 SD: 5.87 | M: 5.00 SD: 5.82 | M: 4.50 SD: 5.76 | M: 5.01 SD: 5.98 | M: 4.44 SD: 6.17 |
| K6 Depressive symptoms | M: 1.43 SD: 2.71 | M: 1.34 SD: 2.62 | M: 1.64 SD: 2.85 | M: 1.69 SD: 2.85 | M: 1.45 SD: 2.76 |
| K6 Anxiety symptoms | M: 1.28 SD: 1.80 | M: 1.35 SD: 1.80 | M: 1.15 SD: 1.79 | M: 1.34 SD: 1.90 | M: 0.99 SD: 1.69 |
| Demographic characteristics | | | | | |
| Age Group | | | | | |
| 25-34 | 26.25 | 23.58 | 27.31 | 37.67 | 32.37 |
| 35-44 | 26.86 | 25.74 | 26.75 | 27.96 | 32.55 |
| 45-54 | 25.24 | 26.35 | 25.60 | 20.35 | 21.70 |
| 55-64 | 21.65 | 24.32 | 20.33 | 14.02 | 13.39 |
| Sex (male =1 ) | 45.08 | 46.70 | 39.13 | 42.24 | 45.64 |
| Race/Ethnicity | | | | | |
| Non-Hispanic White | 65.41 | | | | |
| Black | 15.30 | | | | |
| U.S.-Born Hispanic | 7.58 | | | | |
| Foreign-Born Hispanic | 11.72 | | | | |
| Socioeconomic characteristics | | | | | |
| Marital status | | | | | |
| Married/Cohabitating | 57.65 | 61.76 | 35.71 | 52.95 | 66.43 |
| Divorced/Separated | 19.72 | 18.93 | 25.33 | 20.93 | 15.97 |
| Widowed | 2.92 | 2.83 | 4.06 | 2.43 | 2.25 |
| Never married | 19.71 | 16.47 | 34.90 | 23.96 | 15.35 |
| Education | | | | | |
| Less than high school | 15.14 | 7.76 | 16.67 | 19.08 | 51.72 |
| High school/GED | 26.52 | 26.19 | 30.15 | 29.41 | 21.78 |
| Some college/AA | 29.96 | 31.23 | 33.33 | 34.35 | 15.75 |
| BA/BS and above | 28.37 | 34.82 | 19.85 | 17.26 | 10.75 |

| | | | | | |
|---|---|---|---|---|---|
| Family income-to-poverty ratio | | | | | |
| Below poverty | 14.60 | 8.81 | 24.65 | 19.57 | 30.55 |
| 1-1.9 times | 17.69 | 13.51 | 22.27 | 22.07 | 32.25 |
| 2-3.9 times | 29.51 | 30.12 | 29.51 | 31.02 | 25.15 |
| 4 times and above | 38.20 | 47.57 | 23.57 | 27.34 | 12.05 |
| Owns home (yes =1) | 58.23 | 67.35 | 39.80 | 48.69 | 37.58 |
| Current employment status | | | | | |
| Employed | 73.02 | 75.21 | 68.09 | 71.00 | 68.56 |
| Unemployed | 9.33 | 7.84 | 14.26 | 10.71 | 10.34 |
| Not in labor force | 17.65 | 16.95 | 17.65 | 18.29 | 21.10 |
| Months worked last year | | | | | |
| 12 months | 67.16 | 69.93 | 62.28 | 64.38 | 59.9 |
| 1-11 months | 13.56 | 12.58 | 14.88 | 15.21 | 16.19 |
| Not in labor force | 19.28 | 17.49 | 22.84 | 20.40 | 23.88 |

*Source:* Own calculations using the National Health Interview Survey (NHIS)

**Table 2** OLS regression models predicting mental distress over time (ages 25-64), 1997 to 2018

| | Model 1<br>B (se) | Model 2<br>B (se) |
|---|---|---|
| Time | -0.1261*** | -0.0997*** |
| | (0.0220) | (0.0265) |
| Time$^2$ | 0.0117*** | 0.0080** |
| | (0.0023) | (0.0028) |
| Time$^3$ | -0.0002** | -0.0001 |
| | (0.0001) | (0.0001) |
| Age group (ref: 25-34) | | |
| 35-44 | -0.0598* | -0.0603* |
| | (0.0269) | (0.0269) |
| 45-54 | 0.0145 | 0.0155 |
| | (0.0283) | (0.0282) |
| 55-64 | -0.2641*** | -0.2636*** |
| | (0.0319) | (0.0318) |
| Male | -1.1035*** | -1.1039*** |
| | (0.0202) | (0.0202) |
| Race/Ethnicity (Ref: NH-White) | | |
| Black | -0.6106*** | -0.5536*** |
| | (0.0354) | (0.1404) |
| U.S-Born Hispanic | -0.1097* | 0.7611*** |
| | (0.0443) | (0.1824) |
| Foreign-Born Hispanic | -0.5863*** | -0.6801*** |
| | (0.0410) | (0.1548) |
| Time x Race/Ethnicity (ref: NH-White) | | |
| Black | | -0.0087 |
| | | (0.0533) |
| U.S-Born Hispanic | | -0.2845*** |
| | | (0.0701) |
| Foreign-Born Hispanic | | -0.0715 |
| | | (0.0581) |
| Time$^2$ X Race/Ethnicity (ref: NH-White) | | |
| Black | | 0.0036 |
| | | (0.0055) |
| U.S-Born Hispanic | | 0.0262*** |
| | | (0.0072) |
| Foreign-Born Hispanic | | 0.0143* |
| | | (0.0060) |
| Time$^3$ X Race/Ethnicity (ref: NH-White) | | |
| Black | | -0.0002 |
| | | (0.0002) |
| U.S-Born Hispanic | | -0.0007** |

| | | |
|---|---|---|
| | | (0.0002) |
| Foreign-Born Hispanic | | -0.0005** |
| | | (0.0002) |
| Constant | 5.6914*** | 5.6372*** |
| | (0.0608) | (0.0712) |
| Degrees of freedom | 10 | 19 |
| F | 390.33*** | 213.05*** |

+p<0.10; *p<0.05; **p<0.01; ***p<0.001
*Notes:* N = 425,556; NH-White = Non-Hispanic White
Source: Own calculations using the National Health Interview Survey (NHIS)

**Table 3** Spline regression models predicting mental distress (ages 25-64), 1997 to 2018

| | Model 1<br>B (se) | Model 2<br>B (se) | Model 3<br>B (se) |
|---|---|---|---|
| **Spline 1 x Race/Ethnicity** | | | |
| Spline 1 X NH-White | -0.0592*** | -0.0517*** | 0.0015 |
| | (0.0122) | (0.0121) | (0.0120) |
| Spline 1 X Black | -0.0745** | -0.0522** | 0.0069 |
| | (0.0234) | (0.0232) | (0.0226) |
| Spline 1 X U.S.-Born Hispanic | -0.2202*** | -0.2117*** | -0.1359*** |
| | (0.0304) | (0.0302) | (0.0301) |
| Spline 1 X Foreign-Born Hispanic | -0.0216 | -0.0147 | 0.0587* |
| | (0.0251) | (0.0252) | (0.0249) |
| **Spline 2 x Race/Ethnicity** | | | |
| Spline 2 X NH-White | 0.0977*** | 0.0938*** | 0.0093 |
| | (0.0169) | (0.0169) | (0.0165) |
| Spline 2 X Black | 0.1139*** | 0.1261*** | 0.0156 |
| | (0.0318) | (0.0314) | (0.0304) |
| Spline 2 X U.S.-Born Hispanic | 0.2946*** | 0.2961*** | 0.1835*** |
| | (0.0423) | (0.0421) | (0.0415) |
| Spline 2 X Foreign-Born Hispanic | 0.1033** | 0.1024** | -0.0052 |
| | (0.0338) | (0.0337) | (0.0332) |
| **Spline 3 x Race/Ethnicity** | | | |
| Spline 3 X NH-White | 0.0613*** | 0.0652*** | 0.1118*** |
| | (0.0164) | (0.0163) | (0.0156) |
| Spline 3 X Black | -0.0524+ | -0.04735+ | 0.0085 |
| | (0.0270) | (0.0265) | (0.0250) |
| Spline 3 X U.S.-Born Hispanic | -0.0286 | -0.0291 | 0.0267 |
| | (0.0358) | (0.0359) | (0.0346) |
| Spline 3 X Foreign-Born Hispanic | -0.0817* | -0.0664* | -0.0059 |
| | (0.0317) | (0.0312) | (0.0302) |
| Age group (ref: 25-34) | | | |
| 35-44 | -0.0602* | -0.0676* | 0.1655*** |
| | (0.0269) | (0.0269) | (0.0269) |
| 45-54 | 0.0140 | -0.0276 | 0.2221*** |
| | (0.0282) | (0.0282) | (0.0284) |
| 55-64 | -0.2647*** | -0.3478*** | -0.3182*** |
| | (0.0318) | (0.0316) | (0.0315) |
| Male | -1.1037*** | -1.1152*** | -0.7964*** |
| | (0.0202) | (0.0201) | (0.0203) |
| Race/Ethnicity (Ref: NH-White) | | | |
| Black | -0.5029*** | -0.7058*** | -1.4259*** |
| | (0.1160) | (0.1146) | (0.1092) |
| U.S.-Born Hispanic | 0.6619*** | 0.4051** | -0.0070 |

| | | | |
|---|---|---|---|
| | (0.1474) | (0.1469) | (0.1410) |
| Foreign-Born Hispanic | -0.9024*** | -1.4696*** | -1.8892*** |
| | (0.1279) | (0.1297) | (0.1290) |
| Education (ref: high school) | | | |
| Less than high school | | 0.9534*** | 0.3119*** |
| | | (0.0359) | (0.0353) |
| Some college/AA | | 0.0812** | 0.3206*** |
| | | (0.0270) | (0.0259) |
| BA/BS and above | | -0.5452*** | 0.2181*** |
| | | (0.0307) | (0.0291) |
| Marital status (ref: married/cohabitating) | | | |
| Divorced/Separated | | | 0.9774*** |
| | | | (0.0276) |
| Widowed | | | 1.0529*** |
| | | | (0.0613) |
| Never married | | | 0.6497*** |
| | | | (0.0270) |
| Family income-to-poverty ratio (ref: below poverty) | | | |
| 1-1.9 times | | | -0.4155*** |
| | | | (0.0381) |
| 2-3.9 times | | | -1.0275*** |
| | | | (0.0383) |
| 4 times and above | | | -1.5819*** |
| | | | (0.0413) |
| Owns home (yes =1) | | | -0.6261*** |
| | | | (0.0262) |
| Employment status (ref: employed) | | | |
| Unemployed | | | 1.5297*** |
| | | | (0.0465) |
| Not in labor force | | | 0.5330*** |
| | | | (0.0468) |
| Months worked last year (Ref: 12 months) | | | |
| 1-11 months | | | 0.7896*** |
| | | | (0.0344) |
| Not in labor force | | | 0.8478*** |
| | | | (0.0450) |
| Constant | 5.5923*** | 5.6564*** | 5.6985*** |
| | (0.0596) | (0.0614) | (0.0691) |
| Degrees of freedom | 19 | 22 | 33 |
| F | 213.81*** | 252.37*** | 590.59*** |

+p<0.10; *p<0.05; **p<0.01; ***p<0.001

*Notes:* N = 425,556; Spline 1 includes years 1997-2002, Spline 2 includes years 2003-2011, and Spline 3 includes years 2012-2018; NH-White = Non-Hispanic White

Source: Own calculations using the National Health Interview Survey (NHIS)

**Table 4** Spline regression models predicting mental distress by education among non-Hispanic whites (ages 25-64), 1997 to 2018

| | Model 1<br>B (se) | Model 2<br>B (se) |
|---|---|---|
| Spline 1 | -0.032+ | 0.031 |
| | (0.019) | (0.019) |
| Spline 2 | 0.091** | -0.017 |
| | (0.027) | (0.026) |
| Spline 3 | 0.024 | 0.085*** |
| | (0.028) | (0.027) |
| Spline 1 x Education (Ref: High School) | | |
| Less than high school | -0.020 | -0.021 |
| | (0.039) | (0.037) |
| Some college | -0.001 | -0.003 |
| | (0.026) | (0.024) |
| BA degree and above | -0.040 | -0.038 |
| | (0.025) | (0.033) |
| Spline 2 x Education (Ref: High School) | | |
| Less than high school | 0.048 | 0.051 |
| | (0.053) | (0.050) |
| Some college | -0.006 | -0.010 |
| | (0.035) | (0.033) |
| BA degree and above | 0.007 | 0.035 |
| | (0.034) | (0.033) |
| Spline 3 x Education (Ref: High School) | | |
| Less than high school | -0.136** | -0.138** |
| | (0.051) | (0.049) |
| Some college | 0.025 | 0.028 |
| | (0.031) | (0.030) |
| BA degree and above | 0.106** | 0.072* |
| | (0.031) | (0.029) |
| Age group (ref: 25-34) | | |
| 35-44 | -0.134*** | 0.163*** |
| | (0.037) | (0.036) |
| 45-54 | -0.259*** | 0.085* |
| | (0.036) | (0.036) |
| 55-64 | -0.678*** | -0.522*** |
| | (0.039) | (0.039) |
| Male | -1.066*** | -0.830*** |
| | (0.024) | (0.024) |
| Education (ref: high school) | | |
| Less than high school | 1.225*** | 0.386* |
| | (0.168) | (0.161) |

| | | | |
|---|---|---|---|
| Some college/AA | 0.223* | | 0.381*** |
| | (0.112) | | (0.106) |
| BA/BS and above | -0.258* | | 0.294** |
| | (0.111) | | (0.108) |
| Marital status (ref: married/cohabitating) | | | |
| Divorced/Separated | | | 0.927 |
| | | | (0.034) |
| Widowed | | | 1.090 |
| | | | (0.076) |
| Never married | | | 0.733 |
| | | | (0.037) |
| Family income-to-poverty ratio (ref: below poverty) | | | |
| 1-1.9 times | | | -0.421 |
| | | | (0.055) |
| 2-3.9 times | | | -1.254 |
| | | | (0.055) |
| 4 times and above | | | -1.801 |
| | | | (0.056) |
| Owns home (yes =1) | | | -0.753 |
| | | | (0.032) |
| Current employment status (ref: employed) | | | |
| Unemployed | | | 1.601 |
| | | | (0.063) |
| Not in labor force | | | 0.832 |
| | | | (0.059) |
| Months worked last year (ref: 12 months) | | | |
| 1-11 months | | | 0.777 |
| | | | (0.043) |
| Not in labor force | | | 0.831 |
| | | | (0.067) |
| Constant | 5.610*** | | 5.948 |
| | (0.091) | | (0.100) |
| Degrees of freedom | | 19 | 30 |
| F | 177.66*** | | 463.49*** |

+p<0.10; *p<0.05; **p<0.01; ***p<0.001

*Notes:* N = 278,317; Spline 1 includes years 1997-2002, Spline 2 includes years 2003-2011, and Spline 3 includes years 2012-2018.

Source: Own calculations using the National Health Interview Survey (NHIS)

**Table 5** Spline regression models predicting depressive symptoms by education among non-Hispanic whites (ages 25-64), 1997 to 2018

| | Model 1<br>B (se) | Model 2<br>B (se) |
|---|---|---|
| Spline 1 | 0.011 | 0.041*** |
| | (0.009) | (0.008) |
| Spline 2 | 0.026* | -0.032** |
| | (0.012) | (0.012) |
| Spline 3 | -0.002 | 0.036** |
| | (0.013) | (0.012) |
| Spline 1 x Education (Ref: High School) | | |
| Less than high school | -0.003 | -0.003 |
| | (0.020) | -0.018 |
| Some college | -0.002 | 0.000 |
| | (0.011) | (0.010) |
| BA degree and above | -0.005 | -0.007 |
| | (0.010) | (0.010) |
| Spline 2 x Education (Ref: High School) | | |
| Less than high school | 0.013 | 0.008 |
| | (0.029) | (0.026) |
| Some college | -0.013 | -0.013 |
| | (0.015) | (0.014) |
| BA degree and above | -0.028* | -0.005 |
| | (0.014) | (0.014) |
| Spline 3 x Education (Ref: High School) | | |
| Less than high school | -0.055+ | -0.046 |
| | (0.032) | (0.030) |
| Some college | 0.019 | 0.019 |
| | (0.015) | (0.013) |
| BA degree and above | 0.038** | 0.013 |
| | (0.014) | (0.013) |
| Age group (ref: 25-34) | | |
| 35-44 | 0.082*** | 0.203*** |
| | (0.014) | (0.014) |
| 45-54 | 0.159*** | 0.280*** |
| | (0.015) | (0.015) |
| 55-64 | 0.042*** | -0.014 |
| | (0.016) | (0.016) |
| Male | -0.398*** | -0.206 |
| | (0.011) | (0.010) |
| Education (ref: high school) | | |
| Less than high school | 1.052*** | 0.494 |
| | (0.087) | (0.080) |

| | | |
|---|---|---|
| Some college/AA | -0.083+ | 0.036 |
| | (0.047) | (0.043) |
| BA/BS and above | -0.527*** | -0.155*** |
| | (0.045) | (0.044) |
| Marital status (ref: married/cohabitating) | | |
| Divorced/Separated | | 0.549*** |
| | | (0.016) |
| Widowed | | 0.697*** |
| | | (0.041) |
| Never married | | 0.269*** |
| | | (0.017) |
| Family income-to-poverty ratio (ref: below poverty) | | |
| 1-1.9 times | | -0.566*** |
| | | (0.032) |
| 2-3.9 times | | -1.108*** |
| | | (0.029) |
| 4 times and above | | -1.364*** |
| | | (0.030) |
| Owns home (yes =1) | | -0.338*** |
| | | (0.015) |
| Current employment status (ref: employed) | | |
| Unemployed | | 0.894*** |
| | | (0.031) |
| Not in labor force | | 0.350*** |
| | | (0.030) |
| Months worked last year (ref: 12 months) | | |
| 1-11 months | | 0.294*** |
| | | (0.019) |
| Not in labor force | | 0.735*** |
| | | (0.034) |
| Constant | 1.399*** | 1.887*** |
| | (0.039) | (0.047) |
| Degrees of freedom | 19 | 30 |
| F | 310.71*** | 571.99*** |

+p<0.10; *p<0.05; **p<0.01; ***p<0.001

Notes: N = 278,317; Spline 1 includes years 1997-2002, Spline 2 includes years 2003-2011, and Spline 3 includes years 2012-2018.

Source: Own calculations using the National Health Interview Survey (NHIS)

**Table 6** Spline regression models predicting anxiety symptoms by education among non-Hispanic whites (ages 25-64), 1997 to 2018

| | Model 1<br>B (se) | Model 2<br>B (se) |
|---|---|---|
| Spline 1 | 0.013* | 0.007 |
| | (0.006) | (0.006) |
| Spline 2 | 0.038*** | 0.003 |
| | (0.008) | (0.008) |
| Spline 3 | 0.012 | 0.032*** |
| | (0.009) | (0.009) |
| Spline 1 x Education (Ref: High School) | | |
| Less than high school | -0.012 | -0.012 |
| | (0.014) | (0.013) |
| Some college | 0.005 | 0.006 |
| | (0.008) | (0.007) |
| BA degree and above | -0.001 | -0.002 |
| | (0.010) | (0.007) |
| Spline 2 x Education (Ref: High School) | | |
| Less than high school | 0.028 | 0.026 |
| | (0.020) | (0.019) |
| Some college | -0.012 | -0.012 |
| | (0.011) | (0.010) |
| BA degree and above | -0.016 | -0.005 |
| | (0.010) | (0.010) |
| Spline 3 x Education (Ref: High School) | | |
| Less than high school | -0.055** | -0.051** |
| | (0.019) | (0.019) |
| Some college | 0.021* | 0.022* |
| | (0.010) | (0.009) |
| BA degree and above | 0.033** | 0.020* |
| | (0.010) | (0.010) |
| Age group (ref: 25-34) | | |
| 35-44 | -0.063*** | 0.010 |
| | (0.011) | (0.011) |
| 45-54 | -0.102*** | -0.024* |
| | (0.011) | (0.011) |
| 55-64 | -0.260*** | -0.261*** |
| | (0.011) | (0.012) |
| Male | -0.291*** | -0.198*** |
| | (0.008) | (0.008) |
| Education (ref: high school) | | |
| Less than high school | 0.595*** | 0.308*** |
| | (0.062) | (0.059) |

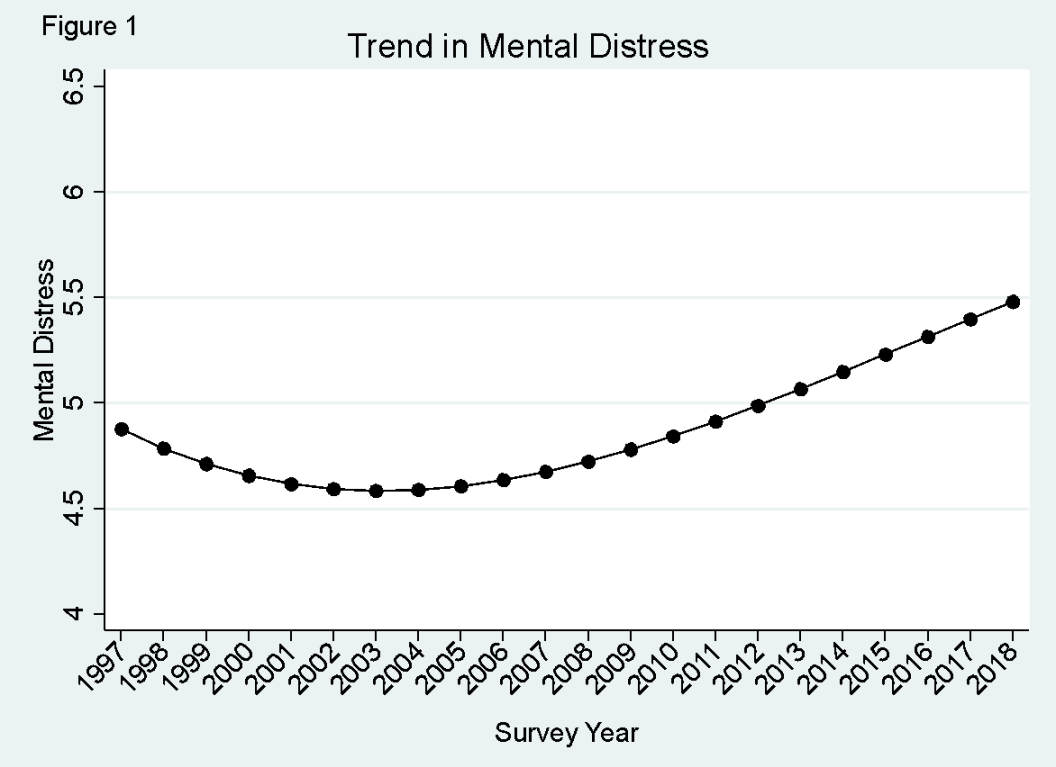
| | | |
|---|---|---|
| Some college/AA | -0.034 | 0.021 |
| | (0.034) | (0.032) |
| BA/BS and above | -0.206*** | -0.027 |
| | (0.031) | (0.031) |
| Marital status (ref: married/cohabitating) | | |
| Divorced/Separated | | 0.242*** |
| | | (0.011) |
| Widowed | | 0.229*** |
| | | (0.024) |
| Never married | | 0.110*** |
| | | (0.011) |
| Family income-to-poverty ratio (ref: below poverty) | | |
| 1-1.9 times | | -0.293*** |
| | | (0.020) |
| 2-3.9 times | | -0.584*** |
| | | (0.018) |
| 4 times and above | | -0.674*** |
| | | (0.019) |
| Owns home (yes =1) | | -0.237*** |
| | | (0.010) |
| Current employment status (ref: employed) | | |
| Unemployed | | 0.513*** |
| | | (0.020) |
| Not in labor force | | 0.182*** |
| | | (0.020) |
| Months worked last year (ref: 12 months) | | |
| 1-11 months | | 0.209*** |
| | | (0.013) |
| Not in labor force | | 0.359*** |
| | | (0.022) |
| Constant | 1.562*** | 1.827*** |
| | (0.026) | (0.031) |
| Degrees of freedom | 19 | 30 |
| F | 225.63*** | 407.42*** |

+p<0.10; *p<0.05; **p<0.01; ***p<0.001

*Notes:* N = 278,317; Spline 1 includes years 1997-2002, Spline 2 includes years 2003-2011, and Spline 3 includes years 2012-2018.

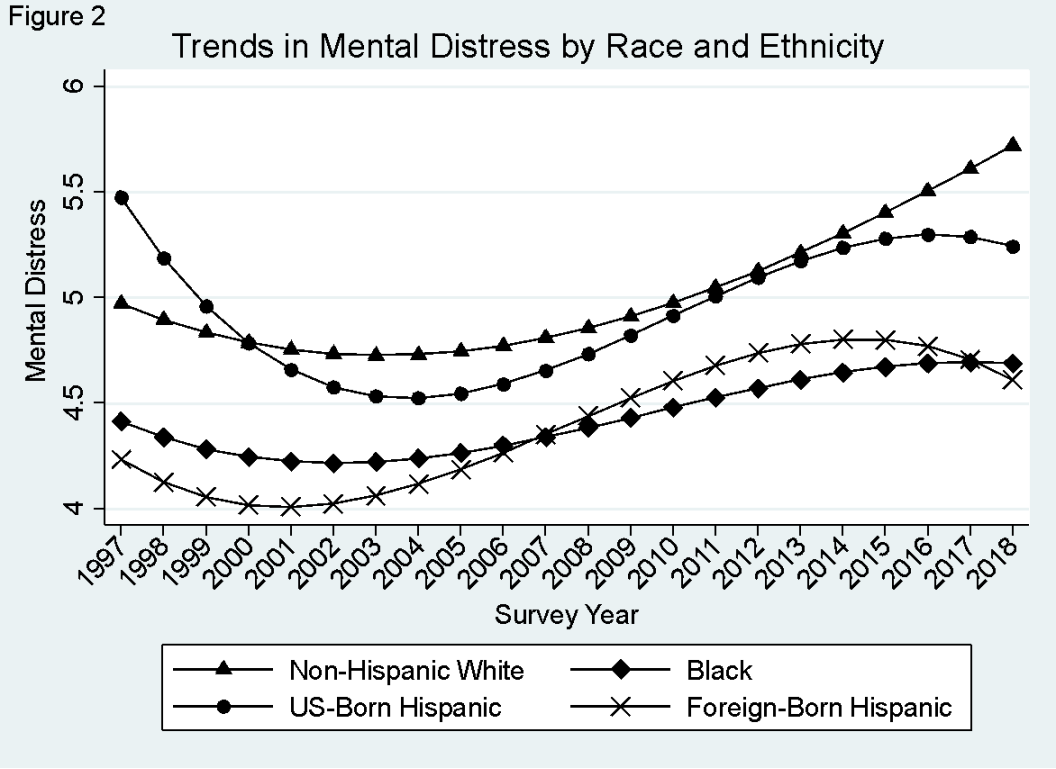
Source: Own calculations using the National Health Interview Survey (NHIS)

Figure 1



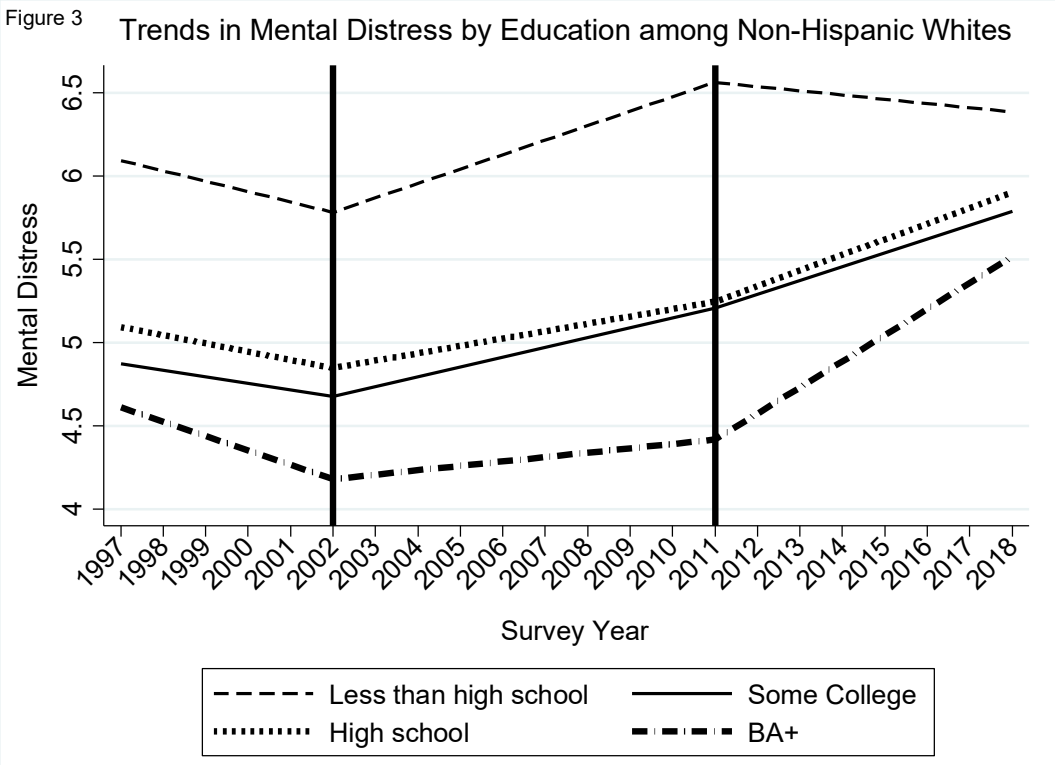

Source: Own calculations using National Health Interview Survey (NHIS)

Figure 2



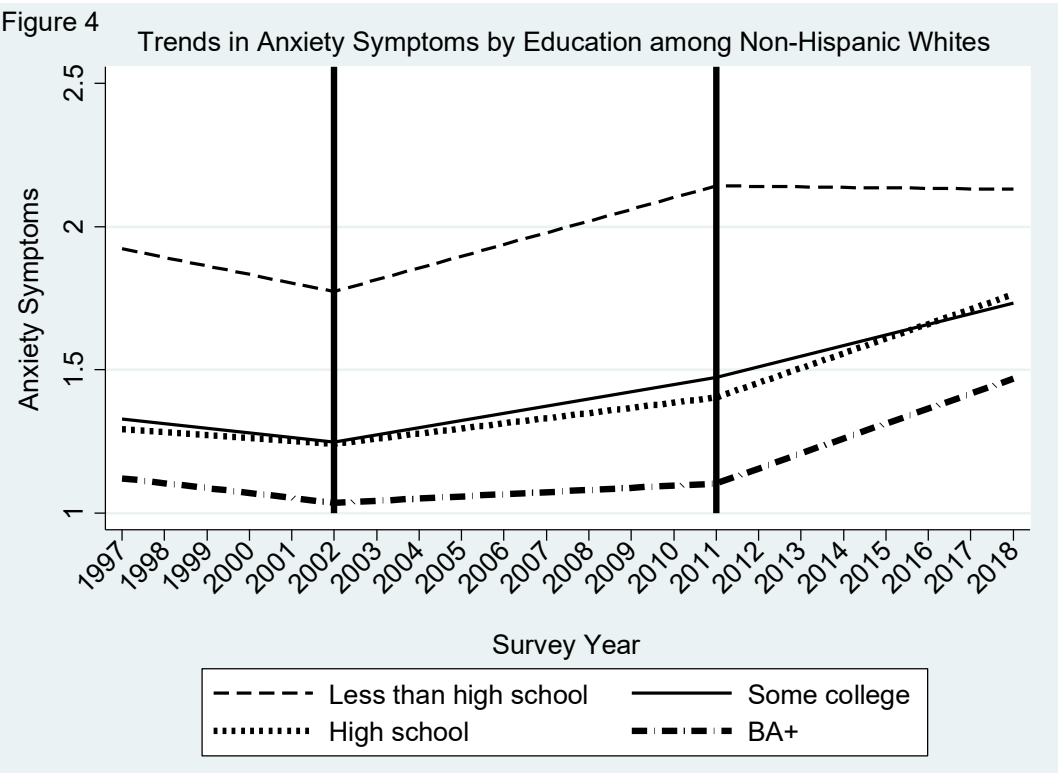

Source: Own calculations using National Health Interview Survey (NHIS)

Figure 3




Notes: Vertical bars denote spline nodes
Source: Own calculations using the National Health Interview Survey (NHIS)

Figure 4




Notes: Vertical bars denote spline nodes
Source: National Health Interview Survey (NHIS)

## Appendix

**Table 1** Changes in socioeconomic variables for each time period by race/ethnicity (ages 25-65), 1997 to 2018

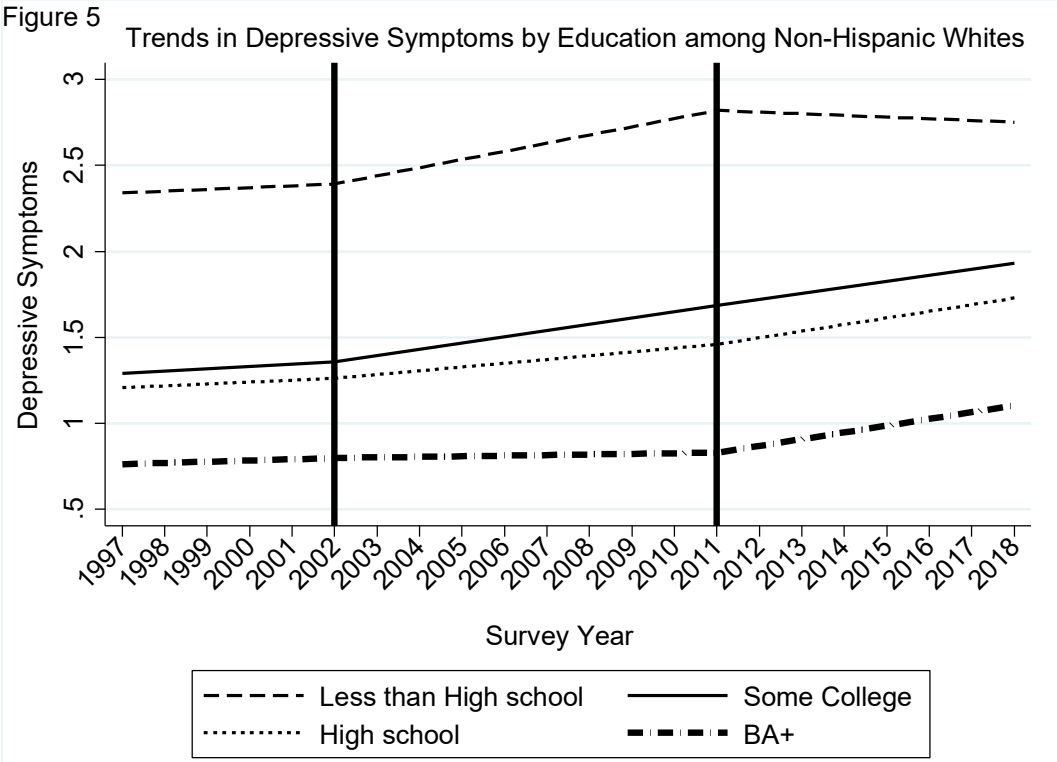
| | Spline 1 time period: 1997-2002 | | | | Spline 2 time period: 2003-2011 | | | | Spline 3 time period: 2012-2018 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Non-Hispanic Whites | Blacks | U.S-Born Hispanics | Foreign-Born Hispanics | Non-Hispanic Whites | Blacks | U.S-Born Hispanics | Foreign-Born Hispanics | Non-Hispanic Whites | Blacks | U.S-Born Hispanics | Foreign-Born Hispanics |
| Education | | | | | | | | | | | | |
| Less than HS | -2.12*** | -4.46* | n.s. | -6.13* | n.s. | -0.13** | -7.47** | -6.27** | -2.33*** | -4.88** | n.s. | -11.84*** |
| High school/GED | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Some college/AA | n.s. | 4.64** | n.s. | n.s. | 1.65*** | 3.14*** | 4.78* | n.s. | n.s. | n.s. | n.s. | n.s. |
| BA/BS and above | 2.85*** | 1.84* | 2.92* | n.s. | 3.90*** | 3.16*** | 4.50** | n.s. | 6.66*** | 5.17** | 7.83*** | 8.71*** |
| Family Income-to-poverty ratio | | | | | | | | | | | | |
| Below poverty | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| 1-1.9 times | n.s. | n.s. | n.s. | 2.71*** | 1.59* | n.s. | n.s. | n.s. | n.s. | n.s. | -0.44** | -2.91*** |
| 2-3.9 times | n.s. | 1.10* | 5.10*** | 3.72*** | -0.63* | -1.18* | n.s. | -2.45** | -3.14*** | 1.18** | -1.05** | 7.13*** |
| 4 times and above | 4.76*** | 2.75** | 6.46*** | 3.30*** | -3.02*** | -2.56** | n.s. | n.s. | 9.22*** | 5.58*** | 8.98*** | 7.58*** |
| Owns home (yes =1) | 40.09*** | 28.69*** | 30.58*** | 23.57*** | -4.36*** | -4.14** | -5.12** | -2.79* | 1.59* | n.s. | 5.69** | 6.30*** |
| Employment status | | | | | | | | | | | | |
| Employed | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Unemployed | 2.34*** | n.s. | n.s. | -2.81*** | -3.02*** | n.s. | -3.62* | n.s. | -2.67*** | -5.66*** | -5.98*** | -4.66*** |
| Not in labor force | n.s. | n.s. | -3.62*** | n.s. | 6.46*** | 11.90*** | 5.11** | n.s. | -1.27*** | 2.21** | -2.13* | n.s. |
| Months worked last year | | | | | | | | | | | | |
| 12 months | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| 1-11 months | n.s. | n.s. | n.s. | n.s. | 1.24*** | 2.08*** | n.s. | 2.50** | -1.49*** | n.s. | -3.39** | -3.90** |
| Not in labor force | 0.79*** | -3.13** | -4.55** | -4.04*** | -4.29*** | 5.38*** | n.s. | 1.68* | -2.61*** | -5.27*** | -4.61** | -3.03** |

*p<0.05; **p<0.01; ***p<0.001

*Notes:* N = 425,556; n.s. = not significant; These values were calculated by subtracting the percentage from the first year of the time period from the percentage from the last year of the time period and then testing whether this change was significant

Source: Own calculations using the National Health Interview Survey (NHIS)

Figure 5




Notes: Vertical bars denote spline nodes
Source: National Health Interview Survey (NHIS)