Exploring socioeconomic disparities in posttraumatic stress in an urban population

by

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ABSTRACT

Although studies have shown that persons with low socioeconomic position (SEP) are more likely to develop posttraumatic stress disorder (PTSD) than those with high SEP, there has been no systematic attempt to explain this observation. We used data from the Detroit Neighborhood Health Study (DNHS), a longitudinal population-based study of Detroit residents, to explore the relation between SEP and posttraumatic stress (PTS). Our first goal was to assess whether low SEP persons are more likely to develop PTSD than those with high SEP because they are more likely to experience a traumatic event or because they are more vulnerable to psychopathology after the traumatic experience. We then examined additional SEP differences in PTS symptomatology that cannot be evaluated using categorical measures of PTS. Finally, given that social support is one of the strongest predictor of PTS and is thought to buffer against the psychological consequences of stressful events, we investigated the potential modifying role of social support in the relation between SEP and PTS. We found that although low SEP persons were more likely to have experienced assaultive violence than those with high SEP, this did not explain their greater risk of PTSD. Instead, it was the greater burden of concomitant stressful life events among low SEP persons that explained their vulnerability to PTS. An examination of SEP differences in PTS as a continuous variable yielded additional information about PTS symptomatology. We found that differences in

PTS score distribution between low and high SEP groups were not only more pronounced in the highest range of scores but also in the middle range of scores, which may be overlooked in categorical conceptualizations of PTS but may also be accompanied by substantial functional impairment. Though not conclusive, there was some evidence that social support reduced socioeconomic vulnerability to PTS. Differences in PTS severity between low and high SEP persons were smaller among those with high social support than among those with low social support. Our findings may inform interventions to reduce socioeconomic disparities in mental health and improve well-being among the most disadvantaged.

CHAPTER 1

Introduction

Posttraumatic stress disorder (PTSD) is a psychiatric illness that can follow exposure to a traumatic event. Although psychological distress following traumatic event experience has been observed throughout history, it was not until the 20th century that researchers began to study it systematically and not until 1980 that the American Psychiatric Association (APA) first included PTSD in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III).[1] Early studies identified psychological distress among combat veterans and concentration camp survivors, and, later, among female rape victims.[1] Several studies of World War I combat veterans observed symptoms of mental disorder, which were referred to as "war or combat neurosis" or "shell shock".[2-3] The first major study of the psychological consequences of combat was published in 1941 by Abram Kardiner and described what the author called "physioneurosis" in World War II survivors.[4] A 1974 study of women who had experienced sexual assault observed a set of symptoms of flashbacks and hyper-alertness, which was labeled "rape trauma syndrome".[5] Since PTSD's debut in the DSM-III, studies have mainly focused on Vietnam veterans and victims of specific types of traumatic events such as natural disasters, motor vehicle accidents, and sexual assault.[6-7] However, a few studies have assessed PTSD in the general U.S. population. The Epidemiologic Catchment Area

(ECA) studies in St. Louis and North Carolina in the early 1980swere the first to assess

PTSD in the general population, followed by two large population-based studies, the

National Comorbidity Survey (NCS) in the early 1990s and the National Comorbidity

Survey Replication (NCS-R) ten years later. These community studies have provided

prevalence estimates of PTSD in the United States and identified key risk factors for

development of the disorder.

The fourth and most current edition of the DSM (DSM-IV) describes six criteria

that can be used in the diagnosis of PTSD. First and foremost is exposure to an event that

posed a serious threat and elicited feelings of fear, horror, or helplessness (Criterion A).

After the event, the individual must experience three types of symptoms to qualify as

having PTSD: re-experiencing the traumatic event, for example through repeated,

disturbing memories, dreams, or flashbacks (Criterion B); emotional numbing and

avoidance of places, thoughts, or situations that remind the individual of the event

(Criterion C); and symptoms of hyperarousal such as irritability, trouble sleeping or

concentrating, and feeling watchful or on guard (Criterion D). Diagnosis of PTSD

requires that these symptoms be present for a least one month (Criterion E) and cause

significant distress or impairment in social, occupational, or other functioning (Criterion

F).[8]

PTSD is fairly common, affecting approximately 1 in 12 adults at some time in

their life.[1] Prevalence estimates vary by study. Results from the ECA studies found that

less than 1% of individuals suffered from PTSD in their lifetime,[1] while later community

studies found PTSD to be much more common in the general, non-clinical population

than previously thought.[9-10] Lifetime prevalence of PTSD was reported as 7.8%[10] and

6.8%,[1] in the NCS and NCS-R, respectively. Resnick et al[11] reported lifetime PTSD prevalence of 12.3% in a representative sample of women. Breslau et al[12] found that 9.2% of Detroit residents who had experienced a least one traumatic event in their lifetime developed PTSD. Studies report past year PTSD prevalence at 3.9%[13] and past month PTSD prevalence at 2.7% among women and 1.2% among men.[9] Differences in prevalence estimates between studies may be due to changes in DSM criteria (particularly regarding qualifying traumatic events), differences in survey administration and sample characteristics, and whether PTSD symptoms are asked in relation to an event identified as the "worst" or to a randomly-chosen event.[6-7, 10, 14]

Some studies have identified socioeconomic position (SEP) as a risk factor for PTSD, consistent with substantial evidence that links SEP to other mental disorders.[15] Although a greater burden of PTSD has been noted among persons with low SEP compared to high SEP,[10, 12, 16] this association has not been explored further. Those with low SEP might be more likely to develop PTSD because they have greater exposure to traumatic events and/or because they are more vulnerable to developing psychopathology after a traumatic event. Studies have noted that low SEP persons are more likely than those with high SEP to have experienced events related to assaultive violence,[12] which carry with them a higher risk of PTSD than do other types of traumatic events.[10, 12, 17] This greater exposure to assault may explain the disproportionate burden of PTSD among low SEP persons. On the other hand, those with low SEP may be more likely to develop PTSD than high SEP persons because they are more psychologically vulnerable to traumatic event experience. This vulnerability may reflect greater exposure to additional stressful life events or stressors such as financial difficulties and unemployment and lack

of adequate social support, which have been reported more often among low SEP persons compared to those with high SEP.[18-19]

This dissertation addresses these issues using data from the Detroit Neighborhood Health Study (DNHS), a prospective study of 1547 randomly-selected adult Detroit city residents. Aim 1 will examine the interrelation between SEP, traumatic event experience, stressful life events, and PTSD. The goal is to determine whether low SEP individuals have a greater risk of developing PTSD than high SEP individuals because they have greater experience with traumatic events (in particular, those events related to assaultive violence) or because they are more vulnerable to the consequences of traumatic events due to greater exposure to acute and chronic life stressors. Aim 2 will evaluate the association between SEP and posttraumatic stress (PTS) severity to ascertain whether low SEP persons have different PTS symptomatology from those with high SEP. Finally, Aim 3 will investigate the role of social support in the relation between SEP and PTS, specifically whether social support modifies the association between SEP and PTS.

In this chapter, we first outline the specific aims and hypotheses of this dissertation. We then review the literature on socioeconomic disparities in psychopathology and the mechanisms through which SEP might influence PTSD, identifying gaps that this work hopes to fill. Finally, we discuss the public health significance of this study, with a focus on how we might use our findings to further our knowledge of the socioeconomic disparities in PTS and inform interventions that might mitigate the consequences of traumatic events among those who suffer the most after a traumatic event experience.

1.1 Specific aims and hypotheses

Aim 1. To determine (a) the associations between household income and educational attainment (as measures of SEP) and traumatic event exposure, (b) the association between SEP and risk of PTSD, controlling for other individual-level characteristics (e.g. gender, race/ethnicity, marital status, history of mental illness) among residents of Detroit who have experienced a traumatic event, and (c) the role of stressful life events as a mediator of the relation between SEP and PTSD.

Hypothesis: Low-income and education persons have greater exposure to traumatic events, specifically those events related to assaultive violence. However, low SEP persons who have experienced a traumatic event are also more vulnerable to developing PTSD than high SEP persons who have experienced a traumatic event. This socioeconomic disparity is explained in large part by exposure to concomitant stressful life events.

Aim 2. To determine whether PTS symptoms are more severe (measured using a PTS score) among persons with low SEP compared to persons with high SEP, controlling for demographic variables, history of mental illness, assault experience, life stressors, and social support.

Hypothesis: Persons with low income and education will report greater symptom severity than persons with high income and education, even when controlling for experience with assault and other covariates.

Aim 3. To determine whether level of social support modifies the association SEP and PTS. *Hypothesis: Among those who report low social support, low SEP individuals will have greater PTS than those with high SEP. However, this socioeconomic disparity will be less pronounced among those respondents who report high levels of social support.*

1.2 Background

Socioeconomic position and mental illness: evidence and mechanisms

The association between SEP and mental illness is one of the most well-documented relationships in psychiatric epidemiology.[20] An early study of SEP and psychopathology in the general population, the Midtown Manhattan Study of the early 1950s, documented greater psychological dysfunction among persons in lower social classes compared to those in higher social classes.[21] Hollingshead and Redlich,[22] around the same time, reported greater rates of psychiatric illness among lower-class persons in a New Haven, Connecticut, treatment population. These two hallmark studies have been supported, over the years, by additional evidence of an inverse relation between a broad range of SEP measures and mental disorders[23] such as depression,[24] schizophrenia, and anxiety.[25] More recent large population-based studies have also found a higher prevalence of psychopathology among persons with lower SEP compared to those with higher SEP.[25] In several studies that use Epidemiologic Catchment Area (ECA) data, measures of SEP such as income, education, and occupation (and a composite measure of the three) were inversely associated with psychiatric illness, namely alcohol abuse, depression, and schizophrenia.[15, 26] Low income and low education were also associated with greater psychopathology in the National Comorbidity Survey (NCS).[25]

Extensive inquiry in the mechanisms at work in the relation between SEP and mental illness have yielded two dominant perspectives on socioeconomic disparities in mental health.[19] The first perspective posits that low SEP persons suffer disproportionately from mental illness because they are at greater risk of experiencing negative situations that bring about mental illness. The second perspective argues that socioeconomic differences in psychopathology result from greater psychological vulnerability to negative situations. These "stress" and "vulnerability" perspectives comprise the "life stress hypothesis," which has frequently been used to explain socioeconomic differences in health. It posits that individuals with lower social status have poorer health outcomes than those with higher social status because they are exposed to more life stressors and because they are more vulnerable to the negative effects of these stressors due to inadequate resources with which to cope.[19]

Until the early 1970s, the "stress" component of the life stress hypothesis was the leading explanation for differential burden of psychopathology between low and high SEP persons,[20] predicated on findings that chronic stress or life stressors such as getting a divorce or experiencing long-term unemployment and exposure to poor quality living environments were more prevalent among low SEP individuals than they were among those with high SEP[19, 27-29] and were associated with higher levels of psychological distress.[19, 30-31] Later studies uncovered evidence that low SEP persons were also more vulnerable to psychological distress in the face of stressful life events,[32] reporting that this vulnerability explained in large part the association between SEP and mental disorders such as depression.[33] Indeed, persons with low SEP have reported lower utilization of mental health services and social support from family and friends than those

with high SEP,[18, 34] resources that can help buffer the psychological consequences of negative situations or experiences.[35-36]

Although less consistent, there is evidence of a similar relationship between SEP and PTSD. Although the ECA and NCS studies found only significant negative bivariable associations between SEP and PTSD,[7, 12] more recent work has reported evidence of socioeconomic disparities in PTSD. For example, persons with low incomes were shown to have a significantly higher risk of PTSD than those with higher incomes in a longitudinal study of determinants of PTSD in a representative sample of New York City residents.[16] Another study of New Yorkers that focused on PTSD after the September 11, 2001 attacks reported that persons with low income and low educational attainment had significantly higher odds of developing PTSD than those with higher income and educational attainment.[37] Hobfoll and colleagues also found that low education was a significant predictor of PTSD among Arabs exposed to recurring terrorist acts in Israel.[38]

Although evidence points to a relation between SEP and PTSD, there is a paucity of research into how SEP might influence PTSD. In exploring the relation between SEP and PTSD, we might use a framework similar to what has been used to explain SEP differences in other psychiatric disorders, described above. Individuals with low SEP may be at greater risk of PTSD than those with high SEP because they are more likely to experience negative situations that lead to the disorder (in this case, exposure to a traumatic event). Alternatively, low SEP individuals may be more likely to develop PTSD because they are more vulnerable to posttraumatic stress after the traumatic event experience. Studies have found that having low income or education is associated with

greater likelihood of experiencing events related to assaultive violence,[12] perhaps due to living in poorer and/or more dangerous environments where there are higher rates of violent crime.[39] Assault has been linked to greater risk of PTSD than other types of traumatic events.[10, 12, 17, 40] Low SEP persons may also participate in more risky behavior such as illicit drug use than those with high SEP, putting them at greater risk of traumatic event exposure[41] and subsequently PTSD. On the other hand, there is evidence that low SEP persons might be more vulnerable to developing PTSD than those with high SEP because they lack the psychosocial resources of high SEP persons that might mitigate the psychological consequences of the traumatic event experience.[18, 35-36] Low SEP persons may be more likely to develop PTSD after a traumatic event because they experience a greater burden of acute and chronic life stressors,[19] which can make them more psychologically vulnerable. Chapter 2 aims to further our knowledge of this socioeconomic vulnerability to PTSD, informed by an extensive literature on SEP and mental health. Specifically, we will assess whether low SEP persons are more likely to develop PTSD than high SEP persons because they are more likely to experience a traumatic event or because they are more vulnerable to developing psychopathology from the event. We will also evaluate the role of stressful life events in the SEP-PTSD relationship.

Characterizing posttraumatic stress

There has been considerable debate over how to best characterize symptoms of posttraumatic stress (PTS). Some view PTS symptoms as an abnormal or maladaptive reaction to stress that qualifies as a distinct psychological disorder with a categorical

structure.[42] This argument is supported by neurobiological evidence that the biology of

PTSD does not mirror the biology of stress, as once thought. That the biological

processes associated with PTSD are not present among persons who have experienced a

stressful or traumatic event and did not develop PTSD also suggests that PTSD is a

distinct disorder.[43-44] Others argue, however, that these clusters of symptoms do not

comprise a disorder, that they simply lay at the "extreme end of a normal distribution of

stress reactions".[42] They support characterizing PTS as a dimensional construct,

measured on a continuous scale. They posit that determining the presence of a disorder

using a predetermined cutoff is arbitrary[43] and note that although few people actually

meet criteria for PTSD, many have partial or sub-threshold PTSD,[42, 45-46] which can also

result in substantial impairment in functioning.[9, 42, 47] Studies that used taxometric

methods to test the latent structure of PTS symptoms have found that PTS is better

characterized as a dimensional construct rather than a categorical one,[42-43] which supports

this view.

Since PTSD's debut in the DSM-III, much of the research into socioeconomic

disparities in PTS has focused on the influence of SEP on risk of developing the disorder,

dividing study subjects into a group of cases and a group of non-cases. In these studies,

cases of PTSD were identified using instruments designed to assess DSM symptoms of

re-experiencing (criterion B), avoidance and emotional numbing (criterion C), and

hyperarousal (criterion D).[16, 37-38] Following DSM guidelines, cases generally met one or

more criterion B symptoms, three or more criterion C symptoms, and two or more

criterion D symptoms.[8] Studies of SEP and PTS that characterize PTS as a continuous

variable have also yielded evidence of socioeconomic differences in PTS severity. For

example, a study of female assault victims found that educational attainment was inversely related to PTS severity. Another study of Bosnian women exposed to war reported that level of education was the strongest predictor of PTS severity.[48] To our knowledge, however, there have been no population-based studies of SEP and PTS severity. Therefore, in Chapter 3 we assess the relation between SEP and PTS severity, with the aim of extracting additional information on socioeconomic disparities in PTS symptomatology.

The buffering role of social support

Among all of the factors that have been linked to greater risk of PTSD, lack of social support has emerged as one of the strongest predictors of PTSD across a wide range of studies,[5, 49] influencing development, severity, and course of symptoms.[50] Social support is thought to influence symptoms of PTSD after exposure to a potentially traumatic event through its effect on how the individual interprets his experience. For example, if the individual feels that others support how he reacted during the event, he may be more likely to consider his reaction appropriate and less likely to avoid his thoughts and feelings about the event, which may benefit him psychologically. Support from others may also have an effect on how the individual feels after the event (e.g. fearful, guilty, or ashamed) and how he copes with what he has experienced.[50-51]

Studies of social support generally define it as the emotional and instrumental help individuals receive from others, such as being provided with assistance (e.g. with loans, caretaking, or transportation) or being made to feel worthwhile and cared for. Social support is often studied from the structural and functional perspectives.[18] The

structural perspective considers social support in terms of the structure of a person's relationships and social networks, for example using the number of close relationships a person has or marital status to measure social support. The functional perspective focuses on how well relationships with others function, for example if they make the individual feel loved or worthwhile or if financial assistance is available if needed.[36] The main effect hypothesis and indirect effect, or buffer, hypothesis describe two ways in which social support can influence health. The main effect hypothesis argues that social support influences health directly regardless of exposure to stressful events. The buffer hypothesis argues that social support only protects health in the face of stressors, functioning to mitigate the psychological consequences of the stressor. Although these hypotheses are both supported in the literature,[35-36, 52] the latter is particularly relevant to the study of social support and PTS, which is linked by definition to a specific stressful or traumatic event.[8]

It has also been suggested that social support may play a role in the relation between SEP and psychopathology. The "vulnerability" component of the life stress hypothesis, described previously, posits that those with low SEP may be more likely to experience negative psychological consequences of life stressors because they lack the coping resources of higher SEP individuals, such as adequate social support.[19, 53-54] While low SEP persons in general may report lower levels of social support than those with high SEP,[18, 34] not all low SEP persons lack adequate social support. It is possible that low SEP individuals who have the psychosocial resources they need to cope with traumatic event exposure may not suffer disproportionately from PTS compared to high SEP persons with adequate social support. The potential influence of social support on

socioeconomic vulnerability to PTS has not been addressed in the literature. Therefore, in Chapter 4 we investigate the modifying role of both functional and structural social support on socioeconomic disparities in PTS.

1.3 Public health significance

This dissertation hopes to contribute to the field of public health in three ways. The first goal is to further our understanding of PTSD development. This research will examine disparities in PTSD, specifically differences in PTSD risk between low and high SEP individuals, and attempt to explain what factors drive these disparities. Understanding the relation between SEP and PTSD will guide interventions; if SEP influences PTSD only through traumatic event exposure, then interventions should focus on preventing traumatic events, for example by reducing neighborhood crime or addressing substance abuse. On the other hand, if low SEP individuals are more vulnerable to the consequences of traumatic event exposure, then we should direct our energies toward post-traumatic-event interventions such as psychological first aid and efforts to reduce chronic life stress to prevent PTSD from developing. The second goal is to identify individuals who, in general, suffer from more severe PTS after a traumatic event experience than others. If we are able to identify those individuals who are at higher risk of PTSD and who may suffer from more severe symptoms after traumatic event exposure, public health and medical practitioners know to target members of this particular population after an event occurs. Understanding differences in PTS symptomatology can also help practioners determine the most effective treatment. Third, this study investigates the role of social support as a protective factor against

socioeconomic vulnerability to PTS. This information can also inform interventions –

such as forming and involving traumatic event victims in social support groups in

particularly poor areas – that may prevent the development of PTSD or help alleviate the

disabling symptoms that accompany PTS among the most disadvantaged persons.

CHAPTER 2

Socioeconomic position and risk of posttraumatic stress disorder

Abstract

Although it has been shown that individuals with low socioeconomic position (SEP) are more likely to report posttraumatic stress disorder (PTSD) after a traumatic event than high SEP individuals, there has been no systematic attempt to explain this observation. We used data from the Detroit Neighborhood Health Study, a population-based sample of residents of Detroit, to assess two potential alternate explanations for this observation. We assessed whether low SEP individuals are more likely to develop PTSD than high SEP individuals because (a) they have greater exposure to traumatic events or (b) because they are more vulnerable to developing psychopathology after a traumatic event. We used household income, educational attainment, and a combination of the two as measures of SEP. We did not find a significant difference in exposure to any traumatic event between low and high SEP individuals; however, those with low income were significantly more likely to have experienced assaultive violence than those with high income (10.2% vs. 2.3%, $p<0.05$). In logistic regression analysis, those with both low income and low education were significantly more likely to develop PTSD after exposure to a traumatic event than those with both high income and high education after adjusting for demographic variables, history of mental illness, and experience with assaultive violence (odds ratio (OR) = 3.3, 95% confidence interval (CI): 1.0-11.1), but

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this relationship lost significance when burden of stressful life experiences, including unemployment and financial difficulties, was added to the model. Greater likelihood of PTSD among persons with low SEP was explained by ongoing concomitant stressful life events. These findings suggest that SEP differences in PTSD likely reflect the greater burden of life stressors that in turn increase the likelihood of developing psychopathology after a traumatic event. Interventions that alleviate stressors may play a key role in preventing the onset of PTSD after traumatic event exposure.

2.1 Introduction

It is well documented that persons with lower SEP are more likely to have mental illness than those with higher SEP.[25, 28] Early studies such as the Midtown Manhattan Study reported differences in the prevalence of mental illness between persons in the lowest and highest social classes.[21] Over the years, the inverse relation between SEP and risk of mental illness has been reported across a broad range of mental disorders.[23] Large population-based studies such as the Epidemiologic Catchment Area (ECA) studies and the National Comorbidity Survey (NCS) have found higher prevalence of psychopathology among individuals with lower SEP compared to those with higher SEP, using measures such as education and household income to operationalize SEP.[25]

We can approach the question of why persons with low SEP might suffer disproportionately from psychopathology from two perspectives. Low SEP individuals may have (1) a greater risk of exposure to negative situations that lead to mental illness, or they may have (2) a greater risk of developing mental illness after exposure to these negative experiences. For instance, chronic or acute life stressful events, or stressors,

such as getting a divorce or experiencing long-term unemployment and exposure to poor quality living environments are more prevalent among low SEP individuals than they are among those with high SEP[19, 27-29] and have been linked to higher levels of psychological distress.[19, 30-31] On the other hand, factors that can help buffer the psychological consequences of negative situations or experiences – such as utilization of mental health services and social support from family and friends[35-36] – that are less commonly reported among individuals with low SEP[18] may play a role in the greater burden of mental disorder among low SEP individuals.

There is evidence that an inverse relationship may also exist between SEP and PTSD, although this association has not been found as consistently as it has been for other types of psychopathology. Large community studies found significant negative bivariable associations between measures of SEP such as income and education and PTSD, but these associations did not remain significant after adjusting for other individual-level factors.[7, 12] More recently, in a longitudinal population-based study of determinants of PTSD in a New York City cohort, individuals with low incomes were shown to have a significantly higher risk of PTSD than persons with higher incomes.[16] A study that focused on PTSD after the September 11, 2001 attacks reported that individuals with low income and low educational attainment had significantly higher odds of developing PTSD than those with higher income and educational attainment,[37] and research that focused on Jews and Arabs who were exposed to recurring terrorist acts in Israel found that low education was a significant predictor of probable PTSD among Arabs.[38]

While measures of SEP have been evaluated as predictors of PTSD,[49] the literature remains somewhat silent on why SEP might influence the risk of PTSD in particular. The reasons for SEP differences in risk of PTSD may be understood using the framework suggested above. Individuals with low SEP may be at greater risk of PTSD than those with high SEP because they are more likely to experience situations that lead to the disorder (in this case, the experience of a traumatic event, the essential precursor to PTSD), or they may be more likely to experience certain types of traumatic events that carry with them relatively high risk of developing PTSD. Studies have found that lifetime prevalence of exposure to events related to assaultive violence is higher among those with less than a high school education compared to college graduates and among those with low income compared to those with high income.[12] Persons with low SEP may be more likely to experience assaultive violence than those with high SEP due to living in poorer and/or more dangerous environments where there is greater exposure to violent crime,[39] events that have been linked to greater PTSD burden compared to other types of events.[10, 12, 17, 55] Low SEP persons may also participate in more risky behavior such as illicit drug use than those with high SEP, putting them at greater risk of traumatic event exposure[41] and, subsequently, PTSD.

On the other hand, low SEP individuals may be more likely to develop PTSD because they are more psychologically vulnerable after the traumatic event experience. Social support has been reported as one of the strongest and most consistent predictors of PTSD[5, 49] and is thought to function as a buffer against PTSD in the face of traumatic event experience.[35-36] There is evidence that low SEP individuals have lower levels of social support than high SEP individuals,[18] which may explain their higher risk of PTSD.

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The "life stress hypothesis," which has frequently been used to explain socioeconomic differences in health, posits that individuals with lower status have poorer health outcomes than those with higher status because they are exposed to a greater number of stressful events such as long-term unemployment and financial difficulty and because they are more vulnerable to the negative effects of these stressful events because they have fewer resources with which to cope.[19] It is possible that burden of stressful life events plays a similar role in socioeconomic disparities in the development of PTSD.

This study aims to explore the relationship between SEP and PTSD, using income and education as measures of SEP and taking advantage of longitudinal data to establish temporality. Specifically we will focus on the roles of traumatic event experience, particularly related to assaultive violence, and stressful life events in the association between SEP and PTSD to further our understanding of socioeconomic vulnerabilities in PTSD risk.

2.2 Methods

Study population

The Detroit Neighborhood Health Study (DNHS) is a longitudinal population-based study of Detroit residents. At baseline 1,547 adult participants (age 18 years or older) were selected from the Detroit population to participate in a telephone survey by choosing a probability sample of households within the city limits of Detroit and then randomly selecting one adult from each household. We utilized a dual-frame probability sample design to draw a sample of residential addresses, obtaining telephone numbers from two sources: (1) a list-assisted sampling random-digit-dial (RDD) frame, covering

Detroit households that are not residential directory-listed numbers (the unlisted number

frame) and (2) U.S. Postal Service Delivery Sequence File (DSF), which consists of the

entire Detroit population and includes non-telephone and cellular phone-only households.

We matched the telephone numbers in these two databases to identify the sample

addresses that have at least one listed landline telephone number and then contacted these

people by telephone to participate in the survey. We invited the other part of the sample

with no listed landline, no telephone, or cell phone only to participate in the survey

through a postal mail effort. The overall cooperation rate (response rate among eligible

participants) was 53.0%, and the overall response rate was 33.1%.

Baseline (Wave 1) surveys were administered from September 2008 to April

2009, during which participants answered questions from a structured 40-minute

telephone assessment. A follow-up survey was administered to 1,054 Wave 1

respondents (68.1%) who could be located and agreed to continue participation in the

study between September 2009 and May 2010. Interviewers obtained consent from the

participant at the start of each interview and offered a $25 incentive for participation in

each wave.

Key variables

Informed by a large body of literature in the area,[25, 56-57] SEP, measured at

baseline, was assessed using past year household income and lifetime educational

attainment. Participants were asked to choose one of seven income categories that best

described their total household income from the past year: (1) Less than $10,000, (2)

$10,000-$15,000, (3) $15,000-$25,000, (4) $25,000-$35,000, (5) $35,000-$50,000, (6)

$50,000-$75,000, and (5) $75,000 or more. We dichotomized this variable to create a low-income group (less than or equal to $35,000) and a high-income group (more than $35,000) based on the most recent estimate of median household income in Detroit for a household of three (which was the median household size in the DNHS sample) from the U.S. Census, $34,316.[58] Participants were asked to choose the highest level of education or schooling they had completed from eight categories: (1) never attended school, (2) kindergarten to 8th grade, (3) some high school (9th to 11th grade), (4) high school equivalency (GED), (5) high school graduate (12th grade), (6) some college or technical training, (7) college graduate (4-year), and (8) graduate work. We also divided educational attainment into two groups: (1) low education: high school graduate/GED or less and (2) high education: some college or technical training, college graduate, and/or graduate work. This categorization allows us to specifically evaluate the returns to higher education. In order to assess the combined effect of income and education on traumatic event experience and PTSD, we created a combined SEP variable that divides participants into four groups: (1) low income and low education; (2) high income and low education; (3) low income and high education; and (4) high income and high education based on the dichotomization of income and education described above.

In Wave 2 we asked participants about exposure to traumatic events since baseline using a list of 19 potentially traumatic events from previous work by Breslau et al,[12] and an additional question that allows the participant to briefly describe any other extraordinarily stressful situation or event. These traumatic events may be classified into four categories: assaultive violence, other injury or shocking experience, learning about traumatic events from others, and the sudden, unexpected death of a close friend or

relative; this last category is devoted entirely to one type of traumatic event because it is a particularly common lifetime event.[12] We assessed symptoms of PTSD using the PTSD Checklist (PCL-C), a 17-item self-report measure that evaluates DSM-IV PTSD Criteria B, C, and D (symptoms of re-experiencing, avoidance and emotional numbing, and hyperarousal, respectively).[8] Additional questions addressed the remaining three DSM-IV criteria: Criterion A, having feelings of fear, horror, or helplessness at the time of the traumatic event; Criterion E, duration of symptoms for at least one month; and Criterion F, significant distress or impairment as a result of symptoms. We asked those participants who had experienced at least one traumatic event on the list since baseline to choose which event they considered to be the worst (if they experienced more than one event; otherwise, PTSD symptom questions were asked in relation to the one event experienced). Participants rated each of the 17 PTSD symptoms on a scale indicating the degree to which they had been bothered by the symptom as a result of the event from 1 (not at all) to 5 (extremely). Those who met all six DSM-IV criteria were considered PTSD cases; if they had no history of PTSD at baseline, these cases were considered "incident". We conducted clinical in-person interviews among a random subsample of 51 participants, using the Clinician-Administered PTSD Scale (CAPS).[59] Participants received $50 for participation in this part of the study. Analysis of data from the in-person interviews showed that the PTSD instrument used during the telephone interviews had excellent internal consistency and high concordance with the CAPS.[60]

Past year assault experience was exposure to any of the seven assault-related events assessed in this study (e.g. sexual assault, being stabbed or shot, being badly beaten). Exposure to stressful events since baseline was measured using a list of 11 life

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stressors such as divorce, financial and legal problems, unemployment, and difficulty

obtaining health care. Total number of stressful events experienced (out of 11) was used

to measure burden of stressful events. This list was a modified version of one used in

other studies of stress, health, and health behaviors.[61-62] A list of the traumatic events and

stressors assessed in this study can be found in Table 2. Data for all other covariates

come from the baseline wave. These variables were age, race, sex, marital status, and

history of mental illness. We defined history of mental illness as having met criteria for

lifetime PTSD or depression at baseline or having answered "yes" to a question about

having ever experienced a mental illness.

Weighting

Each survey participant was assigned a weight at baseline, accounting for

differences in how contact information was obtained and the probability of being selected

from households of different sizes and number of telephone lines. We also incorporated

post-stratification weights to account for baseline differences in sample demographics

compared to the Detroit population, using data from the 2005-2007 American

Community Survey (ACS) Public Use Microdata Sample (PUMS) and the 2007 National

Health Interview Survey as referent. We also developed inverse probability weights to

account for attrition between waves. To determine these weights, we first assessed

differences in various baseline characteristics between Wave 2 responders and non-

responders. We then modeled Wave 2 non-response as a function of variables that

seemed to predict non-response – gender, age, race, income, educational attainment,

marital status, employment status, lifetime traumatic event experience, lifetime history of

mental illness, and social support – using logistic regression. This regression analysis

yielded predicted probabilities whose inverse values were incorporated into the overall

weights.

Statistical analysis

We conducted univariable analysis of various baseline demographic

characteristics, traumatic event experience that occurred between Waves 1 and 2, and

incident PTSD. We then evaluated bivariable associations between traumatic event

experience and PTSD and each SEP measure: 1) income, (2) education, and (3)

combination of income and education. Since the correlation between income and

education was high (r=0.5), separate multivariable models were run for non-combined

income and education. We first ran bivariable logistic regressions modeling PTSD (case

vs. non-case) as a function of each SEP measure separately, followed by multivariable

logistic regressions adjusted only for basic demographics and history of mental illness. A

second round of multivariable models also adjusted for past year assault experience.

Final multivariable models additionally adjusted for number of distinct past year

stressors. All regression analysis was restricted to those who had experienced a

potentially traumatic event between waves because, by definition, a person cannot

develop PTSD without having experienced this type of event.[8]

All analyses used SUDAAN Version 10[63] to account for complex survey design

and weighting. Most variables used in these analyses had very few missing observations

(under 2.5% missing); however, 12.2% of the sample did not report household income,

one of our predictors of interest. To avoid potential bias in our effect estimates, we

imputed missing income values using multiple imputation techniques for logistic regression.[64] We imputed income based on age, gender, educational attainment, race, marital status, and employment status. We then considered three final versions of regression models: (1) restricting analyses to only those who provided income information, (2) using a "missing" dummy variable for those participants who did not report income, and (3) using imputed income values. Results did not differ between methods. We report here the analyses that used imputed values.

2.3 Results

Table 1 shows the distribution of key demographic characteristics in our sample collected at baseline. The majority of our sample was between 25 and 64 years of age (67.2%), and approximately one-half of respondents were female (52.8%). Almost all respondents reported their race as non-white (92.1%; 86.9% identified as black or African American). The majority had low household income (62.9%) and low educational attainment (58.2%), defined in this study as making $35,000 or less and graduating from high school or less, respectively. Almost three-fourths of the population was unmarried (71.2%). Comparison with data from the American Community Survey of Detroit found no significant differences in the distribution of any of these variables.

In Table 2 we report the prevalence of traumatic event and stressor experience between Waves 1 and 2. More than half of the respondents (57.4%) experienced at least one traumatic event during this period; 7.3% experienced events related to assaultive violence. More than two-thirds of respondents (68.8%) experienced at least one stressor of the 11 assessed. There were no significant differences in experiencing any traumatic

event between SEP groups; however, the prevalence of assaultive violence experience

was significantly higher for low income persons compared to high income persons

(10.2% vs. 2.3%, p<0.01) and low income and high education persons compared to high

income and high education individuals (11.4% vs. 1.7%, p<0.01). Those with low

income also had a significantly higher prevalence of exposure to any of the 11 stressors

(72.3% vs. 62.7%, p=0.03) and to many of the distinct stressor types such as having

trouble getting access to adequate healthcare (25.6% vs. 16.0%, p=0.05) than those with

high income. Those with low education compared to high education had significantly

higher prevalence of experiencing distinct stressors such as having a parent with drug or

alcohol problems (11.8% vs. 3.1%, p<0.01) and losing a job (24.2% vs. 10.1%, p<0.01).

There were also differences in experiencing stressors between income-education

combination groups, mostly in the two groups with low income compared to the

reference group (high income and high education). Those with high income and low

education, however, had a significantly greater prevalence of lob loss between Waves 1

and 2 than those with high income and high education (27.1% vs. 10.2%, p<0.01).

Among those who experienced a traumatic event between waves, incidence of

PTSD was 7.0% (not shown in tables). Risk of PTSD was higher among low income

compared to high income individuals (9.5% vs. 3.1%; p=0.06) and among low education

compared to high education individuals (9.0% vs. 4.5%; p=0.24) but not at the 0.05

significance level. The risk was the highest among those with low income and low

education (9.8%) and lowest among those with high income and high education (2.4%)

(p=0.02; not shown in tables). Table 3 reports results from regression analysis. In

bivariable logistic regression (Model 1), low income persons had significantly greater

odds of PTSD, conditional on having experienced a traumatic event, than did high income persons (OR=3.3, 95% CI: 1.0-11.6; marginal significance, p=0.06). Respondents with low income and low education had more than four times greater odds of developing PTSD than those with high income and high education (OR=4.4, 95% CI: 1.2-15.9); those with low income and high education were also more likely to develop PTSD than those with high income and high education, though not at the 0.05 significance level (OR=3.8, 95% CI: 0.8-18.5). In models adjusted for basic demographics and history of any mental illness (Model 2), only those with low income and low education still had significantly higher odds of developing PTSD than high income and high education individuals (OR=3.7, 95% CI: 1.2-11.8). When we adjusted for past year assault experience (Model 3), this association remained significant and strong (OR=3.3, 95% CI; 1.0-11.1). However, it lost significance and the odds ratio dropped much closer to the null value when we also adjusted for number of past year stressors (Model 4; OR=1.3, 95% CI: 0.4-4.6).

2.4 Discussion

Using a population-based sample of residents of Detroit we found that persons with both low income and low education were more likely than those with both high income and high education to develop PTSD after a traumatic event experience. We explored explanations for higher risk of PTSD among low versus high SEP individuals. We hypothesized that the higher risk of PTSD in low SEP individuals may be explained not by greater risk of experiencing a traumatic event but instead by their greater exposure to certain types of events, specifically those related to assaultive violence. Individuals

with low household income were significantly more likely to have experienced events related to assaultive violence than those with high income, consistent with findings from other studies.[12, 39] However, when we included assault experience in our regression analysis, the odds of PTSD among low SEP compared to high SEP individuals – though slightly weakened – remained strong and statistically significant. Greater assault experience, then, may not fully explain the low SEP vulnerability to PTSD.

Our findings, instead, lend support to the life stress hypothesis discussed in the Introduction. Low SEP individuals in the Detroit population experienced a greater burden of stressors than those with high SEP and were more likely to experience specific types of stressors that may be chronic in nature – such as having a parent with a drug or alcohol problem, having serious financial problems, and having difficulty accessing healthcare – which is consistent with the literature.[19, 65] In models adjusted for burden of these stressful life events, the effect estimate was substantially reduced. Experiencing a greater burden of stressors appears to explain a substantial portion of the relation between SEP and PTSD in the Detroit population. Studies have used biological explanations for the link between stressors and mental illness, positing that life stressors may be accompanied by elevated levels of physiological arousal, which over time can lead psychological vulnerability,[19, 66] which would be consistent with our findings.

This study was strengthened by its use of longitudinal data from a population-based study of Detroit. Restricting our sample to individuals who, at baseline, had no history of PTSD allowed us to identify incident cases of PTSD and establish the temporal direction of the SEP-PTSD relationship. We also operationalized SEP using two measures found in other studies of PTSD – household income and educational attainment

– which makes it possible to compare our findings with others. Our combined estimate of SEP allowed us to also examine the cumulative influence of low income and low education on PTSD, which to our knowledge has not been investigated in other studies of PTSD. Additionally, we used a structured instrument to assess PTSD that has been validated in other populations as well as in our own, giving us confidence that we have correctly classified cases and non-cases of the disorder.

Our study is not without limitations. We did not conduct clinical interviews on all participants, hence limiting our ability to draw inference about PTSD diagnosis. The use of a structured, well-established instrument, accompanied by a clinical reappraisal in this population mitigates this concern. Although in line with other comparable population-based studies,[16] the low response rate introduces the potential for systematic selection bias. Comparability of the baseline sample to established demographic characteristics of the area is reassuring in this regard. We also did not have available measures of the frequency and severity of traumatic events and stressors. We were thus unable to account for the possibility that experiencing the same type of event or stressor a greater number of times or experiencing a more traumatic form of the event or stressor may increase the risk of PTSD. It is possible that a more thorough assessment of traumatic event and stressor burden may further explicate the link between SEP and risk of PTSD. Although our study results are not generalizable to all urban populations, they may be generalizable to other urban populations that are predominantly African American and of similar demographic and socioeconomic status.

This study suggests that socioeconomic vulnerability to PTSD likely reflects the greater burden of life stressors experienced by low SEP persons. Interventions that

reduce stressors – for instance, improving access to healthcare or preventing long-term

unemployment with more employment support programs – may play a key role in

preventing the onset of PTSD after traumatic event exposure. The impact of this type of

intervention has the potential to reach beyond the realm of mental health. Because stress

influences many outcomes both physical and mental, alleviating the burden of life

stressors in the city of Detroit could prevent psychological distress related to traumatic

events as well as improve the overall well-being of this population.

Table 2.1 DNHS Wave 2 longitudinal cohort, baseline demographic characteristics (n=1054)

Characteristics	DNHS N	DNHS % weighted*	ACS[§] % (2005-2007)	Chi-test for difference (p-value)
Age (years)				
18-24	56	19.4	13.3	0.20
25-64	747	67.2	71.8	
65 +	244	13.4	14.8	
Gender				
Male	426	47.2	47.0	0.96
Female	628	52.8	53.0	
Race/ethnicity				
White	115	7.9	10.4	0.42
Non-white	933	92.1	89.6	
Household income[a]				
Low	639	62.9	56.9	0.23
High	415	37.2	43.1	
Educational attainment[b]				
Low	434	58.2	60.9	0.58
High	620	41.8	39.1	
Marital status				
Married	280	28.9	27.9	0.84
Not married	774	71.2	72.0	

Notes:

[a] Low = Less than $35,000

[b] Low = High school graduate/GED or less; High = Some college, college graduate, graduate school

* Weighting accounts for the probability of being selected from households of different sizes and with different number of telephone lines and includes a post-stratification weight.

§ American Community Survey (ACS) 2005-2007 estimates

Table 2.2 Prevalence of exposure to specific traumatic events and stressors since baseline

Type of Traumatic event or stressor	Overall	Household income		Educational attainment		Income-education combinations			
		Low	High	Low	High	Low income, low education	High income, low education	Low income, high education	High income, high education
Traumatic events									
Assaultive violence	7.3	10.2**	2.3	8.5	5.6	9.8	3.7	11.4**	1.7
Other injury or shocking experience	17.7	19.4	14.7	19.9	14.6	20.9	16.1	15.6	14.0
Learning about traumas to others	19.4	20.3	18.0	17.0	22.8	18.2	12.5	25.9	20.7
Sudden, unexpected death of a close friend or relative	38.1	40.2	34.6	38.5	37.5	42.4	24.3	34.1	39.9
Any traumatic event	57.4	58.4	55.7	54.5	61.4	58.5	39.6	57.9	63.9
Stressors									
Experienced mental illness personally or of someone close to you	15.7	18.5*	11.0	14.0	18.1	15.9	7.1	25.4*	13.0
Had parent with problem with drugs or alcohol	8.2	11.4*	2.7	11.8**	3.1	13.6**	5.3	5.5	1.4
Family member other than parent with serious drug or alcohol problem	23.3	26.3*	18.2	24.6	21.4	27.5	14.2	22.9	20.4
Divorce or "break up"	10.8	12.7	7.4	12.4	8.5	13.5	8.1	10.6	7.1

with a partner or
significant other

Lost your job	18.3	19.8	15.9	24.2**	10.1	23.4	27.1**	10.1	10.2
Emotionally mistreated	12.8	17.3**	5.2	12.6	13.0	15.3	2.8	22.4**	6.4
Seen or heard physical fighting between your parents or caregivers	1.8	2.7**	0.1	2.5	0.8	3.1	0.0	1.7	0.2
Stressful legal problems	8.4	9.2	7.0	7.5	9.7	7.9	6.1	12.9	7.4
Been unemployed or seeking employment for at least 3 months	30.7	34.0	25.1	35.4**	24.1	37.1	29.2	25.7	23.0
Had serious financial problems	42.1	46.3*	35.2	46.7*	35.8	46.9*	46.3	44.6	29.6
Had problems getting access to adequate healthcare	22.1	25.6*	16.0	26.4**	16.1	27.6*	22.0	20.4	13.1
Any stressor	68.8	72.3*	62.7	71.7	64.7	73.1	66.6	70.4	60.8

*Significantly higher prevalence at the 0.05 significance level
**Significantly higher prevalence at the 0.01 significance level

Table 2.3 Odds of PTSD from a traumatic event that occurred between Waves 1 and 2 by socioeconomic indicators

Among those who have experienced at least one traumatic event and had no history of PTSD at Wave 2 (n=478)

	Model 1: Unadjusted			Model 2: Adjusted*			Model 3: Adjusted**			Model 4: Adjusted***		
	OR	LCL	UCL	OR	LCL	UCL	OR	LCL	UCL	OR	LCL	UCL
Houshold income												
Low	3.3	1.0	11.6	2.6	0.9	7.9	2.3	0.7	7.2	1.2	0.4	3.7
High	1.0			1.0			1.0			1.0		
Educational attainment												
Low	2.1	0.6	7.3	2.0	0.7	6.2	2.1	0.7	6.2	1.1	0.4	3.3
High	1.0			1.0			1.0			1.0		
Socioeconomic group												
Low income, low education	4.4	1.2	15.9	3.7	1.2	11.8	3.3	1.0	11.1	1.3	0.4	4.6
High income, low education	2.2	0.2	19.8	2.4	0.2	23.7	2.0	0.2	24.4	1.5	0.2	10.5
Low income, high education	3.8	0.8	18.5	2.9	0.6	13.2	2.1	0.5	9.3	1.4	0.2	8.2
High income, high education	1.0			1.0			1.0			1.0		

*Adjusted for age, gender, race, marital status, and history of mental illness (psychhis)

**Adjusted for age, gender, race, marital status, history of mental illness, assault experience in the past year
***Adjusted for age, gender, race, marital status, history of mental illness, past year assault, and number of past year stressors

CHAPTER 3

Socioeconomic differences in posttraumatic stress symptomatology

Abstract

Most studies of the relation between socioeconomic position (SEP) and posttraumatic stress (PTS) focus on assessing SEP differences in risk of developing posttraumatic stress disorder (PTSD) after a traumatic event experience, i.e. becoming a case versus a non-case, potentially losing important information on SEP differences in PTS symptomatology. We evaluated differences in PTS symptomatology severity between low and high SEP Detroit residents who experienced a traumatic event, using scores from the PTSD Checklist, a structured, validated instrument whose scores can range from 17 to 85. Those with low SEP had a higher mean symptom score than those with high SEP (35.8 vs. 26.6, p<0.01, low vs. high income; 34.2 vs. 30.5, p=0.02, low vs. high education; 35.7% and 36.2% vs. 26.9%, both p<0.01, low income and low education combined and low income and high education combined vs. high income and high education combined, respectively). In regression analysis, mean logged PTS score was significantly higher among low income compared to high income individuals (beta=0.15, p<0.01), after adjusting for demographic characteristics, history of mental illness, assaultive violence exposure, burden of life stressors, and social support. Those with both low income and low education had significantly higher mean PTS score compared

to high income and high education persons (beta=0.13, p=0.03). Models that explore

income and education as multiple categories (rather than dichotomously) showed a

negative dose-response relationship between income level and PTS severity and

education level and PTS severity, although significant differences in PTS only remained

between the lowest and highest SEP groups in adjusted models. The most disadvantaged

suffer disproportionately from psychological distress after traumatic events, which may

reflect differences in other psychological resources that can mitigate the mental health

consequences of exposure to traumatic events.

3.1 Introduction

Socioeconomic disparities in the development of posttraumatic stress after a

traumatic event experience have been documented, consistent with strong evidence that

links measures of SEP to many types of mental disorder.[23] Since the addition of

posttraumatic stress PTSD to the Diagnostic and Statistical Manual of Mental Disorders

(DSM-III) in 1980, most studies that investigate the relation between SEP and PTS divide

subjects into cases and non-cases of the disorder. In these studies, cases of PTSD have

generally been identified using instruments designed to assess DSM symptoms of re-

experiencing (criterion B), avoidance and emotional numbing (criterion C), and

hyperarousal (criterion D).[16, 37-38] Cases met one or more criterion B symptoms, three or

more criterion C symptoms, and two or more criterion D symptoms.[8]

Other studies of SEP and PTS, however, investigate the relation between SEP and

PTS severity, operationalizing PTS as a continuous variable that equates higher severity

with a higher PTS score. Ullman and Filipas[67] used the Posttraumatic Stress Diagnostic

Scale (PDS) to assess PTS severity based on the total score of response weights to questions about symptoms of re-experiencing, avoidance and emotional numbing, and hyperarousal. They found that level of educational attainment was significantly and negatively correlated with severity. Another study of Bosnian women both displaced and not displaced by the war in Bosnia used the Bosnian Trauma Questionnaire, a local instrument that assesses PTS symptoms and functional impairment due to these symptoms, to evaluate PTS severity. They reported that level of education was the strongest predictor of PTS severity among these women.[48]

Differences in how studies operationalize PTS may reflect the considerable debate in the literature over how to best characterize symptoms of PTS. Some argue that these symptoms are an abnormal or maladaptive reaction to stress that should be viewed as a distinct disorder, a perspective that led to the inclusion of PTSD in the DSM-III.[42] Supporters of this argument point to epidemiological and neurobiological evidence that these symptoms reflect a categorical structure.[43-44] Others contend that these symptoms simply lay at the "extreme end of a normal distribution of stress reactions" and should not be characterized as a distinct disorder.[42] Their position is predicated on three main arguments. First, determining the presence of a disorder using a cutoff is arbitrary.[43] Second, although few people actually meet criteria for PTSD, many have partial or subsyndromal PTSD,[42, 45-46] which can also result in substantial impairment in functioning.[9, 42, 47] Third, studies that use taxometric methods to test the latent structure of these symptoms report that that PTS is better characterized as a dimensional construct, measured as a continuous variable, rather than a categorical one.[42-43]

To our knowledge there have been no large population-based studies of SEP and

PTS severity. Therefore, we aimed to explore potential socioeconomic disparities in PTS

severity in a population-based sample of Detroit residents. Our study aims to investigate

whether household income and educational attainment – two SEP measures common to

health research[25, 56-57] – influence PTS severity and to see if there is an inverse gradient in

the relation between SEP and PTS severity, which has consistently been found between

SEP and other health outcomes.[57] By measuring PTS as a continuous variable, we are

able to explore SEP differences in PTS symptomatology in greater detail than we could in

Chapter 2, where we examined SEP disparities in PTSD risk. For instance, we are

interested in ascertaining whether SEP differences in PTS symptomatology exist only at

the extreme end of the PTS spectrum (which would explain why we see a difference in

risk of PTSD between SEP groups), or if low and high SEP persons also differ in their

experience of symptoms at lower levels of PTS severity, which may not qualify as PTSD

but may still cause significant functional impairment. The overall purpose of this study is

to further our understanding of socioeconomic vulnerability to the consequences of

traumatic event exposure and identify those individuals who bear the greatest burden of

posttraumatic stress after a traumatic event.

3.2 Methods

Study population

We used data from the first two waves of the Detroit Neighborhood Health Study

(DNHS), a three-wave population-based study of mental health in the city of Detroit.

During the baseline wave, which was conducted between September 2008 and April

2009, 1,547 adult participants (age 18 years or older) participated in a 40-minute

telephone survey. We recruited these individuals by first choosing a probability sample

of households within the city limits of Detroit and then randomly selecting one adult from

each household. We administered a second survey to 1,054 Wave 1 respondents (68.1%)

who could be located and agreed to continue participation in a second wave of the study

one year later, between September 2009 and May 2010.

Key variables

We assessed SEP at baseline, asking participants to report their past year

household income and lifetime educational attainment. Respondents were asked to

choose which category best described their total household income from the past year: (1)

Less than $10,000, (2) $10,000-$15,000, (3) $15,000-$25,000, (4) $25,000-$35,000, (5)

$35,000-$50,000, (6) $50,000-$75,000, and (5) $75,000 or more. We also asked

participants to choose the highest level of education or schooling they had completed at

the time of the survey from eight categories: (1) never attended school, (2) kindergarten

to 8th grade, (3) some high school (9th to 11th grade), (4) high school equivalency

(GED), (5) high school graduate (12th grade), (6) some college or technical training, (7)

college graduate (4-year), and (8) graduate work.   Because the first two education groups

had few people in them, we collapsed the first three categories into one group. We also

combined those who got their GED with those who graduated from high school. For the

purposes of evaluating income and education combined, we separated individuals into a

low-income group (less than or equal to $35,000) and a high-income group (more than

$35,000) based on the most recent U.S. Census estimate of median household income in

Detroit for a household of three (the median household size in the DNHS sample), which was $34,316 (ACS 2008). We also divided respondents into a low-education group (high school graduate/GED or less) and a high-education group (some college or technical training, college graduate, and/or graduate work), which roughly divides the study population into equal halves. We constructed an SEP measure that combined income and education into four categories: (1) low income and low education; (2) high income and low education; (3) low income and high education; and (4) high income and high education. This allowed us to examine income and education together; controlling for one another in regression analysis was made difficult by their high correlation (r=0.5) in the study population.

During the follow-up survey, we assessed exposure to various types of traumatic events between Waves 1 and 2 during the follow-up survey using a list of 19 potentially traumatic events used in previous studies of PTS.[12] We included an additional question that allowed the participant to briefly describe any other extraordinarily stressful situation or event that occurred between survey waves. If the participant reported the experience of at least one traumatic event, we assessed symptoms of PTS in relation to that event using the 17-item PTSD Checklist (PCL-C), a self-report instrument based on DSM-IV Criteria B, C, and D.[8] If the participant experienced more than one event between waves, we asked the PCL-C in relation to the event he or she considered the "worst". Participants were asked to rate each of the 17 PTS symptoms on a scale indicating the degree to which the symptom had bothered them from 1 (not at all) to 5 (extremely). Scores can range from 17 to 85.[68] Validation analysis of the PCL-C in the study population yielded excellent internal consistency (Cronbach coefficient alpha = 0.93).[60]

Most model covariates were measured at baseline: age, race, sex, marital status, employment status, and history of mental illness. Those with a history of mental illness met criteria for lifetime PTSD or depression at baseline or answered "yes" to a question about having ever experienced a mental illness at baseline. Other covariates – stressor experience and exposure to assaultive violence – were measured at Wave 2. We defined stressor experience as the number of distinct acute and chronic life stressors experienced between waves (out of a possible 11) such as divorce, financial and legal problems, losing a job, and difficulty obtaining health care. Exposure to assaultive violence indicated whether the participant had experienced events related to assault between waves such as being badly beaten and sexually assaulted, as defined in a previous study of Detroit.[12] We also included level of perceived social support as a covariate in regression models because it is highly predictive of PTS,[5, 49] using responses to the following three statements from the Deployment, Risk and Resilience Survey (DRRI):[69] (1) "Among my friends or relatives, there is someone who makes me feel better when I am feeling down", (2) "Among my friends or relatives, there is someone I go to when I need good advice", and (3) "My friends or relatives would lend me money if I needed it". Responses can range from 1 (strongly disagree) to 5 (strongly agree). A social support score was calculated for each respondent by summing the response weights to these three questions; scores ranged from 3 to 15, with higher scores denoting higher levels of perceived social support. The three social support questions showed good internal consistency (Cronbach coefficient alpha = 0.7).

Weighting

We assigned each survey participant a weight at baseline that accounted for differences in how we obtained contact information for recruitment and the probability of being selected from households of different sizes and number of telephone lines. Post-stratification weights were also incorporated into the weight calculations to match the distribution of key demographic variables in the sample population more closely to that of Detroit as a whole, using data from the 2005-2007 American Community Survey (ACS) Public Use Microdata Sample (PUMS) and the 2007 National Health Interview Survey. Additional weights were also included to account for attrition between Waves 1 and 2. To calculate these weights, we examined differences in various baseline characteristics between those who participated in Wave 2 and those who did not. We then used logistic regression to model Wave 2 non-response as a function of those variables that appeared to predict non-response: gender, age, race, income, educational attainment, marital status, employment status, lifetime traumatic event experience, lifetime history of mental illness, and social support. The predicted probabilities that were estimated in this analysis were then incorporated into the baseline weights to form an overall weight.

Statistical analysis

The first step in our analysis was to calculate mean PTS score among all individuals who experienced a traumatic event between Waves 1 and 2. We restricted analysis to this population because by definition one cannot have symptoms of PTS without having experienced a traumatic event.[8] We then examined PTS score by income

and education group and ran t-tests to assess significant differences in these means. (We log-transformed PTS score in order to normalize the variable's distribution so that we could use t-tests to compare scores.) Differences in PTS score between SEP combination groups were assessed using linear regression. We plotted the frequency distribution of PTS score by low and high income and education group to further explore socioeconomic differences in PTS symptomatology. We then used linear regression to model PTS score as a function of each SEP measure (dichotomous income and education and combined income and education) adjusted for age, gender, race, marital status, history of any mental illness, past year assault exposure, number of past year stressors, and social support. We did not adjust for education in models where income was the predictor of interest (and vice versa) because of strong correlation between the two measures. Additional regression models used all available categories of income and education (as dummy variables) in an effort to extract more detailed information on the SEP-PTS relationship and to see if there might be inverse dose-response relationships. An EFFECTS statement was added to regression analyses to test for the presence of a linear trend in the relations between income and PTS score and education and PTS score. All regression analysis used PTS scores log transformed to normalize their distribution. PTS score is bounded (scores can only fall between 17 and 85); therefore, we were uncertain if basic linear regression was appropriate. However, minimum and maximum predicted scores in fully-adjusted models closely approximated the possible range of PTS scores, and fully adjusted models met assumptions required for linear regression analysis.

All analyses used SAS-callable SUDAAN[63] to account for complex survey design and weighting. Because a relatively large proportion of our sample population did not

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report household income (12.2%), one of our predictors of interest, we imputed missing

income values using multiple imputation techniques for logistic regression[64] to avoid

potential bias in our effect estimates. We imputed income based on age, gender,

educational attainment, race, marital status, and employment status. We ran regressions

three ways: (1) restricting analyses to only those who provided income information, (2)

utilizing a "missing" dummy variable for those participants who did not report income,

and (3) using imputed income values. Each method yielded a similar result. Analyses

that used imputed values for income are reported here.

3.3 Results

Table 1 reports mean PTS scores among the 581 individuals (57.4%) who

experienced at least one traumatic event between Waves 1 and 2. Overall mean PTS

score was 32.5. Bivariable analysis yielded significant differences in logged PTS score

between persons with low and high income (35.8 vs. 26.6, p<0.01) and between those

with low and high education (34.2 vs. 30.5, p=0.02). Those with both low income and

low education and those with low income and high education had significantly higher

PTS scores than those with high income and high education (35.7 and 36.2 vs. 26.9,

p<0.01 and p=0.01, respectively). Using bivariable linear regression, we found that

individuals in the four lowest income groups (all less than $35,000) had significantly

higher mean PTS scores than those in the highest income group ($75,000 or greater; all

p<0.01). Those in the lowest two education groups (high school graduate/GED or less)

had significantly higher mean PTS scores than those in the highest education group

(graduate work; p=0.02 for those with less than high school and p=0.03 for high school graduates/GED).

Figure 1 compares PTS score distribution between low and high SEP groups. PTS scores for those with low income were more heavily distributed to the right than were scores among those with high income (Figure 1a). Besides having a greater frequency of high PTS scores, the low income group had a greater frequency of midrange scores, particularly those between 25 and 50. When we compared distributions between individuals with low and high education (Figure 1b), we found that they are fairly similar except for a higher frequency of having few or no symptoms of PTS (score below 25) among those with high education compared to those with low education.

Table 2 shows results from linear regression analysis of the relation between PTS and dichotomous income and education and combined SEP. In bivariable models, those with low income had significantly higher mean logged PTS score than those with high income (beta(b)=0.29, <0.01); a similar relation was found for education (b=0.13, p=0.02). Individuals with low income and low education and those with low income and high education had significantly higher logged mean PTS scores than those with high income and high education (b=0.29, p<0.01 and b=0.27, p<0.01; respectively). After adjusting for age, gender, race, marital status, history of mental illness, past year assault, number of past year stressors, and social support, the association between income and PTS weakened but remained statistically significant (b=0.15, <0.01). The relation between SEP combination group and PTS score was also weaker but significant when comparing low income and low education persons to those with both high income and high education (b=0.13, p=0.03).

Results from regression analysis using multiple categories for income and education are shown in Table 3. Those at the lowest income level had the greatest difference in PTS score compared to those at the highest income level (b=0.41, p<0.01); the same was true for education (b=0.28, p=0.02). There was also evidence of a negative linear trend in the relation between both SEP measures and PTS score (test for linear trend: p<0.01 for income, p=0.01 for education). In adjusted models, only the lowest income group (less than $10,000) had a significantly higher logged mean PTS score than the highest income group ($75,000 or more; b=0.19, p=0.04), and only those in the lowest education group (less than high school graduate) had a significantly higher logged mean PTS score than those in the highest education group (graduate work; b=0.23, p=0.02).

3.4 Discussion

Using data from a representative sample of adults from the Detroit population, we show that lower household income and educational attainment were both associated with more severe PTS after exposure to a traumatic event, consistent with other studies of risk factors of PTS.[16, 37, 67] When we explored the relationship between SEP and PTS using all available categories of income and education, we found evidence of an inverse dose-response relationship between SEP and PTS severity, which supports the well-documented social gradient in health.[70] However, when we controlled for other demographic variables, history of mental illness, exposure to assault and life stressors, and social support, differences in PTS severity only remained between the poorest and wealthiest individuals and between the least and most educated individuals.

Socioeconomic disparities in burden of mental illness similar to those found in our study are frequently ascribed to differences in availability of psychosocial resources and exposure to stressors, as described in Chapter 2. Studies cite evidence that psychosocial resources such as social support are more commonly reported among high compared to low SEP persons and might partially mediate the relation between SEP and health.[18] Social support, in particular, is a strong and consistent predictor of PTS.[5, 49] It also has been argued that stressful life events are linked to psychological distress, those with lower SEP experience a greater number of stressful life events, and a greater burden of stressful events plays a key role in the relation between SEP and psychological well-being.[19, 27-29, 71] We found that the lowest SEP persons experienced a greater burden of PTS than those at the highest SEP level, even after controlling for stressor experience and social support. While it is possible that our measures do not fully capture the aspects of stress and social support that influence the psychological consequences of traumatic event experience, there may be additional explanations for socioeconomic vulnerability among the most disadvantaged. Other psychological resources that we were unable to measure in this study such as optimistic outlook and high levels of self-efficacy have been linked to better mental health outcomes and, because they are found less frequently among low SEP compared to high SEP persons, may play a role in the SEP-PTS relation.[18, 72-73]

Comparing the distribution of PTS scores between SEP groups provided additional information about socioeconomic differences in PTS symptomatology. The distribution of PTS score among individuals with low education differed from scores among high education individuals only at the lower end of the distribution, with high

education individuals reporting a greater number of no or low PTS symptoms than low education individuals. Differences in PTS score distribution between income groups were more pronounced in the highest and middle range of scores (between 25 and 50), where the likelihood of experiencing disability from symptoms is higher. These findings reflect an essential drawback in conceptualizing PTS as a categorical measure as opposed to a continuous measure. Studies of PTS that use cutoff scores to determine cases and non-cases of disorder generally set the cutoff around 30-50.[68, 74] If we had used a cutoff score in our study, we may have failed to identify that low SEP persons disproportionately experienced midrange symptoms, which may be accompanied by substantial psychological distress and functional impairment. While the purpose of this study was not to champion the categorical or dimensional approach, our findings highlight the importance of continuing to explore PTS symptomatology.

This study benefited from the use of population-based data and a structured, validated instrument to assess PTS. However, there were some limitations to this study. First, examining the influence of SEP on health outcomes is challenged by the potential for reverse causality. It is possible that in this study we found evidence of social selection instead of social causation; in other words, the association we found between SEP and PTS might instead reflect the drift of individuals who suffer from PTS into lower SEP groups, perhaps because of unemployment or a reduction in income due to symptoms.[23, 56] However, using longitudinal data we were able to establish SEP prior to assessing traumatic event experience and resulting PTS. Although PTS is by definition linked to a particular traumatic event and its onset is therefore incident, we also controlled for history of mental disorder predicted on evidence that history of mental

illness predicts subsequent mental illness.[75] These study design features lend confidence

to the direction of the SEP-PTS relation found in this study. Second, the location of our

study is unique in its demographic make-up (the Detroit population is approximately 90%

African-American and relatively disadvantaged) and its continuous population and

economic decline over the past half-century. We caution others when generalizing

results to other urban populations. Third, our study excludes individuals who do not have

a home or could not complete the survey by telephone, who are likely the most

economically disadvantaged and perhaps most vulnerable to traumatic event exposure

and the psychological consequences of traumatic experiences. Studies that examine

exposure to traumatic events and psychological distress in a representative sample of

these individuals are needed to further our understanding of PTS vulnerability.

This study highlights socioeconomic disparities in PTS, lending support to a vast

literature on SEP differences in mental health. Our finding that the most disadvantaged

individuals experience the greatest burden of PTS after a traumatic event experience has

implications for how we target mental health interventions.   Ensuring that these

particularly vulnerable individuals receive psychological first aid after a traumatic event

such as an assault or a natural disaster may prevent the onset or reduce the severity of

subsequent PTS symptoms. Increasing access to mental health resources through

expanded insurance coverage or sliding scale service fees may also mitigate the negative

consequences of traumatic experiences. Further research into the efficacy of

interventions that might promote recovery and reduce socioeconomic disparities in

mental illness may be fruitful.

Table 3.1 PTS score associated with the "worst" event experienced between Waves 1 and 2, by SEP group

	N	Mean (SE)	p-value*
Total sample	581	32.5 (1.1)	
Household income			
Low	356	35.8 (1.4)	<0.01
High	225	26.6 (1.1)	
Less than $10,000	116	39.0 (2.9)	<0.01
$10,000 to less than $15,000	75	34.1 (2.5)	<0.01
$15,000 to less than $25,000	81	33.3 (2.4)	<0.01
$25,000 to less than $35,000	84	34.9 (2.6)	<0.01
$35,000 to less than $50,000	81	25.9 (1.9)	0.79
$50,000 to less than $75,000	81	28.6 (2.0)	0.24
$75,000 or more	63	25.2 (1.8)	reference
Educational attainment			
Low	66	36.4 (3.5)	0.17
High	515	31.9 (1.1)	
Less than HS grad	66	36.4 (3.5)	0.02
High school graduate/GED	163	33.5 (1.7)	0.03
Some college or technical training	224	31.3 (1.7)	0.22
College graduate (4-year)	90	29.1 (2.5)	0.68
Graduate work	38	26.7 (2.3)	reference
SEP combination			
Low income, low education	60	36.7 (3.7)	<0.01
High income, low education	296	35.6 (1.5)	0.75
Low income, high education	296	35.6 (1.5)	<0.01
High income, high education	184	26.9 (1.3)	reference

*T-tests use log-transformed PTS scores

Figure 3.1 Distribution of PTS score by SEP group

Figure 1a. Low vs. High income
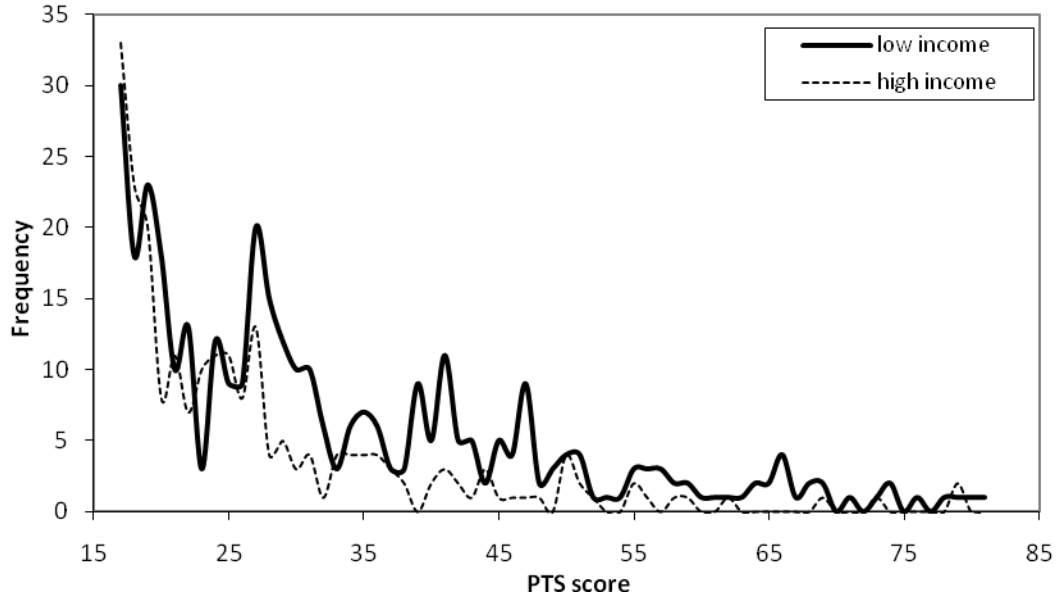
Figure 1b. Low vs. high education
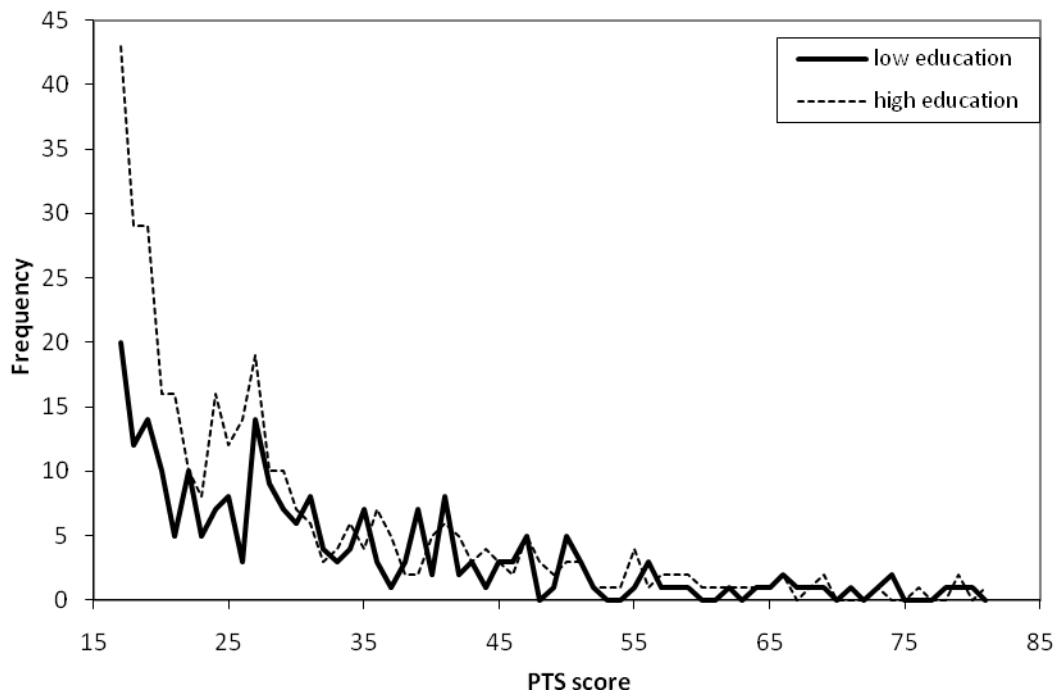
Table 3.2 Associations between dichotomous measures of SEP and logged PTS score
Among those who have experienced at least one traumatic event between Waves 1 and 2

	Unadjusted			Adjusted*		
	Beta	**SE**	**p-value**	**Beta**	**SE**	**p-value**
Household income						
Low	0.29	0.05	<0.01	0.15	0.05	<0.01
High	0.00					
	R-square	*0.10*		*R-square*	*0.38*	
Educational attainment						
Low	0.13	0.10	0.17	0.17	0.06	0.01
High	0.00			0.00		
	R-square	*0.01*		*R-square*	*0.37*	
Socioeconomic group						
Low income, low education	0.31	0.10	<0.01	0.25	0.07	<0.01
High income, low education	0.22	0.14	0.12	0.18	0.16	0.27
Low income, high education	0.29	0.05	<0.01	0.12	0.05	0.03
High income, high education	0.00			0.00		
	R-square	*0.11*		*R-square*	*0.38*	

*Adjusted for age, gender, race, marital status, history of mental illness, past year assault, number of past year stressors, and social support

Table 3.3 Associations between multi-category measures of SEP and logged PTS score
Among those who have experienced at least one traumatic event between Waves 1 and 2

	Unadjusted				Adjusted*			
	Beta	**SE**	**p-value**	**Test for trend p-value**	**Beta**	**SE**	**p-value**	**Test for trend p-value**
Less than $10,000	0.41	0.10	<0.01		0.19	0.09	0.04	
$10,000 to less than $15,000	0.29	0.10	<0.01		0.13	0.09	0.14	
$15,000 to less than $25,000	0.27	0.09	<0.01		0.14	0.08	0.10	
$25,000 to less than $35,000	0.29	0.09	<0.01		0.09	0.08	0.29	
$35,000 to less than $50,000	0.02	0.09	0.79		-0.04	0.08	0.64	
$50,000 to less than $75,000	0.10	0.09	0.24		0.01	0.07	0.84	
$75,000 or more	0.00				0.00			
	R-square	*0.13*		<0.01	*R-square*	*0.38*		0.01
Less than HS grad	0.28	0.12	0.02		0.23	0.10	0.02	
High school graduate/GED	0.21	0.09	0.03		0.06	0.09	0.53	
Some college or technical training	0.12	0.09	0.22		0.06	0.09	0.48	
College graduate (4-year)	0.05	0.11	0.68		0.08	0.09	0.37	
Graduate work	0.00	0.00			0.00			
	R-square	*0.03*		0.01	*R-square*	*0.38*		0.04

*Adjusted for age, gender, race, marital status, history of mental illness, past year assault, number of past year stressors, and social support

CHAPTER 4

Social support may modify socioeconomic vulnerability to posttraumatic stress

Abstract

Low socioeconomic position (SEP) has been linked with greater burden of posttraumatic stress (PTS) after exposure to a traumatic event. However, in contexts of high social support, which is thought to buffer against the psychological consequences or stressful or traumatic events, this socioeconomic disparity may be reduced. We examined the modifying effect of different types of social support on the relation between SEP and PTS using data from a study of traumatic event experience and mental health in an urban population. Overall, individuals with low SEP had greater mean PTS score than those with high SEP (low income and low education, beta=0.24, p<0.01 and low income and high education, beta=0.19, p<0.01 compared to persons with both high income and high education). However, when we stratified the sample by perceived functional social support level, this association was stronger among those with low social support (low income and low education, beta=0.37, p<0.01, and low income and high education, beta=0.28, p=0.02) than among those with high social support (low income and low education, beta=0.19, p=0.01, and low income and high education, beta=0.15, p=0.06). Models that stratified the sample by measures of structural social support yielded similar results. However, tests for interaction between SEP and social support were not

significant at the 0.05 level. Our findings suggest that individuals with low SEP may be more vulnerable to the psychological consequences of traumatic event experience (compared to those with high SEP) in the face of low social support. Interventions that promote social relationships may help to reduce socioeconomic disparities in mental illness.

4.1 Introduction

Socioeconomic disparities in mental health have been reported in studies of several psychiatric disorders,[23] including, more recently, the development of posttraumatic stress (PTS) after a traumatic event experience. Measures of low socioeconomic position (SEP) have been linked to greater risk of developing posttraumatic stress disorder (PTSD) and greater severity of PTS symptoms in several studies[16, 37-38, 48, 67] and confirmed in the work described in Chapters 2 and 3. Notwithstanding this evidence, it is possible that socioeconomic vulnerability to PTS may not exist in all contexts. The "vulnerability" component of the life-stress hypothesis – which has been used frequently to explain the greater burden of mental illness among persons with low SEP compared to high SEP – argues that those with low SEP may be more likely to experience the negative consequences of life stressors because they lack the coping resources of higher SEP individuals, such as adequate social support.[19, 53-54] Although some studies have reported lower levels of social support among persons with low compared to high SEP,[18] there are no doubt low SEP persons who receive a great deal of support from those around them. Given that social support is one of the strongest predictors of PTS,[5, 49] it is possible that in a context where all individuals have adequately

high levels of social support, socioeconomic disparities in burden of PTS after a traumatic event may be small or even nonexistent.

Social support is generally defined as the emotional and instrumental help individuals receive from others, such as being made to feel cared for and worthwhile and being provided with assistance (e.g. with loans, caretaking, or transportation) or helpful information. There are two perspectives from which social support is generally studied: the structural perspective and the functional perspective.[18] The structural perspective considers social support in terms of the structure of relationships and social networks, for example using the number of close relationships a person has to assess social support. The functional perspective focuses on whether relationships function in certain ways, for example if they make the individual feel loved or worthwhile or if financial assistance is available if needed.[36] The main effect hypothesis and indirect effect, or buffer, hypothesis describe two key ways in which social support can influence mental health. The main effect hypothesis argues that social support influences health directly regardless of exposure to stress. The buffer hypothesis conceives of social support as only having a protective effect on health in the face of stressors, functioning to mitigate the psychological consequences of the stressor. Although findings from several studies support both hypotheses,[35-36, 52] the latter is particularly relevant to the study of social support and PTS, which can by definition only manifest after exposure to a particularly stressful or traumatic event.[8]

To our knowledge there have been no population-based studies that investigate the role of social support in the association between SEP and PTS. Therefore, we aim to examine whether social support modifies socioeconomic vulnerability to PTS using data

from a longitudinal, population-based study of Detroit residents who recently experienced a traumatic event. Informed by conceptualizations of social support described above, we will assess the potential modifying effect of both structural and functional social support on the SEP-PTS relationship.

4.2 Methods

The sample

The Detroit Neighborhood Health Study (DNHS) is a population-based study of mental health among 1,547 adult participants (age 18 years or older) randomly selected from the Detroit population. Potential participants were selected by choosing a probability sample of households within the city limits of Detroit and then randomly choosing one adult from each household. We administered baseline (Wave 1) survey from September 2008 to April 2009, during which participants completed a structured 40-minute telephone assessment. We administered a follow-up survey to 1,054 Wave 1 respondents (68.1%) one year later, between September 2009 and May 2010. Interviewers obtained consent from the participant at the start of each interview and offered respondents a $25 incentive for participation in each wave.

Key variables

SEP was measured at baseline using a combined measure of past year household income and lifetime educational attainment, two measures frequently operationalized in other studies of SEP and health.[25, 56-57] Participants were asked to choose one of seven income categories that best described their total household income from the past year: (1)

Less than $10,000, (2) $10,000-$15,000, (3) $15,000-$25,000, (4) $25,000-$35,000, (5) $35,000-$50,000, (6) $50,000-$75,000, and (5) $75,000 or more. We dichotomized this variable to create a low-income group (less than or equal to $35,000) and a high-income group (more than $35,000) based on the most recent estimate of median household income in Detroit for a household of three (the median household size in the DNHS sample) from the U.S. Census, which was $34,316.[76] Participants were also asked to choose the highest level of education or schooling they had completed at the time of the baseline survey from eight categories: (1) never attended school, (2) kindergarten to 8th grade, (3) some high school (9th to 11th grade), (4) high school equivalency (GED), (5) high school graduate (12th grade), (6) some college or technical training, (7) college graduate (4-year), and (8) graduate work. We divided educational attainment into two groups based on enrollment in higher education: (1) low education: high school graduate/GED or less and (2) high education: some college or technical training, college graduate, and/or graduate work. We then created a combined SEP variable that categorized respondents into (1) low income and low education, (2) high income and low education, (3) low income and high education, and (4) high income and high education groups based on the dichotomization of income and education described above. Because income and education were strongly correlated in the study population (r=0.5), we did not model the two measures in the same regression. Combining the measures allowed us to assess the SEP measures – which may be confounders in each other's relation with PTS – together.

In Wave 2 we asked participants about their exposure to traumatic events since baseline using a list of 19 potentially traumatic events assessed in previous studies of

Detroit,[12] as well as an additional question that allows the participant to describe any other extraordinarily stressful situation or event. These traumatic events may be classified into four categories: assaultive violence, other injury or shocking experience, learning about traumatic events from others, and the sudden, unexpected death of a close friend or relative.[12] We used the PTSD Checklist (PCL-C), a 17-item self-report measure that evaluates DSM-IV PTSD Criteria B, C, and D (symptoms of re-experiencing, avoidance and emotional numbing, and hyperarousal, respectively), to assess symptoms of PTS in relation to the traumatic event experienced between waves that the respondent considered the "worst" (or in relation to the one event experienced).[8] Participants rated each of the 17 PTS symptoms on a scale indicating the degree to which they had been bothered by the symptom as a result of this event from 1 (not at all) to 5 (extremely). A total PTS score was calculated by summing the response weights to all 17 items. Scores can range from 17 to 85; a higher score indicates more severe symptoms of PTS as a result of the traumatic event.[68] The PCL-C showed excellent internal consistency in our study population (Cronbach's coefficient alpha = 0.9).[60]

We examined both structural and functional social support. Structural social support was characterized as the frequency of contact with family members or friends who do not live with the respondent (through visits, phone calls, letter, or emails). Those with high social contact had contact with friends or family nearly every day, those with low social contact 3-4 days a week or less. To evaluate functional social support, we used responses to the following three statements, which were taken from the Deployment, Risk and Resilience Survey (DRRI):[69] (1) "Among my friends or relatives, there is someone who makes me feel better when I am feeling down", (2) "Among my friends or

relatives, there is someone I go to when I need good advice", and (3) "My friends or relatives would lend me money if I needed it". Participant responses could range from 1 (strongly disagree) to 5 (strongly agree). This social support scale assesses how participants' view their relationships, specifically whether they believe that their relationships provide them with the emotional and instrumental support they need. A perceived functional social support score for each participant was calculated by summing the response weights to these three questions and ranged from 3 (lowest social support level) to 15 (highest social support level). We divided this score into low and high social support level. Those with low social support had a score that fell in the lowest quartile (score less than 13), and those with high social support had a score of 13, 14, or 15. Factor analysis of these three questions using data from the DNHS study population yielded one dominant global factor, and validation analysis showed good internal consistency (Cronbach coefficient alpha = 0.7).

Other covariates measured at baseline were age, race, sex, marital status, and history of mental illness. We defined history of mental illness as having met criteria for lifetime PTSD or depression at baseline or having answered "yes" to a question about having ever experienced a mental illness. Exposure to assaultive violence – the experience of an event related to assault such as being badly beaten or sexually assaulted – was measured at follow-up and was also included as a covariate.

Weighting

Each survey participant was assigned a weight at baseline. These weights account for differences in how contact information was obtained and the probability of being

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selected from households of different sizes and number of telephone lines. We also

incorporated post-stratification weights into the final weight to account for baseline

differences in sample demographics compared to the Detroit population, using data from

the 2005-2007 American Community Survey (ACS) Public Use Microdata Sample

(PUMS) and the 2007 National Health Interview Survey as referent. Additionally, we

developed inverse probability weights to account for attrition between waves. To

determine these weights, we first assessed differences in a number of baseline

characteristics between Wave 2 responders and non-responders. We then modeled Wave

2 non-response as a function of variables that seemed to predict non-response – gender,

age, race, income, educational attainment, marital status, employment status, lifetime

traumatic event experience, lifetime history of mental illness, and social support – using

logistic regression. This regression analysis yielded predicted probabilities whose

inverse values were also incorporated into the overall weights.[77]

Statistical analysis

We conducted univariable analysis of structural and functional social support to

assess their distribution in our total study population and in each SEP group. We used

bivariable logistic regression to assess differences in social support by SEP group. We

then calculated mean PTS score by SEP and social support group among those who had

experienced a traumatic event between survey waves. Bivariable regressions assessed

differences in PTS risk between SEP groups (using the high income and high education

group as the reference) stratified by social support level. Stratified multivariable models

adjusted for age, gender, race, marital status, history of mental illness, and past year

assault experience. Because the distribution of PTS scores was heavily right-skewed in this population, we log-transformed PTS score in regression analysis.

All analyses were conducted using SAS-callable SUDAAN[63] to account for complex survey design and weighting. Most variables used in these analyses had very few missing observations (under 2.5% missing); however, 12.2% of the sample did not report household income. To avoid potential bias in our effect estimates, we imputed missing income values using multiple imputation techniques for logistic regression.[64] We imputed income based on age, gender, educational attainment, race, marital status, and employment status. We ran regressions three ways: (1) restricting analyses to only those who provided income information, (2) utilizing a "missing" dummy variable for those participants who did not report income, and (3) using imputed income values, which yielded similar results. We report here results of analyses that used imputed values for income.

3.3 Results

Table 1 shows respondent reports of structural and functional social support. Mean functional social support score was 13.4 in this population, with almost three-quarters of respondents (73.4%) reporting high levels of social support. More than half of respondents said they had contact with friends and family that do not live with them nearly every day (53.8%). Those with high income and high education more frequently reported high functional social support and daily contact with friends and family than those in the other SEP groups. However, there were no significant differences in the

distribution of the two dichotomous social support measures by SEP group at the 0.05 significance level.

Mean PTS score by SEP and social support level among the 581 respondents who experienced at least one traumatic event between Waves 1 and 2 (57.4% of the total Wave 2 population) is shown in Table 2. Scores were significantly higher for persons with low income and low education and low income and high education compared to those with high income and high education regardless of social support level (35.7% and 36.2%, respectively, vs. 26.9%, both p<0.01). However, differences in PTS scores between low and high SEP persons were more pronounced among those persons who reported low social support. Among respondents with high levels of social contact, the difference in mean PTS score between low income and low education individuals and those with high income and high education was approximately 7.7 (35.1 – 27.4), while the difference in mean PTS score between low income and low education and high income and high education individuals was 10.6 (36.5 – 25.9) among those with low levels of social contact. Similarly, the difference in PTS score between low income and low education individuals compared to those with high income and high education was larger for those who reported low functional social support (10.7) than among those who reported high levels of functional social support (7.3). We also see this relationship when comparing those with low income and high education to those with high income and high education.

Table 3 shows multivariable linear regression models stratified by perceived functional social support, adjusted for age, sex, race, marital status, history of mental illness, and past year assault experience. Lower SEP was significantly associated with

higher PTS in the total sample. However, differences in PTS risk between SEP combination groups varied by social support level. Beta estimates showing differences in mean PTS score between low and high SEP groups were larger among those with low functional social support (low income and low education: beta=0.37, p<0.01; low income and high education: beta=0.28, p=0.02; compared to high income and high education) than they were among those with high functional social support (low income and low education: beta=0.19, p=0.01; low income and high education: beta=0.15, p=0.06); compared to high income and high education. Table 4 shows models stratified by structural social support. Findings were similar to those stratified by functional social support. However, tests for interaction between SEP and both measures of social support in adjusted models yielded results that were not significant at the 0.05 level.

4.4 Discussion

    In this study we found some evidence that the relation between SEP and PTS varies by social support level. Overall, individuals with lower SEP had greater risk of PTS than those with higher SEP. This is consistent with a long history of literature reporting greater burden of mental illness – including PTS – among lower SEP individuals.[16, 23] When we stratify individuals into low and high social support groups, this socioeconomic disparity in PTS is larger among those respondents who reported low levels of social support than among respondents who reported high social support. The interaction between SEP and social support was not, however, significant at the 0.05 level; we therefore caution against making definitive conclusions about the buffering effect of social support on the relation between SEP and PTS.

Evidence from the literature regarding the relation between SEP, stressful life events (stressors), social support, and mental health lends support to a potential social support modification of the SEP-PTS association. There has been considerable inquiry into the relation between SEP and mental illness since studies in the early 1900s reported a greater burden of mental illness among individuals of lower social status.[21, 23, 28, 79] Many of these studies have linked SEP to mental health through socioeconomic differences in exposure to life stressors, positing that low SEP individuals suffer disproportionately from mental illness because they experience a greater burden of stressful events.[19] Similarly, the link between social support, stressors, and mental illness has been investigated extensively. Having adequate social support is thought to protect against psychological distress in the face of stressful situations by preventing or eliminating a stress reaction or influencing neuroendocrine processes to reduce physiological reactivity to stress.[52] It is possible, then, that having high levels of social support helps low SEP individuals cope with their greater burden of stressors and reduces the negative psychological effects of stressors that leave them more vulnerable to mental illness, thereby reducing the mental health disparity between low and high SEP individuals.

Cohen et al note that different types of social support may influence health through distinct mechanisms. Frequency of contact with friends and family – the measure of structural social support in this study – may influence the degree to which an individual is integrated into society. Having larger social networks and greater social integration may encourage psychological well-being by providing the individual with positive experiences and opportunities to play a meaningful role in the community. On

the other hand, perceived functional social support – the perception that friends and family provide needed supportive resources – can promote mental health by improving an individual's coping ability and relieving stress.[52] In this study, we found that structural and functional measures of social support play similar roles in reducing SEP disparities in PTS. Although social support measures may influence PTS vulnerability in different ways, they are often correlated – individuals who report high frequency of contact with loved ones also report high functional social support[52] (in this study, Chi-square=13.1, p<0.01) – which may explain our findings.

This study was strengthened by its use of population-based data, allowing us to understand the relation between SEP, social support, and PTS among all Detroit residents. Using a structured, validated instrument to assess PTS also gives us confidence in our outcome measure. Additionally, by characterizing social support as both structural and functional measures, we were able to explore multiple dimensions of social support and the role they may play in moderating socioeconomic vulnerability to PTS. Our use of questions that capture respondents' *perception* of functional social support are also consistent with the argument that it is more the perception of support than the support actually received that influences mental health after stressful life events.[80]

Some aspects of the study may influence interpretation of our results. Several studies have highlighted the potential for recall bias in explorations of the influence of social support on mental health,[5] noting that individuals who suffer from mental illness may be more likely to report low levels of social support in the past due to negative feelings associated with current illness. However, the longitudinal nature of our study

allowed us to measure social support prior to the experience of the traumatic events assessed in this study. Further adjustment for history of mental illness in regression models lends confidence to the direction of the relationships we found, which are consistent with other longitudinal studies of social support and mental health.[50, 52] Persons with lower PTS after a traumatic event may also been more likely to seek out social support to help cope with their experience, an issue that the longitudinal aspect of this study could not address. If this behavior were more prevalent among high SEP persons, for instance, than among low SEP persons, this could have led to bias in our effect estimates. Our finding that high SEP persons were not significantly more likely to report higher levels of support than low SEP persons in the study population may provide some evidence that the potential for self-selection into a high social support category by those with lower PTS scores may not be differential by SEP and would result in a bias towards the null. Future work in this area would be benefited by additional research into differences in seeking support as a coping behavior after exposure to a traumatic event in similar populations. Additionally, our respondents reside in a unique urban environment that has, over the past 50 years, experienced considerable economic decline. This population may differ from others in ways that could influence the relations explored in this study. Caution should be exercised when generalizing results to other populations.

This study highlights the role social support may play in reducing mental health disparities and alleviating the psychological consequences of traumatic event experience in more vulnerable populations. Though not conclusive, these findings suggest that we might reduce socioeconomic disparities in PTS by incorporating social support resources into post-event interventions. For example, encouraging greater peer support—which has

been shown to enhance social support networks and promote recovery[81] – among

survivors of traumatic events in disadvantaged communities through the formation of

support groups has the potential to reduce the disproportionate burden of psychological

distress in those populations. In the absence of policy directed at reducing

socioeconomic inequality, promoting social support is a simple, relatively low-resource

way to potentially improve mental health in poor communities.

Table 4.1 Perceived functional and structural measures of social support by socioeconomic position

	PERCEIVED FUNCTIONAL SOCIAL SUPPORT									
	Total		Low income and low education		High income and low education		Low income and high education		High income and high education	
Individual questions (range 1-5)	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Among my friends or relatives, there is someone who makes me feel better when I am feeling down	4.7	0.1	4.7	0.1	4.7	0.1	4.5	0.1	4.8	0.1
Among my friends or relatives, there is someone I go to when I need good advice	4.5	0.1	4.5	0.1	4.4	0.3	4.4	0.1	4.5	0.1
My friends or relatives would lend me money if I needed it	4.3	0.1	4.2	0.1	4.3	0.3	4.1	0.1	4.6	0.1
TOTAL SCORE	**13.4**	**0.2**	**13.3**	**0.2**	**13.3**	**0.5**	**13.0**	**0.3**	**13.8**	**0.1**
Social support score	N	%	N	%	N	%	N	%	N	%
Low	279	26.6	108	28.4	17	22.6	87	30.6	67	22.6
High	747	73.4	230	71.6	67	77.4	196	69.4	254	77.4
	STRUCTURAL SOCIAL SUPPORT									

Contact with friend and family nearly every day	N	%	N	%	N	%	N	%	N	%
No	473	46.2	155	48.4	37	34.4	129	51.5	152	44.3
Yes	578	53.8	193	51.6	49	65.6	161	48.5	175	55.7

Table 4.2 Posttraumatic stress score by SEP group and social support level
Among those who experienced at least one traumatic event between survey waves
(n=581)

	N	Mean (SE)	Beta*	SE	p-value
TOTAL	581	32.5 (1.1)			
Socioeconomic group					
Low income, low education	188	35.7 (1.7)	0.3	0.1	<0.01
High income, low education	41	25.7 (2.0)	0.0	0.1	0.75
Low income, high education	168	36.2 (2.4)	0.3	0.1	<0.01
High income, high education	184	26.9 (1.3)	ref		
FUNCTIONAL SOCIAL SUPPORT					
High level of social contact					
Socioeconomic group					
Low income, low education	114	35.1 (2.3)	0.2	0.1	0.01
High income, low education	23	25.9 (3.4)	-0.1	0.1	0.69
Low income, high education	93	32.6 (2.7)	0.2	0.1	0.15
High income, high education	105	27.4 (1.9)	ref		
Low level of social contact					
Socioeconomic group					
Low income, low education	74	36.5 (2.4)	0.4	0.1	<0.01
High income, low education	18	25.6 (1.9)	0.0	0.1	0.88
Low income, high education	74	40.0 (3.7)	0.4	0.1	<0.01
High income, high education	78	25.9 (1.8)	ref		

PERCEIVED SOCIAL SUPPORT					
High social support					
Socioeconomic group					
Low income, low education	85	34.3 (1.9)	0.3	0.1	<0.01
High income, low education	20	23.6 (2.3)	0.0	0.1	0.75
Low income, high education	66	33.4 (3.4)	0.2	0.1	0.01
High income, high education	105	27.0 (1.7)	ref		

Low social support
Socioeconomic group

Low income, low education	56	38.1 (3.3)	0.4	0.1	0.01
High income, low education	10	24.7 (1.6)	0.0	0.1	0.88
Low income, high education	54	38.7 (5.1)	0.3	0.2	0.04
High income, high education	32	27.4 (3.5)	ref		

*PTS score log-transformed

Table 4.3 Associations between measures of SEP and PTS, stratified by perceived functional social support level

Among those who have experienced at least one traumatic event between Waves 1 and 2 (n=581)

	Model 1 ALL PARTICIPANTS			Model 2 HIGH SOCIAL SUPPORT ONLY			Model 3 LOW SOCIAL SUPPORT ONLY		
	Beta	SE	p-value	Beta	SE	p-value	Beta	SE	p-value
Stratified									
Socioeconomic group									
Low income, low education	0.24	0.06	<0.01	0.19	0.07	0.01	0.37	0.09	<0.01
High income, low education	-0.02	0.08	0.77	-0.04	0.11	0.74	0.00	0.15	0.99
Low income, high education	0.19	0.07	<0.01	0.15	0.08	0.06	0.28	0.12	0.02
High income, high education	0.00			0.00			0.00		
SEP-social support interaction									
Low support/low income and low education	0.15	0.13	0.24						
Low support/high income and low education	0.02	0.17	0.88						
Low support/low income and high education	0.08	0.14	0.57						
Low support/high income and high education	0.00	0.00							
High support/low income and low education	0.00	0.00							
High support/high income and low education	0.00	0.00							
High support/low income and high education	0.00	0.00							
High support/high income and high education	0.00	0.00							

*All models adjusted for age, gender, race, marital status, history of mental illness, and past year assault

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Table 4.4 Associations between measures of SEP and PTS, stratified by structural social support level

Among those who have experienced at least one traumatic event between Waves 1 and 2 (n=581)

	Model 1 ALL PARTICIPANTS			Model 2 HIGH SOCIAL SUPPORT ONLY			Model 3 LOW SOCIAL SUPPORT ONLY		
	Beta	**SE**	**p-value**	**Beta**	**SE**	**p-value**	**Beta**	**SE**	**p-value**
Stratified									
Socioeconomic group									
Low income, low education	0.24	0.06	<0.01	0.18	0.09	0.04	0.32	0.06	0.01
High income, low education	-0.02	0.08	0.77	-0.02	0.12	0.86	-0.01	0.10	0.95
Low income, high education	0.19	0.07	<0.01	0.09	0.09	0.29	0.32	0.09	<0.01
High income, high education	0.00								
SEP-social support interaction									
Low support/low income and low education	0.10	0.11	0.36						
Low support/high income and low education	-0.01	0.15	0.92						
Low support/low income and high education	0.21	0.12	0.08						
Low support/high income and high education	0.00	0.00							
High support/low income and low education	0.00	0.00							
High support/high income and low education	0.00	0.00							
High support/low income and high education	0.00	0.00							
High support/high income and high education	0.00	0.00							

*All models adjusted for age, gender, race, marital status, history of mental illness, and past year assault

CHAPTER 5

Conclusion

This dissertation explored the association between socioeconomic position (SEP) and posttraumatic stress (PTS) and the roles that stressful life events and social support might play in this relationship, using longitudinal data from a representative sample of the Detroit adult population. Informed by an extensive literature on SEP and mental health, the goal of the study was to thoroughly examine socioeconomic vulnerability to PTS after exposure to a traumatic event. We were particularly interested in three key questions. First, we investigated whether low SEP individuals were at higher risk of posttraumatic stress disorder (PTSD) than those with high SEP and if this could be explained by their greater exposure to daily life stressors.[19, 27] Second, we assessed whether low SEP individuals differed from high SEP in PTS symptomatology after a traumatic event. Third, given its key role in predicting PTSD,[5, 49] we were interested in how social support might influence the relation between SEP and PTS – specifically, whether social support might buffer socioeconomic vulnerability to traumatic-event-related psychological distress. This chapter reviews findings for each dissertation aim, discusses how they compare with past studies, and theorizes about how we might explain our findings using biological and epidemiological evidence in the literature. Overall

strengths and limitations to these studies and potential directions for future research follow.

In Chapter 2 we presented evidence that low SEP is associated with greater risk of PTSD, which is consistent with studies of SEP and other mental illness.[16, 20, 37-38] Although low SEP persons were more likely than high SEP persons to experience events related to assaultive violence – events that are more likely to result in psychopathology[10, 12] – this greater exposure to assault did not appear to explain SEP differences in risk of PTSD in the study population. Instead, low SEP persons seemed more vulnerable to PTSD after experiencing a traumatic event than were high SEP persons; greater burden of exposure to additional acute and chronic stressors reported among low SEP persons such as unemployment, difficultly accessing healthcare, and other financial problems explained the largest portion of the additional risk of PTSD among low SEP persons. This is also consistent with an extensive literature on the role stressful events play in explaining socioeconomic disparities in other mental illnesses.[19-20, 28] These studies cite biological mechanisms that link stressors and mental illness, positing that life stressors may be accompanied by elevated levels of physiological arousal, which can cause psychological wear and tear over time and result in vulnerability to psychological distress.[19, 66] In the context of PTSD, in particular, Yehuda et al[82] explored the influence of recent stressful events on PTSD risk and severity among traumatized individuals, informed by earlier evidence that additional stress may bring about or reactivate symptoms of PTSD.[83] They found that exposure to lifetime and current stressors was associated with greater presence and severity of PTSD from a different traumatic event experience. A more recent longitudinal study of PTSD among New Yorkers noted that

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the number of ongoing life stressors that are not generally thought of as "traumatic events" such as divorce or unemployment predicted the development of PTSD from an earlier traumatic event.[16] This evidence supports our finding that the disproportionate burden of stressors experienced by low SEP individuals may contribute to their psychological vulnerability to traumatic event experience.

Chapter 3 examined the relation between SEP and PTS severity, modeling PTS as a continuous variable as opposed to a dichotomous one. This analysis was predicated on evidence that PTS may be better characterized as a dimensional rather than a categorical construct.[42] We found that low SEP persons reported more severe PTS symptoms than high SEP persons. In models that included all income and education categories, burden of life stressors appeared to explain a large portion of this greater severity for most of the lower SEP groups (compared to the highest SEP group). However, even after controlling for life stressors, the lowest income persons still had greater mean PTS score than those with the highest income. This finding suggests that there may be additional vulnerability to PTS among the most disadvantaged persons that we were unable to test with the available data. For instance, other psychological factors that can protect against mental illness such as positive coping and optimistic outlook have been found to be less prevalent among low SEP persons.[18] These factors may account for some of the association between SEP and PTS severity that remained in our study. Our findings also suggest weaknesses in the conceptualization of PTS as a distinct disorder. Low SEP persons were more likely than high SEP persons to report a level of PTS symptoms just below commonly used cutoffs that determine presence of disorder. Symptoms at these subthreshold levels have also been associated with substantial functional impairment.[9]

Categorizing respondents into cases and non-cases of PTSD, then, may obscure

meaningful socioeconomic differences in psychological burden after exposure to a

traumatic event.

Chapter 4 highlighted the role of social support as a potential modifier of the

relation between SEP and PTS. We found that socioeconomic differences in PTS were

smaller among those with high levels of social support compared to those with low levels

of social support, although tests for interaction between SEP and social support yielded

results that were not significant at the 0.05 level. Though not definitive, our findings

suggest that high levels of social support may lessen low SEP vulnerability to

psychopathology after a traumatic event. This might be explained by evidence that

having adequate social support protects against negative psychological consequences of

stressful situations by preventing or eliminating a person's reaction to that stressful event

or influencing neuroendocrine processes in such a way to reduce physiological reactivity

to the stressor.[52] Having adequate levels of social support, then, may help low SEP

individuals cope with their greater burden of stressors and reduce the negative

psychological effects of the stressors that leave them more vulnerable than their high SEP

counterparts to mental illness. Although this study used two measures of social support –

one structural and one functional – both appeared to function similarly as buffers of the

socioeconomic disparity in PTS. Some studies suggest that different types of social

support influence health through distinct mechanisms and argue that functional social

support plays a greater role in protecting health in the face of stress life events.[52]

However, social support measures are generally correlated, i.e. those who report high

levels of structural social support also report high levels of functional support.[52]

Therefore, that we found a similar relation between SEP, social support, and PTS regardless of the support measure is not surprising.

One key strength of this work was its use of longitudinal data. Studies that assess the influence of SEP on health are often limited by temporal ambiguity in their findings. Early studies that found an association between SEP and various health outcomes cited theories of social causation and social selection to explain these relations. The idea that stressors might explain the association between SEP and mental health supported the social causation argument, that having low SEP is a risk factor for mental illness. Others argued that the SEP-mental health relation was due to persons suffering from mental disorder drifting into lower SEP groups because of their inability to work or pursue educational opportunities.[23] We were, however, able to establish SEP level at baseline and assess traumatic event exposure and symptoms of PTS after following respondents for one year, as well as control of history of mental illness at baseline, allowing us to be certain of the temporal relation between SEP and PTS in our study and to support the theory of social causation. Recall bias is also a concern in studies of social support and mental illness. It is thought that finding an association between low social support and greater psychological distress may only reflect negative attitudes about interactions with others due to suffering associated with having a psychological illness.[5] Individuals with a mental disorder may also become isolated from others due to their symptoms and therefore, lose the support from others they may have once had. In this study, we were also able to establish level of social support (both structural support and perceived functional support) at baseline, before the participant experienced the traumatic event we assessed in the follow-up study. This study design, as well as our ability to control for

history of mental illness reported at baseline, eases our concern about recall bias. Additionally, use of a structured instrument to evaluate symptoms of PTS that has been validated in the study population[60] lends additional support to our findings.

There are some issues that should be considered when interpreting the results of this study. First, although the response rate for the study was similar to that of other telephone-based studies,[84] it was fairly low (53.0%), which may leave study results open to bias. Lower response and participation rates have been reported in scientific research over the years due to decreasing desire to volunteer and the increasing number of requests for study participation.[84] This is a challenge to all current and future survey research. Our results might be biased if participation in the study was associated with the outcome of interest (here, PTS) and this association was different for exposed and unexposed persons (low vs. high SEP persons). It is possible that those with PTS were less likely to participate in the study because they do not feel well enough to complete the survey. This may be case more often among low SEP individuals, who tend to suffer from more severe mental illness (and as we have shown here, PTS). However, excluding these low SEP persons with PTS would have led us to underestimate the strength of the association between SEP and PTS and report more conservative results. Additionally, finding that the distributions of key demographic variables in our study were not statistically significant from those estimated using Census data of Detroit also reassured us that the study population was representative of Detroit population.

Second, the study excluded individuals who did not have a telephone or could not be contacted via mail. These people are likely to be the most disadvantaged and may experience the greatest burden of traumatic and stressful events and psychopathology.

However, we do not feel that exclusion of these individuals would alter our results drastically because the study did include severely disadvantaged individuals (116 participants [11% of the study population] reported income < $10,000/year for the entire household, which is well below the 2008 federal poverty line, $17,600).[58] Additionally, if we had been able to include those individuals unavailable through telephone or mail contact – who likely suffer from greater psychopathology – we may have found a stronger effect size of SEP on PTS. Again, the results shown here may be an underestimation of the true association between SEP and PTS in the Detroit population.

Finally, the city of Detroit is a unique urban environment with a distinctive history. It is a place that has, more than other U.S. cities, experienced substantial population and economic decline. This population, therefore, may differ from other populations by characteristics that may function as effect modifiers of the relations evaluated in this study. One factor that distinguishes Detroit from other U.S. cities is its racial/ethnic distribution. Almost 90% of the Detroit population reports their race as black or African American, compared to approximately 25% in New York City.[76] To our knowledge, however, race has not been shown to modify the relation between SEP and PTS in previous studies.

Ultimately, context plays an important role in all analyses and poses challenges to the application of study findings across populations. The results of this study, therefore, are illustrative without being definitive. They do, however, offer evidence of important mental health disparities that may be reduced through appropriate intervention. Although our results may be generalizable to other predominantly African-American urban

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populations, we encourage others to consider population differences when generalizing results from this study.

This dissertation identified socioeconomic disparities in psychopathology after a traumatic event and potential mechanisms that link low SEP to greater burden of PTS, namely exposure to additional stressful life events. This work also suggests that socioeconomic vulnerability to PTS may be reduced in the context of adequate social support. The findings of this work, though consistent with existing literature on SEP and mental health, are novel in that they highlight vulnerability to PTS that has not been addressed in the PTS literature. This study does, however, leave some questions unanswered. Several avenues of future research might further our knowledge of psychological vulnerability after traumatic events. First, studies might examine other factors that may explain greater severity of PTS symptoms among the most disadvantaged individuals such as coping ability; these studies may provide information helpful in tailoring treatment to specific populations. Second, given our finding of SEP differences in PTS at symptom levels that may not be considered PTSD but may be accompanied by substantial impairment, additional research into risk factors for subthreshold or partial PTSD may uncover populations who suffer disproportionately from psychological distress after a traumatic event experience. Efforts to further explore the potential buffering role of social support on SEP vulnerability may also be fruitful. Finally, although we hypothesized how stressful life events and social support might impact differences in PTS burden between low and high SEP persons, we might obtain support for our findings through further research into the biological mechanisms through which these factors influence PTS vulnerability.

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