Do stressful events account for the link between socioeconomic status and mental health?

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ABSTRACT

Background The purpose of this study was to prospectively examine the relationships between socioeconomic status (SES), demographic variables and mental health and to determine whether number of life stressors mediated these relationships.

Methods Wave 1 (2001–02) and 2 (2004–05) data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; $n = 34 459$) were used in the current study. Controlling for wave 1 mental health, a mediation model was tested to determine the relative impact of socioeconomic and demographic variables (all measured at wave 1) on mental health 3 years later (wave 2). The number of life stressors experienced in the 12 months prior to wave 1, assessed at wave 1, was evaluated as the mediator.

Results Findings indicated that SES, age, race/ethnicity, gender and marital status independently predicted changes in mental health ratings at wave 2. In addition, the number of life stressors mediated the relation between socioeconomic and demographic variables and mental health. Exposure to life stressors helps to explain commonly reported socioeconomic and demographic disparities in mental health.

Conclusions Findings may suggest that reducing exposure to stressors and/or improving coping with life stressors may both improve mental health and reduce health disparities.

Keywords life stress, mediation analysis, mental health, socioeconomic status

Introduction

One in four Americans reports that they have experienced significant mental health issues in the past calendar year, indicating that mental health problems are a major public health issue in the USA.[1,2] Numerous studies have shown that demographic and socioeconomic variables influence mental health. For instance, females and ethnic minorities report poorer mental health than males and Whites.[3] In addition, individuals without a partner tend to report poorer mental health than married or cohabitating individuals,[4,5] and mental health tends to be poorer in the young.[6] A significant positive relation between socioeconomic status (SES) indicators (e.g. income, education, wealth) and mental health has also been repeatedly demonstrated.[7–12] Because SES and demographic variables are often confounded, disentangling their unique contribution to mental health and general psychological functioning is an important area of exploration.

Many studies indicate that individuals of lower SES report a greater number of stressors related to finances, relationships, transportation and employment than those of higher SES.[13–16] Residence in lower SES neighborhoods has also been linked to greater levels of stress.[17] Other studies have shown that socioeconomically disadvantaged individuals tend to experience more distress following a stressor than their more advantaged counterparts.[18–20] The findings of one longitudinal study indicated that although socioeconomically disadvantaged

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individuals reported fewer stressors, the stressors that they experienced were of greater severity.[21]

Not surprisingly, exposure to stressful life events is related to mental health problems including depression, anxiety and substance abuse.[17,22–24] The total number of stressors experienced by an individual may have a direct impact on mental health.[25] Numerous studies have indicated that stress (negative events, chronic strains and traumas) has a damaging impact on mental health (for a review see ref. [26]). However, few studies have examined stressful life events as a mediator of the relation between SES and mental health. One longitudinal study of the rates of psychiatric hospitalization in Massachusetts showed that communities with lower SES had greater rates of psychiatric hospitalization, and this relationship was mediated by economic stress.[8] In a longitudinal Dutch study, the relation between education and perceived health problems was partially mediated by greater exposure to life stressors.[27] Finally, one study found that although the number of 'daily hassles' was higher in individuals with greater levels of education, the presence of daily stressors had a larger negative impact on the mental health of those with lower levels of education than those with higher levels of education.[21] Further examination of the role of life stressors as mediators of the relation between SES and mental health is needed.

Overall, research indicates that stress, SES, demographics and mental health are interrelated.[26] Previous studies that have examined the role of stress in the relation between SES and health have focused on general perceived health, examined mental health at the community level and/or used cross-sectional designs. The current study is among the first to longitudinally examine whether stressful life events mediate the relation between SES (i.e. years of education, level of household income and presence of health insurance), other demographic variables (i.e. marital status, age, race/ethnicity and gender) and self-reported mental health in a large representative sample of US adults.

Methods

Sample

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC[28,29]) is a representative sample of the non-institutionalized household population of the USA over 18 years of age, with oversamples of Blacks, Hispanics and young adults between 18 and 24 years of age. The secondary data analyses described in this study were approved by the Institutional Review Board at the University of Texas School of Public Health. Following random selection of respondents

using multistage cluster sampling procedures, trained interviewers used a computerized survey instrument to collect data in face-to-face interviews of respondents. Data were weighted to adjust for selection probabilities, oversampling and non-response. A post-stratification weight was applied to adjust the data to the distribution of the US household population.[29] Wave 1 was conducted in 2001–02 using face-to-face interviews of 43 093 respondents. Wave 2 was conducted in 2004–05, when 34 653 of the wave 1 respondents were re-interviewed. The present study is focused on this longitudinal sample. A total of 194 respondents had missing data on measures discussed below and were excluded from analyses, leaving a total sample of 34 459. The response rates during waves 1 and 2 were 81 and 86.7%, yielding a cumulative response rate of 70.2%.

Measures

Demographic variables

Self-reported age in years, gender, marital status and race/ethnicity were collected at wave 1. Marital status reflected whether the respondent was married/living with a romantic partner versus never married, separated, divorced or widowed. Race/ethnicity included five categories: White (reference group), Black, Native American, Asian and Hispanic.

Socioeconomic status

A continuous education variable reflected the number of years of education reported at wave 1. Respondents selected 1 of 21 options identifying the range (e.g. $50 000–$59 999) containing their total household income over the last 12 months. A continuous version of this variable was created by recoding responses to the numeric midpoint of each range, using a value of $210 000 for the highest category (i.e. $200 000 or more). Finally, a binary health insurance variable was created to indicate the presence (versus absence) of 1–4 types of coverage: Medicare, Medicaid, military health care or private health insurance (e.g. through an employer or purchased separately). Those who had any form of insurance were coded as 1 and those without insurance were coded as 0.

Number of stressors experienced

Respondents indicated whether they experienced (yes or no) 12 types of stressful events during the previous 12 months at wave 1. The events included death of any family or close friends; being a victim or having a family member be a victim of a crime; moving or having someone new live with you; being fired or laid off; unemployed for more than a month despite looking for a job; having trouble with a boss or coworker; changing job, job responsibilities or work hours;

becoming separated, divorced or breaking off a steady relationship; having problems with a neighbor, friend or relative; experiencing a major financial crisis, bankruptcy or being unable to pay bills; experiencing a serious illness (personally or in a family member or close friend) and having trouble with police, being arrested or being sent to jail. The sum of the number of these events experienced was calculated and used in analyses.[30,31,32]

Mental health

Psychological functioning/mental health at waves 1 and 2 was measured with the norm-based mental component score (NBMCS) of the Short Form 12 Health Survey (version 2). Items reflected vitality, energy or fatigue, social functioning, role limitations due to emotional problems, and general mental health using 5-point response scales scored on equal intervals from 0 to 100 (i.e. 0, 25, 50, 75 and 100), which are then aggregated into a single measure using a norm-based scoring technique[33] to facilitate comparisons of scores across studies. This interviewer administered measure is standardized to a mean of 50, with higher scores indicating better mental health. The reliability and validity of this measure has been established in several previous studies.[33–37]

Statistical analyses

Preliminary analyses, conducted using STATA (11.0), included descriptive characteristics of the sample (i.e. percentages, means and 95% confidence intervals) and zero-order correlations between study variables. All analyses accounted

Table 1 NESARC sample characteristics

Sample characteristics (n = 34 459)	%/Mean (95% CI)
Male	47.9
Race/ethnicity	
White	70.9
Black	11.0
Hispanic	11.6
Native American	2.2
Asian	4.3
Age at wave 1	45.1 (44.8–45.4)
Years of education at wave 1	14.1 (14.1–14.2)
Annual household income at wave 1	54.2k (53.6–54.8k)
Married/living with someone at wave 1	63.2
Had health insurance at wave 1	82.0
Wave 1 number of stressors	1.6 (1.6–1.7)
Wave 1 NBMCS	52.6 (52.4–52.8)
Wave 2 NBMCS	51.4 (51.3–51.6)

CI, confidence interval; NBMCS, norm-based mental component score.

for the complex sampling features of the NESARC. Mplus 6.12[38] was used to test the mediation model. A continuous latent SES variable (wave 1) comprised three SES indicators (i.e. education, income and insurance status). Loadings for all indicators differed significantly from zero. To examine the extent to which the number of stressors mediated the impact of SES (i.e. years of education, level of household income and presence of health insurance) and other demographic characteristics (i.e. age, gender, race/ethnicity and marital status) on later mental health, we estimated direct and indirect effects of these wave 1 variables on wave two NBMCS scores, treating the number of stressors at wave 1 as a mediating variable. Effects of wave 1 NBMCS scores on number of stressors and wave 2 NBMCS scores were controlled. Because the distribution of an indirect effect (a product term) is not typically normally distributed, significance tests of the indirect effect based on normal distribution assumptions are often inaccurate.[39] Consequently, we used the bias-corrected bootstrap resampling method[40] to obtain standard errors and associated significance tests for the indirect effects in the mediation model. Furthermore, because the effects of a 1-year change in age are small, we rescaled age into decades for this analysis (i.e. a unit change in age corresponds to a 10-year increment).

Results

Sample characteristics

On average, respondents were 45 years of age, had 2 years of education beyond high school and reported a yearly income of ~$54 000. Males made up slightly less than half of the sample and most respondents were White (70.9%). On average, respondents reported experiencing fewer than two types of stressful life events in the previous 12-month period and mental health component scores at both waves 1 and 2 were just above the norm-based mean score of 50. The distribution of all demographic, SES, stressor and mental health measures is shown in Table 1.

Zero-order correlations

Zero-order correlations indicated that each of the SES indicators and most of the demographic variables, including age, race (Black, Native American and White), marital status, health insurance status, income and education were significantly related to wave 1 and 2 mental health (Table 2). In addition, the number of stressors experienced in the 12 months prior to wave 1 was related to each of the variables included in the mediation analysis (Table 2). Hispanic race/ethnicity was not significantly related to mental health at either wave and Asian race/ethnicity was only related to wave 1 mental health.

Table 2 Correlations between manifest variables included in the mediation analysis

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. W1 NBMCS	—													
2. W2 NBMCS	0.40***	—												
3. W1 stressors	−0.25***	−0.16***	—											
4. Age at W1	0.02***	0.02***	−0.25***	—										
5. Male gender	0.11***	0.11***	−0.04***	−0.03***	—									
6. Black race	−0.03***	−0.05***	0.06***	−0.02***	−0.07***	—								
7. Hispanic ethnicity	0.01	0.01	−0.02***	−0.14***	0.01	−0.23***	—							
8. N. Amer. race	−0.03***	−0.01*	0.05***	0.00	0.00	−0.06***	−0.06***	—						
9. Asian race	0.01*	0.01	−0.04***	−0.05***	0.01	−0.08***	−0.08***	−0.02***	—					
10. White race	0.02***	0.03***	−0.03***	0.14***	0.05***	−0.57***	−0.56***	−0.15***	−0.20***	—				
11. Married/LW	0.10***	0.09***	−0.12***	0.04***	0.09***	−0.17***	0.05***	0.01	0.03***	0.09***	—			
12. Health Insurance	0.03***	0.04***	−0.10***	0.22***	−0.02***	−0.02***	−0.15***	−0.01*	−0.01*	0.14***	0.07***	—		
13. HH income	0.12***	0.13***	−0.07***	−0.10***	0.12***	−0.14***	−0.08***	−0.02***	0.05***	0.16***	0.31***	0.12***	—	
14. Education	0.08***	0.10***	0.01*	−0.12***	0.03***	−0.06***	−0.24***	−0.01***	0.05***	0.22***	0.07***	0.13***	0.40***	—

W, wave; N. Amer., Native American; NBMCS, norm-based mental component score; LW, living with; Ins, insurance; HH, household.

***$P < 0.001$, *$P < 0.05$.

Exposure to stressors at wave 1 was negatively associated with mental health at both waves.

Predictors of wave 1 stressors and wave 2 mental health

The results from the mediation model are shown in Tables 3 and 4. Table 3 presents the unstandardized estimates and standard errors for effects of SES and demographic variables on wave 1 number of stressors. Wave 1 mental health ($b = -0.041$), SES ($b = -0.062$) and age ($b = -0.220$) were negatively related to the number of wave 1 stressors. Blacks ($b = 0.152$) and Native Americans ($b = 0.510$) reported more stressful life events than Whites, while Hispanics ($b = -0.159$) and Asians ($b = -0.460$) reported fewer stressful life events compared with Whites. Being married or cohabitating with a romantic partner ($b = -0.266$) was also associated with experiencing fewer wave 1 stressors. Gender was not significantly related to number of stressors.

Table 4 presents the direct and indirect effects of SES, demographic variables and number of wave 1 stressors on wave 2 mental health. The 'direct effect' column in Table 4 indicates that, after controlling for wave 1 mental health, demographics variables and stressors, SES was positively associated with mental health at wave 2 ($b = 0.647$). In addition, men ($b = 1.245$) and individuals who were married/cohabitating ($b = 0.611$) reported better wave 2 mental health. Blacks ($b = -0.609$) and Asians ($b = -0.408$) reported poorer mental health when compared with Whites, while there were no significant differences between Hispanics

Table 3 Unstandardized parameter estimates and standard errors for the prediction of wave 1 number of stressors

Variable	Estimate (b)	SE
Effects on wave 1 number of stressors		
SES	−0.062***	0.005
W1 mental health	−0.041***	0.001
Age (in decades) at wave 1	−0.220***	0.003
Male gender	−0.018	0.011
Race/ethnicity (reference = White)		
Black	0.152***	0.016
Hispanic	−0.159***	0.015
Native American	0.510***	0.070
Asian	−0.460***	0.018
Married/living with someone at wave 1	−0.266***	0.010
Intercept (wave 1 number of stressors)	4.971***	0.039

SE, standard error; SES, socioeconomic status.

***$P < 0.001$.

Table 4 Path decomposition of direct and stress-mediated effects on wave 2 mental health

Variable	Direct effect (b)	Indirect effect (b)	Total effect (b)
Wave 1 number of stressors	−0.278*** (0.022)	–	−0.278*** (0.022)
SES	0.647*** (0.027)	0.017*** (0.002)	0.665*** (0.027)
Wave 1 mental health	0.378*** (0.004)	0.011*** (0.001)	0.389*** (0.004)
Age (in decades) at wave 1	0.030 (0.020)	0.060*** (0.005)	0.009*** (0.002)
Male gender	1.245*** (0.063)	0.005 (0.003)	1.251*** (0.063)
Race/ethnicity (ref = White)			
Black	−0.609*** (0.068)	−0.042*** (0.006)	−0.652*** (0.069)
Hispanic	0.101 (0.074)	0.044*** (0.006)	0.145* (0.073)
Native American	0.347 (0.288)	−0.142*** (0.022)	0.205 (0.291)
Asian	−0.408*** (0.087)	0.128*** (0.011)	−0.280** (0.086)
Married/living with someone at Wave 1	0.611*** (0.063)	0.074*** (0.007)	0.685*** (0.061)

SES, socioeconomic status; Ref, reference; Cells contain estimated path coefficient (standard error). Direct effects correspond to the unique effect of the row variable on wave 2 mental health that was independent of wave 1 stress. Indirect effects correspond to the unique effect of the row variable on wave 2 mental health that was mediated by wave 1 stress. The intercept for the wave 2 mental health outcome was 30.92 (SE = 0.23, $P < 0.001$).
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

and Native Americans (compared with Whites) in terms of mental health. The number of stressors ($b = -0.278$) experienced at wave 1 was negatively associated with mental health at wave 2. In sum, the strongest positive direct effects on mental health include male gender, SES and marital status. Black and Asian race/ethnicity had negative impacts on mental health compared with White race/ethnicity.

Mediated effects on wave 2 mental health via wave 1 stressors

Table 4 also reports the 'indirect effects' of SES and demographic variables on wave 2 mental health through number of stressors reported at wave 1. With the exception of gender, the number of stressful life events at wave 1 uniquely mediated the effects of SES and demographic predictors on mental health at wave 2 (after controlling for wave 1 mental health). Both the direct and mediated effects (indirect $b = 0.017$; via number of wave 1 stressors) of SES on wave 2 mental health were positive, indicating that stressors partially mediated wave 1 SES effects on subsequent mental health. Stressors at wave 1 partially mediated the positive effect of being married/cohabiting (indirect $b = 0.074$) on wave 2 mental health. In addition, the negative relationship for Blacks ($b = -0.042$; compared with Whites) on wave 2 mental health was partially mediated by number of wave 1 stressors. The positive effects of age (indirect $b = 0.060$) and Hispanic (indirect $b = 0.044$; compared with White) ethnicity, as well as the negative effect of Native American (indirect $b = -0.142$; versus White) race/ethnicity, on wave 2 mental

health were fully mediated by stressors at wave 1; their direct effects on wave 2 mental health were non-significant. The direct and indirect effects of Asian race/ethnicity on mental health opposed one another (i.e. an inconsistent mediation pattern[41]). Specifically, Asians (indirect $b = 0.128$) reported fewer stressful events than Whites, which in turn predicted better mental health (i.e. a positive 'indirect' effect of being Asian on mental health). However, independently of stress (the 'direct' pathway), mental health scores were significantly lower among Asians compared with Whites.

Discussion

Main findings of this study

The current study is among the first to simultaneously examine the prospective impact of socioeconomic (i.e. education, income, insurance status) and demographic variables (i.e. marital status, age, gender, race/ethnicity) on mental health in a large representative sample. Results indicated that socioeconomic and demographic variables (i.e. gender, race/ethnicity, marital/partner status) directly and independently impacted changes in mental health in prospective analyses. In addition, results demonstrated that the number of stressful life events experienced in the past 12 months (assessed at baseline) mediated the relation between SES (measured at baseline) and mental health 3 years later. The number of life stressors also mediated the relation between demographic variables (i.e., age, race/ethnicity and marital/partner status) and mental health decline. Overall, study findings show that

exposure to stressors is a primary pathway through which SES and other demographic variables impact mental health. In addition, this research highlights the relative contributions of socioeconomic and demographic variables to disparities in mental health.

What is already known on this topic

Previous studies have indicated that individuals who are female,[3] non-White,[3] non-married,[4,5] lower SES[7−12] and younger[6] report worse mental health when compared with their counterparts. Likewise, lower SES (e.g.[13,14−16]), younger age (e.g.[42,43]) and those who are not married/cohabiting tend to report more stressful life events (e.g.[43,44]) than their counterparts. The positive relation between stress and increased risk for mental illness is also well documented.[22,23] Few studies have examined whether stressors mediate the relation between sociodemographic variables and mental health. However, one study found that greater exposure to stressors may mediate the relation between education and overall perceived heath[27] and another study found that the negative impact of stressor exposure on mental health is greater among the less educated.[21] To date, no study has examined the role of life stressors as a potential mediator of the relation between multiple demographic and socioeconomic variables and mental health.

What this study adds

The current study extends previous research by providing clarification regarding the unique impact of SES and other demographic variables on changes in mental health over time. In addition, results may indicate specific groups that are in need of and may be more likely to benefit from interventions aimed at eliminating stressors or attenuating the negative impact of stress on mental health.

These results highlight the important role of stressor exposure in the relation between socioeconomic and other demographic variables and mental health. Numerous studies have indicated that low-cost treatments (e.g. stress inoculation training, cognitive behavioral therapy) can enhance one's ability to cope with stressors.[45,46] Importantly, coping skills training has been used in individuals who are at greater risk for mental health declines.[46−48] Thus, screening for stressor exposure and providing relevant coping skills training may be a low cost and efficient way to curtail mental health decline in vulnerable populations.

Several important conclusions may be garnered from our results. First, Blacks and Native Americans reported more stressful life events than Whites, while Hispanics and Asians reported fewer stressful life events than Whites. It is of public health importance that we found such robust racial/ethnic differences in life stressor exposure, considering that SES, age, gender and marital status were controlled in our analyses. Plausibly, discrimination, acculturation, neighborhood characteristics and other relevant variables may have played a significant role in the observed racial/ethnic differences. Future research should examine the potential explanations of the observed racial/ethnic differences in exposure to life stressors.

A second conclusion is that, after controlling for relevant demographic variables, socioeconomically disadvantaged individuals experienced a greater decline in mental health over time relative to individuals of higher SES. These results are consistent with the work of Carter *et al.*[49] who showed that wealth was longitudinally related to measures of psychological distress. In addition, our results showed that men and individuals who were married (or cohabiting with a romantic partner) reported significantly improved mental health by wave 2 compared with women and individuals who were not married. Blacks and Asians reported a relative decline in mental health compared with Whites. There were no significant differences between Whites and Hispanics and Native Americans on wave 2 mental health scores. Results suggest that SES, gender, marital/partner status and race/ethnicity each affect mental health through independent pathways. However, contrary to previous work,[3,6] we found no direct effect of age on longitudinal mental health ratings. This finding may be due to the relatively short follow-up period of 3 years.

Our third, and perhaps most important conclusion, is that mediation analyses revealed that socioeconomically disadvantaged individuals experienced greater exposure to life stressors which led to a decline in mental health ratings by the 3-year follow-up. These findings expand upon the extant epidemiological literature that has identified direct relations between individual indicators of SES, stress and mental health.[50,51] Likewise, results indicated that a significant proportion of the relation between some demographic variables (i.e. married/cohabiting, older age) at wave 1 and mental health 3 years later depended on the number of stressors that the individual experienced at wave 1. Blacks and Native Americans were more likely to report poorer mental health at wave 2 than Whites, due to their greater exposure to stressors. Older individuals and Hispanics (when compared with Whites) reported better mental health at the 3-year follow-up and this was explained by their relatively low stressor exposure at wave 1. Interestingly, results also suggested that the impact of Asian ethnicity on mental health may depend on the pathway to mental health under consideration. Asians reported fewer life stressors than Whites, which in turn was linked to better

mental health at the 3-year follow-up (as a result of the negative general association between stress and mental health). However, in comparing Asians and Whites who reported similar numbers of stressors, Asians reported poorer mental health. Future studies should examine the potential causes for this disparity. Gender had a direct impact on mental health, but did not have an indirect effect on mental health through stressors. This finding may indicate that some mechanism, other than exposure to stressors, is responsible for the observed relation between gender and mental health. In addition, the mediating effect of stress did not account for the entire relation between SES (i.e., income, education, insurance status), demographic variables (i.e. marital/partner status, Black and Asian race/ethnicities) and mental health. Thus, future research should explore other mechanisms that may link these socioeconomic and demographic variables to mental health.

Limitations of this study

This study has a number of limitations. First, the current study was a secondary analysis of an existing database, thus, analyses were limited to the measures that were collected in the NESARC. Secondly, results may have been skewed due to selection bias for those re-interviewed at wave 2. Thirdly, the primary outcome variable used in this study was a measure of general mental health; thus, the relationships described in this study may not generalize to specific mental health problems (e.g. substance use disorders, major depression). A fourth limitation is that measures of reserve capacity (e.g. social support, coping or other resources; see ref. 13) were not available. Future studies should include the measures of reserve capacity as they may provide important information about variables that may attenuate the effects of stress on mental health.

Funding

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