

# Relationships between Current and Lifetime Mental Health Issues and Subjective Social Status

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## Abstract

**Background** Mental health issues can impact overall health status, personal relationships, workplace productivity, and other social outcomes. Less is known about how and to what extent mental health issues are related to subjective social status (SSS).

**Objectives** To determine whether recent and lifetime mental health problems are significantly related to respondents' SSS.

**Research Design** Our empirical approach first examines bivariate relationships between self-reported mental health measures and SSS. Next, we estimate cross-sectional multivariate regression models. The final empirical models estimate fixed-effects regressions to control for potential bias due to time-invariant heterogeneity.

**Subjects** Respondents to Waves IV and V of the National Longitudinal Survey of Adolescent to Adult Health (Add Health) provide the data for our research.

**Measures** Subjects were asked to rate their perceived relative placement in society (i.e., SSS) in terms of wealth, education, and occupational positions. Respondents also answered questions about their mental health status including ever diagnosed with depression, ever diagnosed with PTSD, ever diagnosed with anxiety or panic disorder, and any psychological or emotional counseling during the past year.

**Results** All mental health measures are negatively and significantly associated with SSS. The effect sizes are relatively large in magnitude, particularly for respondents with an ever-in-lifetime diagnosis of depression. The effect sizes diminish somewhat with the fixed-effects specifications, but almost always remain statistically significant.

**Conclusions** These findings have important policy implications for mental health counselors, employers, and society in general as mental health problems become more common and less stigmatized.

**Key Words:** Mental Health; Subjective Social Status; PTSD; Depression; Counseling

## 1. Introduction

Individuals struggling with mental health problems often face stigma and discrimination in society.<sup>1-4</sup> Research shows that people diagnosed with depression, post-traumatic stress disorder (PTSD), and other mood disorders have greater difficulty in the labor market,<sup>3,5</sup> with interpersonal relationships,<sup>4,6</sup> maintaining a healthy lifestyle,<sup>7,8</sup> with academic achievement,<sup>9,10</sup> as well as other areas.<sup>11-13</sup> Individuals with severe mental illness are among the most socially excluded in society.<sup>4</sup> More recently, mental health status has declined during the global COVID-19 pandemic, as the pandemic exacerbated temporary and permanent mental health challenges.<sup>14</sup>

Increasing disparities in wealth, income, and the number of individuals living in poverty is generating sustained attention to the role of social status in peoples' lives.<sup>15</sup> Subjective social status (SSS) is a social and economic phenomenon<sup>16</sup> that is a critical psychological factor capturing social inequality and one's perception of their social class relative to others.<sup>15,17</sup> SSS incorporates objective information on income, education, and occupation, as well as satisfaction with standard of living, and other factors, representing an individual's perception of their place in the socioeconomic structure.<sup>18,19</sup> SSS assessments do not necessarily account for one's economic position—they are focused on understanding perceived social standing.<sup>20</sup> SSS is traditionally measured via the MacArthur Scale, a reliable and valid instrument in which participants are presented a drawing of a ladder and asked to place themselves on a rung, with the top of the ladder representing people who are best off, with the most money, education, and jobs.<sup>16,18,21,22</sup>

Self-perceptions of social positions are related to a variety of socioeconomic inequalities in health.<sup>23</sup> SSS is a self-perceived element of social position<sup>23</sup> that captures stress-related psychobiological effects<sup>17</sup> and is a strong predictor of overall health status,<sup>21,22,24,25</sup> physical health outcomes,<sup>21,22,24,26-31</sup> and a decline in health status over time.<sup>16</sup> Indeed, research shows that SSS is a stronger predictor of well-being<sup>32</sup> and health outcomes than objective measures of socioeconomic

status.<sup>16-18,21</sup> SSS may not only directly influence health, but be affected by health due to the social value of health status.<sup>17</sup>

The relationships between SSS and mental health outcomes have received little attention in the literature.<sup>33-38</sup> One study shows that SSS is inversely associated with numerous *DSM-IV* mental disorders.<sup>34</sup> Evidence also indicates that perceptions of low SSS are associated with poorer mental health outcomes and may be involved in the pathogenesis of depression.<sup>39</sup> Only one study examines the longitudinal association of SSS with mental health, using German data, and concludes that we need further investigation.<sup>17</sup> If the presence of mental health issues is significantly associated with lower SSS, then this connection could help explain some of the more direct consequences of poor mental health status (e.g., employment difficulties, wage penalties, isolation, unhealthy relationships, etc.). Along the same lines, addressing SSS among those struggling with mental health problems could result in numerous ancillary benefits.

## **2. Data and Methods**

To address this important and understudied topic, the present study analyzes data from a large and nationally representative longitudinal survey to determine whether recent and lifetime mental health problems are significantly related to respondents' SSS. Waves IV and V of the National Longitudinal Survey of Adolescent to Adult Health (Add Health) provide the data for our research. Respondents are between the ages of 24-34 at Wave IV and 33-43 at Wave V. At each wave, subjects were asked to rate their relative placement in society in terms of wealth, education, and occupational position via the MacArthur Scale. Respondents also answered several questions pertaining to their mental health status including ever diagnosed with depression, ever diagnosed with PTSD, ever diagnosed with anxiety or panic disorder, and any psychological or emotional counseling during the past 12 months. The results of this investigation have important mental health policy, workplace, educational, and clinical implications.

Our empirical approach is the most rigorous to date on the topic and makes a significant contribution to the literature, as the only prior longitudinal study did not employ fixed effects models.<sup>17</sup> We used various statistical approaches (e.g., cross-sectional linear regression and longitudinal fixed-effects techniques) to estimate these relationships. The estimation was performed with Stata (Version 16) using the *reg* and *xtreg* commands. It should also be emphasized that, due to possible time-varying omitted variables bias and other forms of endogeneity, all analyses represent associations between mental health issues and SSS, and do not necessarily imply causality.

### ***2.1 Add Health Surveys***

Add Health is a longitudinal study of a nationally representative sample of over 20,000 subjects starting with a cohort of adolescents who have been followed for five waves to date. Wave I was administered during 1994-1995 and included in-home interviews with 20,745 adolescents sampled from 80 high schools and 52 middle schools in the U.S. The study design ensures that the sample is representative of U.S. schools based on region, school type, size, and race/ethnicity. Wave IV, completed in 2008-2009, sampled young adults and contains detailed information on both mental health status and SSS. At the time of Wave IV data collection, subjects were between the ages of 24 and 34. Wave V is the most recent data from Add Health and was completed in 2016-2018. Subjects were between the ages of 33 and 43 at Wave V. Detailed mental health and SSS information were again obtained from survey respondents at Wave V.

Item non-response is infrequent with the Add Health surveys, so when missing values occurred with any of the variables used in the estimation, we simply dropped that observation rather than attempting some form of data imputation. Personal income had the most item non-response at Wave IV—357 observations or 2.3% of the full Wave IV sample—and at Wave V—215 observations or 1.8% of the full Wave V sample. As will be discussed later in the paper, we also conducted sensitivity analyses employing square data sets so that the same observations were used in

both the cross-sectional and longitudinal analyses.

### 2.1.1 *Mental Health Variables*

We examine the associations between current and lifetime mental health problems and recent SSS measured at Waves IV and V of Add Health. The Add Health Wave IV and V surveys asked participants to report if they were ever diagnosed with depression, ever diagnosed with PTSD, ever diagnosed with anxiety or panic disorder, or received any psychological or emotional counseling during the past 12 months. All mental health variables are binary, and they form the set of key predictors for current SSS.

### 2.1.2 *Explanatory Variables*

***Subjective Social Status.*** At each wave, subjects were asked to rate their relative placement in society in terms of wealth, education, and occupational position. The scale has 10 categories, with 1 representing the lowest placement and 10 representing the highest.<sup>16,18,21,22</sup> Although the scale is categorical and ordered, we treat the measure as continuous for the core analyses. This facilitates a straightforward interpretation of the coefficient estimates (i.e., marginal effects). As a robustness check, we also estimated all specifications with the ordered logit technique.

***Socio-demographic Variables.*** A variety of socio-demographic variables are also included in the empirical models as many of these factors influence SSS. These comprise gender, race, ethnicity, age, educational attainment, annual personal earnings, employment status, number of children, body mass index (BMI), currently married, currently attending school, current smoker, and frequent episodic drinking.

### 2.1.3 *Descriptive Statistics*

Table 1 presents summary statistics for all dependent and explanatory variables used in the analyses. The data are stratified by wave for both the full and square data sets. Because most of the summary statistics are very similar for both data sets, we only discuss those from the full data in the

material that follows. Starting with Wave IV, 2.6% of the sample place themselves in the lowest rung of the SSS ladder (Step 1) and 1.1% put themselves in the highest rung (Step 10). The modal category is Step 5 and most of the sample place themselves between Step 3 and Step 7. The sample includes a roughly even gender split with an average age of 28.3. Most of the sample are White (72.5%) and non-Hispanic (88%). A majority of the sample has at least some post-secondary education and 30% have a college degree or higher. Almost 16% are currently attending school, 43.3% are currently married, and the average number of children among the respondents is 1. About 81% of subjects are currently working and the average annual earnings is \$34,100. Turning to the substance use variables, almost 39% of the weighted sample reported smoking during the past month and 21.4% are frequent heavy episodic drinkers—defined as five or more drinks in a row at least twice a month if male and four or more drinks in a row at least twice a month if female. Only 34.4% of the sample fall within the “normal” BMI range, with 31.7% classified at “overweight” and 32.4% are “obese.”

The mental health variables indicate that 16.4% of the sample have been diagnosed with depression at some point during their lifetime, 3% have had a PTSD diagnosis, 13% have had an anxiety or panic disorder diagnosis, and 10.2% have engaged in psychological or emotional counseling during the past 12 months.

Some notable changes occurred over the 6-year span from Wave IV to Wave V. At Wave V, a slightly higher proportion of the full sample place themselves in both the lowest (3.4%) and highest (1.8%) rungs of the SSS ladder. The modal category continues to be Step 5, but the distribution is not as clustered around Steps 3 to 7 as it was at Wave IV. The average age is now 37.4 and almost 37% have a college degree or higher. Less than 8% are currently attending school, 58.2% are currently married, and the average number of children among the respondents is 1.4. Over 82% of subjects are currently working and the average annual earnings is \$57,200. The



proportion of past-month smokers (27.8%) and frequent heavy episodic drinkers (18.3%) show sizable declines from Wave IV to V. However, the sample is much heavier at Wave V with 26.4% of the sample in the “normal” BMI range, 32.3% classified at “overweight,” and 40.6% “obese.”

The lifetime prevalence of each mental health variable has increased—often double or more—over the period from Wave IV to V. Specifically, 29.2% of the full sample at Wave V have been diagnosed with depression at some point during their lifetime compared to 16.4% at Wave IV, 8.5% have had a PTSD diagnosis compared to only 3% at Wave IV, and 26.6% have had an anxiety or panic disorder diagnosis compared to 13% at Wave IV. Engagement in psychological or emotional counseling during the past 12 months jumped to 14.4% at Wave V compared to 10.2% at Wave IV.

To gauge the bivariate associations between mental health status and SSS, we calculated spearman correlation coefficients for each of the mental health variables at both waves. These results are displayed in Table 2. All the spearman correlation coefficients are negative and highly significant ( $p < .01$ ), regardless of wave or sample construction. The strongest association (i.e., highest negative values) occurs between lifetime diagnosis of depression and SSS. Although still statistically significant, the weakest association (i.e., smallest negative values) is between past year psychological or emotional counseling and SSS.

### **3. Estimation Results**

#### ***3.1 Cross-Sectional Regression Results***

The first set of results pertain to linear regression models applied to the full sample (Table 3) and squared sample (Appendix Table A1) of Wave IV respondents. Each of the four mental health variables are included in a separate regression with the same set of control variables as reported in Table 1. All models are estimated with Ordinary Least Squares (OLS) regression, so the coefficient estimates are marginal effects.

As presented in Table 3, even after controlling for a long list of socio-demographic predictors, each of the mental health variables are significantly (negatively) related to SSS ( $p < 0.01$ ). The largest effect size (-0.346) is for lifetime diagnosis of depression and the smallest effect size (-0.183) is for past year psychological or emotional counselling. Considering the former result, the quantitative interpretation is that a lifetime diagnosis of depression is associated with a 0.346 lower score on the SSS ladder (range = 1-10, mean = 5.04). Calculated at the mean, this corresponds to a 6.87% lower (0.346/5.04) SSS score. The qualitative and quantitative results are very similar when analyzing the squared data set, except for lifetime diagnosis of PTSD, which is no longer statistically significant.

SSS varies by race, ethnicity, and other attributes. Black respondents and those in the “other race” category have lower SSS relative to White respondents. Hispanic respondents have a higher SSS score compared to non-Hispanic respondents. Number of children, current smoker, overweight, and obese are negatively associated with SSS. Conversely, several variables are positively and significantly related to SSS including age, employment, annual personal income, education, and currently married.

Turning to the cross-sectional regression results at Wave V, all the mental health variables remain negative and statistically significant when analyzing the full sample (Table 4), albeit slightly smaller in magnitude compared to the Wave IV results. For example, the coefficient estimates for lifetime diagnosis of depression and past year psychological or emotional counseling are -0.252 and -0.142. All mental health variables remain negative and significant when analyzing the square data set (Appendix Table A2)—even lifetime diagnosis of PTSD, which was not significant when analyzing the Wave IV square data.

Some notable differences are present with the control variables as well. Race, ethnicity, and age are no longer statistically significant predictors of SSS. All the other significant predictors at

Wave IV are also significant at Wave V. The largest effect sizes appear for graduate school education, currently married, and being obese.

### ***3.2 Fixed-Effects Regression Results with the Wave IV and V Samples***

The fixed-effects regression results are reported in Table 5. These models control for all time-varying predictors as the time-invariant observable (e.g., gender, race, ethnicity) and unobservable (e.g., cognitive traits, personal beliefs, political affiliation) factors fall out of the models. The fixed-effects results are directly comparable to the cross-sectional results with the square data sets as the sample sizes are identical.

Even after controlling for time-invariant factors and time-varying predictors, all mental health variables are still negatively and statistically related to SSS, except ever been diagnosed with PTSD. The effect sizes are somewhat smaller in magnitude compared to the cross-sectional results, however, and only lifetime diagnosis of depression is significant at  $p < 0.01$ —the other two mental health variables are significant at  $p < 0.05$ . Quantitatively, the fixed-effect coefficient estimate for lifetime diagnosis of depression is -0.198 and it drops to -0.109 for past year psychological or emotional counseling.

Among the time-varying control variables, age, currently working, annual personal earnings, graduate school education, and currently married are positively related to SSS. Being obese is negatively associated with SSS. None of the other time-varying predictors are statistically significant.

### ***3.3 Regression Results with Sub-Samples***

We conducted several subgroup fixed-effects analyses to determine if the results differed across samples. The subgroups are delineated by gender, race, ethnicity, currently working, marital status, and annual income quartiles. All fixed-effects models are the same as described earlier except for a slightly reduced set of control variables due to the disaggregated samples.

Results for subgroups (available upon request from the corresponding author) are generally consistent with those for the full sample. However, some notable differences are present. First, when conducting subgroup analyses by race and ethnicity, the mental health variables are mostly significant for Whites and Hispanics, but not for Black respondents. This suggests that among Black respondents, mental health status is not an important predictor of SSS. Second, the findings are generally consistent for males and females in terms of sign and statistical significance, but the effect sizes are larger for males. In addition, ever been diagnosed with PTSD is now negative and significant for females. Third, we segmented the full sample based on reported work status at Wave IV. For those who were working at Wave IV, only lifetime diagnosis of depression is statistically significant (negative) in the fixed-effects models. Among the non-workers at Wave IV, ever been diagnosed with anxiety or panic disorder and past year psychological or emotional counseling are statistically significant (negative). Fourth, we also divided the full sample based on marital status at Wave IV. For those who reported being married, lifetime diagnosis of depression and lifetime diagnosis of anxiety or panic disorder are both statistically significant in the fixed-effects specifications. Ever been diagnosed with PTSD is the only mental health variable that is significantly related to SSS for those who were unmarried at Wave IV. Fifth, some striking results emerge when considering BMI status at Wave IV. For those individuals in the “normal” weight category, none of the mental health variables are statistically significant. However, among individuals in the obese category or the overweight/obese category, all mental health variables (apart from ever been diagnosed with PTSD) are negative and statistically significant. These findings suggest that weight status accentuates the relationships between mental health problems and SSS.

Finally, we divided the full sample into two groups based on the median value for annual income at Wave IV. For those in the lower half of the income distribution, all mental health variables are negative and statistically significant except ever been diagnosed with anxiety or panic

disorder. However, this variable is negative and significant for those in the upper half of the income distribution while ever been diagnosed with PTSD and past 12-month psychological or emotional counseling are non-significant. These results are more pronounced when we divide income groups into quartiles. Specifically, those in the first quartile (i.e., the lowest income earners) show negative and statistically significant relationships between SSS and all four mental health variables. In addition, the effect sizes are larger than those for the full sample. On the other hand, none of the mental health variables are significant for the other three income quartiles except past 12-month emotional or psychological counseling for the 3<sup>rd</sup> quartile and ever been diagnosed with anxiety or panic disorder for the 4<sup>th</sup> quartile.

### ***3.3 Robustness Checks***

As a check on the robustness of our results, we re-estimated our core fixed-effects models (i.e., Table 5) using alternative estimation techniques and sampling weights. All the results of these robustness checks are available from the authors on request.

The first robustness check involved ordered logit models instead of linear cross-sectional and linear fixed-effects models. The coefficient estimates from ordered logit are odds ratios. Nevertheless, the qualitative results are nearly identical across estimation techniques (e.g., negative and statistically significant effects of mental health variables on SSS).

Next, we re-estimated our core cross-sectional and fixed-effects models with the Add Health sampling weights. It should be noted that the literature is mixed when it comes to Add Health sampling weights, with some published studies employing sampling weights throughout <sup>1,3,4,11,14</sup> and others not at all. <sup>7,9,12,13</sup> For our models with sampling weights, the estimates tend to be smaller in magnitude and some are no longer statistically significant. Considering the fixed-effects models with sampling weights, the only negative and statistically significant mental health variable is ever diagnosed with anxiety or panic disorder.

#### 4. Discussion

The overarching aim of this research is to determine whether mental health issues are significantly related to individuals' SSS. The research topic is important because relative placement in society can impact overall health and well-being. If mental health problems lead to lower SSS, then this relationship can manifest in personal, professional, and societal setbacks. Alternatively, recognizing, addressing, and treating mental health problems can result in improved SSS and countless ancillary benefits.

This research is timely given the rise of mental health problems in society.<sup>14,40</sup> It is also empirically advanced with panel data and fixed-effects estimation techniques. Although we cannot rule out potential bias from the omission of important time-varying predictors, fixed-effects analyses generate results that are closer to causal inferences and more stable than cross-sectional models. Thus, we believe this study is a meaningful methodological and clinical contribution to the existing literature.

The main findings clearly demonstrate that mental health problems are negatively associated with SSS. When estimating cross-sectional models using first Wave IV data and then Wave V data, all four mental health variables are significantly related to SSS. The largest effect size is for ever diagnosed with depression. The effect sizes diminish a bit with the fixed-effects models and ever diagnosed with PTSD is sometimes non-significant. But the size and significance endure for the other three measures. In addition, a variety of sensitivity analyses and robustness checks generally support the core findings with the full sample and primary models.

In summary, our research makes a novel contribution to the extant literature on mental health problems, SSS, and related consequences. Our findings are consistent, persuasive, and somewhat concerning. When treating individuals with mental health challenges, clinicians may want to incorporate techniques to also address the negative influence on SSS and how that relationship

fosters additional consequences in the workplace, with interpersonal relationships, and other social interactions. It would be interesting to see if these relationships persist when the next wave of Add Health data are released. In the meantime, we encourage researchers to further explore the connections between mental health and SSS with different data sets coupled with rigorous estimation techniques.

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### **Compliance with Ethical Standards**

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Ethical approval:** This research is exempt from human subjects requirement because all data are in the public domain and free of any sensitive information.

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**Table 1. Descriptive Statistics for the Full and Square Data Sets by Wave IV (2008-2009) and Wave V (2016-2018)**

	<u>Full data</u>		<u>Square data</u>	
	<b>Wave IV (N=14,761)</b>	<b>Wave V (N=11,982)</b>	<b>Wave IV (N=9,388)</b>	<b>Wave V (N=9,388)</b>
<b>Socio-economic ladder, N (%) ** ##</b>				
Step 1	335 (2.6)	336 (3.4)	142 (1.7)	233 (3.0)
Step 2	622 (4.9)	430 (4.2)	367 (4.4)	328 (4.3)
Step 3	1,767 (12.6)	1,082 (9.9)	1,066 (12.0)	840 (9.8)
Step 4	2,612 (17.2)	1,497 (12.7)	1,638 (17.2)	1,188 (12.8)
Step 5	4,004 (27.2)	2,570 (20.9)	2,571 (27.5)	2,006 (20.8)
Step 6	2,486 (16.5)	2,332 (18.8)	1,676 (17.8)	1,870 (19.7)
Step 7	1,847 (11.9)	2,184 (17.5)	1,261 (12.8)	1,748 (17.7)
Step 8	728 (4.6)	1,046 (8.3)	478 (4.7)	808 (8.0)
Step 9	186 (1.3)	295 (2.5)	112 (1.1)	218 (2.4)
Step 10	174 (1.1)	210 (1.8)	77 (0.6)	149 (1.5)
<b>Gender, N (%)</b>				
Female	7,848 (49.3)	6,772 (49.6)	5,464 (54.2)	5,464 (51.5)
Male	6,913 (50.7)	5,209 (50.4)	3,924 (45.8)	3,924 (48.5)
<b>Race, N (%)</b>				
White	9,170 (72.5)	7,714 (72.1)	6,207 (76.2)	6,207 (74.3)
Black	3,236 (16.2)	2,396 (15.8)	1,783 (13.2)	1,783 (14.4)
Asian	942 (3.4)	776 (3.8)	566 (3.2)	566 (3.4)
Other	1,406 (8.0)	1,094 (8.4)	832 (7.4)	832 (7.9)
<b>Hispanic, N (%)</b>				
Yes	2,355 (12.0)	1,783 (12.2)	1,373 (10.8)	1,373 (11.5)
No	12,365 (88.0)	10,166 (87.8)	8,015 (89.2)	8,015 (88.5)
<b>Age in years, mean (SD) ** ##</b>	28.3 (1.86)	37.4 (1.96)	28.3 (1.83)	37.3 (1.94)
<b>Current education achieved, N (%) ** ##</b>				
Less than high school	1,138 (9.2)	496 (5.6)	539 (7.0)	340 (5.0)
High school diploma or equivalent	2,388 (17.8)	1,731 (16.4)	1,285 (14.9)	1,289 (15.5)
Some post-secondary education	6,505 (42.9)	4,828 (41.3)	4,065 (42.8)	3,765 (41.1)
Graduated from college or university	2,907 (18.8)	2,525 (19.7)	2,125 (21.9)	2,061 (20.8)
More than college	1,821 (11.2)	2,382 (17.0)	1,374 (13.4)	1,933 (17.5)
<b>Number of children, mean (SD) ** ##</b>	0.9 (1.19)	1.4 (1.37)	0.9 (1.14)	1.5 (1.37)
<b>Annual personal income (thousands), mean (SD) ** ##</b>	34.1 (43.14)	57.2 (56.06)	34.5 (37.38)	57.8 (56.00)
<b>Frequent heavy episodic drinking, N (%) <sup>a</sup> ** ##</b>				
Yes	2,878 (21.4)	2,067 (18.3)	1,843 (21.6)	1,672 (19.4)
No	11,771 (78.6)	9,894 (81.7)	7,545 (78.4)	7,716 (80.6)

<b>Current smoker, N (%)<sup>b ** ##</sup></b>				
Yes	5,194 (38.9)	2,902 (27.8)	3,128 (36.9)	2,299 (28.2)
No	9,449 (61.1)	9,002 (72.2)	6,260 (63.1)	7,089 (71.8)
<b>Currently attending school, N (%)<sup>** ##</sup></b>				
Yes	2,471 (15.7)	952 (7.4)	1,681 (16.8)	752 (7.6)
No	12,288 (84.3)	11,004 (92.6)	7,707 (83.2)	8,636 (92.4)
<b>Currently married, N (%)<sup>** ##</sup></b>				
Yes	6,290 (43.3)	7,236 (58.2)	4,252 (45.1)	5,833 (60.7)
No	8,116 (56.7)	4,744 (41.8)	5,136 (54.9)	3,555 (39.3)
<b>Currently working, N (%)<sup>*</sup></b>				
Yes	11,847 (81.1)	10,052 (82.4)	7,878 (84.0)	8,012 (83.8)
No	2,622 (18.9)	1,897 (17.6)	1,510 (16.0)	1,376 (16.2)
<b>BMI classification, N (%)<sup>** ##</sup></b>				
Underweight (<18.5)	210 (1.5)	106 (0.7)	134 (1.4)	76 (0.7)
Normal (18.5-24.9)	5,028 (34.4)	3,217 (26.4)	3,287 (35.0)	2,555 (26.4)
Overweight (25-29.9)	4,713 (31.7)	3,787 (32.3)	2,908 (31.0)	2,938 (31.6)
Obesity (≥30)	4,797 (32.4)	4,801 (40.6)	3,059 (32.6)	3,819 (41.4)
<b>Ever been diagnosed with depression, N (%)<sup>** ##</sup></b>				
Yes	2,258 (16.4)	3,315 (29.2)	1,475 (16.7)	2,697 (30.6)
No	12,501 (83.6)	8,621 (70.8)	7,912 (83.3)	6,665 (69.4)
<b>Ever been diagnosed with PTSD, N (%)<sup>** ##</sup></b>				
Yes	427 (3.0)	906 (8.5)	243 (2.6)	676 (8.2)
No	14,332 (97.0)	11,023 (91.5)	9,145 (97.4)	8,680 (91.8)
<b>Ever been diagnosed with anxiety or panic disorder, N (%)<sup>** ##</sup></b>				
Yes	1,725 (13.0)	2,966 (26.6)	1,121 (13.1)	2,393 (27.3)
No	13,035 (87.0)	8,974 (73.4)	8,267 (86.9)	6,970 (72.7)
<b>Past 12 month psychological or emotional counseling, N (%)<sup>** ##</sup></b>				
Yes	1,441 (10.2)	1,727 (14.4)	916 (9.8)	1,356 (14.4)
No	13,317 (89.8)	10,188 (85.6)	8,472 (90.2)	7,984 (85.6)

Note: All data are weighted based on the survey design weights from Add Health (N is unweighted). Kruskal-Wallis rank-sum non-parametric test was conducted for time-varying variables to compare the differences between Waves IV and V. Rao-Scott chi-square test was also performed for time-varying binary variables. The significance test results for binary variables using Kruskal-Wallis and Rao-Scott chi-square tests are consistent.

<sup>a</sup> Heavy episodic drinking (HED) is defined as five or more drinks in a row for males and four or more drinks in a row if female. Frequent HED occurs if participants reported engaging in HED at least twice a month during the past 12 months.

<sup>b</sup> Current smoker applies to any past month use.

- \* Statistically significant difference between Wave IV and Wave V using full data,  $p < 0.05$ .
- \*\* Statistically significant difference between Wave IV and Wave V using full data,  $p < 0.01$ .
- # Statistically significant difference between Wave IV and Wave V using square data,  $p < 0.05$ .
- ## Statistically significant difference between Wave IV and Wave V using square data,  $p < 0.01$ .

**Table 2. Spearman Correlation Coefficients between Subjective Social Status (SSS) and Mental Health Variables**

***Full Data Set***

	<b>Wave IV</b>	<b>Wave V</b>
Ever been diagnosed with depression	-0.119**	-0.138**
Ever been diagnosed with PTSD	-0.054**	-0.082**
Ever been diagnosed with anxiety or panic disorder	-0.071**	-0.097**
Past 12 month psychological or emotional counseling	-0.029**	-0.031**

\* Statistically significant correlation between SSS and mental health variable,  $p < 0.05$

\*\* Statistically significant correlation between SSS and mental health variable,  $p < 0.01$

***Square Data Set***

	<b>Wave IV</b>	<b>Wave V</b>
Ever been diagnosed with depression	-0.122**	-0.143 **
Ever been diagnosed with PTSD	-0.040 **	-0.085 **
Ever been diagnosed with anxiety or panic disorder	-0.064 **	-0.102 **
Past 12 month psychological or emotional counseling	-0.029 **	-0.025 *

\* Statistically significant correlation between SSS and mental health variable,  $p < 0.05$

\*\* Statistically significant correlation between SSS and mental health variable,  $p < 0.01$

**Table 3. Estimation Results of SSS on Mental Health Variables, Add Health Wave IV (Full Data Set) <sup>a</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Ever been diagnosed with depression	-0.346** (-0.420, -0.273)			
Ever been diagnosed with PTSD		-0.269** (-0.426, -0.113)		
Ever been diagnosed with anxiety or panic disorder			-0.212** (-0.294, -0.131)	
Past 12 month psychological or emotional counseling				-0.183** (-0.271, -0.094)
Female	-0.011 (-0.067, 0.045)	-0.047 (-0.102, 0.009)	-0.032 (-0.088, 0.024)	-0.043 (-0.098, 0.013)
Black <sup>b</sup>	-0.140** (-0.209, -0.071)	-0.109** (-0.178, -0.040)	-0.122** (-0.191, -0.053)	-0.112** (-0.180, -0.043)
Asian <sup>b</sup>	0.041 (-0.068, 0.150)	0.069 (-0.040, 0.178)	0.056 (-0.053, 0.165)	0.066 (-0.043, 0.175)
Other Race <sup>b</sup>	-0.125* (-0.234, -0.016)	-0.119* (-0.229, -0.010)	-0.126* (-0.236, -0.017)	-0.120* (-0.230, -0.011)
Hispanic	0.131** (0.043, 0.220)	0.154** (0.065, 0.243)	0.148** (0.059, 0.236)	0.152** (0.063, 0.240)
Number of children	-0.048** (-0.073, -0.024)	-0.051** (-0.076, -0.026)	-0.051** (-0.076, -0.026)	-0.051** (-0.076, -0.026)
Age	0.025** (0.010, 0.040)	0.025** (0.010, 0.040)	0.025** (0.010, 0.040)	0.025** (0.010, 0.040)
Annual personal income (thousands)	0.006** (0.005, 0.007)	0.006** (0.005, 0.007)	0.006** (0.005, 0.007)	0.006** (0.006, 0.007)
High school diploma or equivalent <sup>c</sup>	0.276** (0.160, 0.392)	0.276** (0.160, 0.391)	0.274** (0.158, 0.390)	0.278** (0.162, 0.394)
Some post-secondary education <sup>c</sup>	0.464** (0.359, 0.570)	0.457** (0.351, 0.563)	0.455** (0.350, 0.561)	0.463** (0.357, 0.568)
Graduated from college or university <sup>c</sup>	1.106** (0.987, 1.224)	1.106** (0.987, 1.225)	1.103** (0.984, 1.222)	1.115** (0.996, 1.234)
More than college <sup>c</sup>	1.643** (1.513, 1.772)	1.646** (1.516, 1.776)	1.643** (1.513, 1.773)	1.657** (1.527, 1.787)
Frequent heavy episodic drinking <sup>d</sup>	0.02 (-0.048, 0.087)	0.017 (-0.050, 0.085)	0.022 (-0.046, 0.089)	0.019 (-0.049, 0.086)
Current smoker <sup>e</sup>	-0.299**	-0.317**	-0.310**	-0.317**

Currently attending school	(-0.358, -0.241) -0.023	(-0.375, -0.259) -0.031	(-0.368, -0.252) -0.026	(-0.375, -0.259) -0.025
Currently married	(-0.096, 0.049) 0.235**	(-0.103, 0.042) 0.248**	(-0.099, 0.046) 0.244**	(-0.097, 0.048) 0.245**
Currently working	(0.178, 0.292) 0.303**	(0.191, 0.306) 0.320**	(0.187, 0.302) 0.314**	(0.188, 0.303) 0.318**
Underweight (<18.5) <sup>f</sup>	(0.232, 0.374) -0.128	(0.249, 0.392) -0.136	(0.242, 0.385) -0.127	(0.247, 0.389) -0.138
Overweight (25-29.9) <sup>f</sup>	(-0.350, 0.093) -0.107**	(-0.358, 0.086) -0.110**	(-0.349, 0.095) -0.112**	(-0.360, 0.084) -0.110**
Obesity (>=30) <sup>f</sup>	(-0.171, -0.043) -0.247**	(-0.174, -0.046) -0.261**	(-0.176, -0.047) -0.261**	(-0.174, -0.046) -0.261**
Constant	(-0.312, -0.183) 3.439**	(-0.326, -0.196) 3.394**	(-0.325, -0.196) 3.421**	(-0.325, -0.196) 3.381**
Number of observations	(3.000, 3.878) 13,646	(2.954, 3.834) 13,646	(2.981, 3.861) 13,647	(2.941, 3.821) 13,646

<sup>a</sup> Ordinary Least Squares (OLS) regressions were used to examine the association between subjective social status and each mental health predictor adjusted for age, gender, race, ethnicity, education, annual income, number of children, alcohol use, smoking, BMI, currently attending school, marital status, and employment status at Wave IV. Coefficient estimates are reported along with 95% confidence intervals in parentheses.

<sup>b</sup> Reference category for race = White

<sup>c</sup> Reference category for education = less than high school

<sup>d</sup> Heavy episodic drinking (HED) is defined as five or more drinks in a row for males and four or more drinks in a row if female. Frequent HED occurs if participants reported engaging in HED at least twice a month during the past 12 months.

<sup>e</sup> Current smoker applies to any past month use.

<sup>f</sup> Reference category for BMI = Normal Weight (i.e., BMI = 18.5 - 24.9)

\* Statistically significant from zero at  $p < 0.05$

\*\* Statistically significant from zero at  $p < 0.01$



**Table 4. Estimation Results of SSS on Mental Health Variables, Add Health Wave V (Full Data Set) <sup>a</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Ever been diagnosed with depression	-0.252** (-0.320, -0.185)			
Ever been diagnosed with PTSD		-0.172** (-0.283, -0.062)		
Ever been diagnosed with anxiety or panic disorder			-0.151** (-0.221, -0.082)	
Past 12 month psychological or emotional counseling				-0.142** (-0.225, -0.059)
Female	0.071* (0.008, 0.133)	0.04 (-0.022, 0.102)	0.062 (-0.001, 0.124)	0.041 (-0.021, 0.103)
Black <sup>b</sup>	-0.058 (-0.136, 0.021)	-0.03 (-0.108, 0.048)	-0.042 (-0.121, 0.036)	-0.024 (-0.103, 0.054)
Asian <sup>b</sup>	0.038 (-0.083, 0.159)	0.064 (-0.057, 0.185)	0.053 (-0.068, 0.174)	0.069 (-0.051, 0.190)
Other Race <sup>b</sup>	0.033 (-0.093, 0.159)	0.031 (-0.095, 0.157)	0.023 (-0.103, 0.149)	0.032 (-0.094, 0.158)
Hispanic	-0.021 (-0.124, 0.082)	-0.004 (-0.106, 0.099)	-0.009 (-0.112, 0.093)	0.003 (-0.100, 0.106)
Number of children	-0.071** (-0.094, -0.049)	-0.069** (-0.092, -0.047)	-0.072** (-0.094, -0.049)	-0.073** (-0.095, -0.050)
Age	-0.003 (-0.018, 0.012)	-0.003 (-0.018, 0.012)	-0.002 (-0.018, 0.013)	-0.004 (-0.019, 0.012)
Annual personal income (thousands)	0.011** (0.010, 0.011)	0.011** (0.010, 0.011)	0.011** (0.010, 0.011)	0.011** (0.010, 0.011)
High school diploma or equivalent <sup>c</sup>	0.202* (0.038, 0.366)	0.201* (0.037, 0.365)	0.200* (0.036, 0.364)	0.194* (0.029, 0.358)
Some post-secondary education <sup>c</sup>	0.378** (0.224, 0.532)	0.373** (0.219, 0.527)	0.377** (0.223, 0.531)	0.367** (0.212, 0.522)
Graduated from college or university <sup>c</sup>	0.917** (0.753, 1.081)	0.923** (0.759, 1.088)	0.922** (0.758, 1.086)	0.919** (0.754, 1.083)
More than college <sup>c</sup>	1.174** (1.006, 1.342)	1.173** (1.005, 1.341)	1.177** (1.009, 1.345)	1.180** (1.011, 1.349)
Frequent heavy episodic drinking <sup>d</sup>	0.043 (-0.036, 0.121)	0.036 (-0.042, 0.115)	0.04 (-0.038, 0.119)	0.043 (-0.035, 0.122)
Current smoker <sup>e</sup>	-0.242** (-0.315, -0.169)	-0.265** (-0.339, -0.192)	-0.259** (-0.332, -0.185)	-0.260** (-0.333, -0.187)

Currently attending school	-0.07 (-0.178, 0.038)	-0.08 (-0.188, 0.028)	-0.076 (-0.184, 0.032)	-0.075 (-0.183, 0.033)
Currently married	0.425** (0.360, 0.491)	0.440** (0.374, 0.505)	0.436** (0.370, 0.501)	0.443** (0.378, 0.508)
Currently working	0.412** (0.327, 0.496)	0.434** (0.349, 0.519)	0.432** (0.348, 0.517)	0.431** (0.347, 0.516)
Underweight (<18.5) <sup>f</sup>	0.028 (-0.291, 0.348)	-0.004 (-0.321, 0.312)	-0.004 (-0.321, 0.312)	0.003 (-0.314, 0.319)
Overweight (25-29.9) <sup>f</sup>	-0.146** (-0.223, -0.070)	-0.147** (-0.224, -0.070)	-0.146** (-0.223, -0.070)	-0.149** (-0.226, -0.072)
Obesity (>=30) <sup>f</sup>	-0.352** (-0.426, -0.278)	-0.360** (-0.434, -0.286)	-0.361** (-0.435, -0.287)	-0.361** (-0.435, -0.287)
Constant	4.145** (3.541, 4.748)	4.074** (3.469, 4.679)	4.075** (3.471, 4.680)	4.108** (3.503, 4.713)
Number of observations	11,539	11,532	11,538	11,513

<sup>a</sup> Ordinary Least Squares (OLS) regressions were used to examine the association between subjective social status and each mental health predictor adjusted for age, gender, race, ethnicity, education, annual income, number of children, alcohol use, smoking, BMI, currently attending school, marital status, and employment status at Wave V. Coefficient estimates are reported along with 95% confidence intervals in parentheses.

<sup>b</sup> Reference category for race = White

<sup>c</sup> Reference category for education = less than high school

<sup>d</sup> Heavy episodic drinking (HED) is defined as five or more drinks in a row for males and four or more drinks in a row if female. Frequent HED occurs if participants reported engaging in HED at least twice a month during the past 12 months.

<sup>e</sup> Current smoker applies to any past month use.

<sup>f</sup> Reference category for BMI = Normal Weight (i.e., BMI = 18.5 - 24.9)

\* Statistically significant from zero at  $p < 0.05$

\*\* Statistically significant from zero at  $p < 0.01$

**Table 5. Fixed-Effects Estimation Results of SSS on Mental Health Variables, Add Health Waves VI and V <sup>a</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Ever been diagnosed with depression	-0.198** (-0.315, -0.080)			
Ever been diagnosed with PTSD		-0.187 (-0.377, 0.003)		
Ever been diagnosed with anxiety or panic disorder			-0.122* (-0.236, -0.007)	
Past 12 month psychological or emotional counseling				-0.109* (-0.203, -0.015)
Number of children	0.0004 (-0.033, 0.034)	0.002 (-0.032, 0.035)	0.0003 (-0.033, 0.034)	0.001 (-0.033, 0.034)
Age	0.027** (0.021, 0.033)	0.026** (0.020, 0.032)	0.026** (0.020, 0.032)	0.025** (0.019, 0.031)
Annual personal income (thousands)	0.005** (0.004, 0.006)	0.005** (0.004, 0.006)	0.005** (0.004, 0.006)	0.005** (0.004, 0.006)
High school diploma or equivalent <sup>b</sup>	-0.121 (-0.367, 0.125)	-0.125 (-0.371, 0.121)	-0.124 (-0.369, 0.122)	-0.133 (-0.380, 0.115)
Some post-secondary education <sup>b</sup>	-0.117 (-0.372, 0.139)	-0.124 (-0.379, 0.132)	-0.119 (-0.374, 0.136)	-0.129 (-0.387, 0.129)
Graduated from college or university <sup>b</sup>	0.075 (-0.213, 0.362)	0.07 (-0.218, 0.358)	0.072 (-0.216, 0.359)	0.063 (-0.226, 0.353)
More than college <sup>b</sup>	0.349* (0.044, 0.653)	0.341* (0.036, 0.645)	0.342* (0.038, 0.646)	0.337* (0.031, 0.643)
Frequent heavy episodic drinking <sup>c</sup>	0.042 (-0.046, 0.129)	0.039 (-0.049, 0.126)	0.043 (-0.044, 0.131)	0.043 (-0.045, 0.130)
Current smoker <sup>d</sup>	0.024 (-0.074, 0.122)	0.025 (-0.074, 0.123)	0.021 (-0.077, 0.119)	0.023 (-0.076, 0.121)
Currently attending school	-0.022 (-0.107, 0.062)	-0.023 (-0.108, 0.061)	-0.023 (-0.107, 0.061)	-0.02 (-0.104, 0.064)
Currently married	0.220** (0.149, 0.291)	0.223** (0.152, 0.293)	0.228** (0.157, 0.298)	0.227** (0.157, 0.298)
Currently working	0.313** (0.212, 0.414)	0.313** (0.212, 0.414)	0.318** (0.217, 0.419)	0.308** (0.206, 0.409)
Underweight (<18.5) <sup>e</sup>	-0.212 (-0.584, 0.161)	-0.208 (-0.582, 0.166)	-0.254 (-0.621, 0.114)	-0.205 (-0.582, 0.172)
Overweight (25-29.9) <sup>e</sup>	-0.032 (-0.128, 0.064)	-0.039 (-0.135, 0.056)	-0.039 (-0.134, 0.057)	-0.034 (-0.129, 0.061)

Obesity ( $\geq 30$ ) <sup>e</sup>	-0.131*	-0.146*	-0.141*	-0.136*
	(-0.263, -0.000)	(-0.277, -0.015)	(-0.272, -0.010)	(-0.268, -0.005)
Constant	3.879**	3.912**	3.898**	3.947**
	(3.597, 4.160)	(3.630, 4.194)	(3.614, 4.181)	(3.665, 4.229)
Number of individuals	9,361	9,356	9,363	9,340

<sup>a</sup> Fixed-effects linear regression models were used to examine the association between subjective social status and each mental health predictor adjusted for time-varying factors such as age, education, annual income, number of children, alcohol use, smoking, BMI, currently attending school, marital status, and employment status. Coefficient estimates are reported along with 95% confidence intervals in parentheses.

<sup>b</sup> Reference category for education = less than high school

<sup>c</sup> Heavy episodic drinking (HED) is defined as five or more drinks in a row for males and four or more drinks in a row if female. Frequent HED occurs if participants reported engaging in HED at least twice a month during the past 12 months.

<sup>d</sup> Current smoker applies to any past month use.

<sup>e</sup> Reference category for BMI = Normal Weight (i.e., BMI = 18.5 - 24.9)

\* Statistically significant from zero at  $p < 0.05$

\*\* Statistically significant from zero at  $p < 0.01$