A systematic review of socioeconomic status measurement in thirteen years of US injury research

Paula Yuma-Guerrero, a,∗ Rebecca Orsi, a Ping-Tzu Lee, a Catherine Cubbin b

a Colorado State University, College of Health and Human Sciences, School of Social Work, 127 Education, 1586 Campus Delivery, Fort Collins, CO 80523-1586, United States
b The University of Texas at Austin, School of Social Work, Austin, TX, United States

Objective: The purpose of this review was to assess the impact of socioeconomic status (SES) on injury and to evaluate how US injury researchers have measured SES over the past 13 years in observational research studies.

Design & methods: This systematic review included 119 US injury studies indexed in PubMed between January 1, 2002 and August 31, 2015 that used one or more individual and/or area-level measures of SES as independent variables. Study findings were compared to the results of a previous review published in 2002. Results: Findings indicate SES remains an important predictor of injury. SES was inversely related to injury in 78 (66%) of the studies; inverse relationships were more consistently found in studies of fatal injury (77.4%) than in studies of non-fatally injured (58%). Approximately two-thirds of the studies (n = 73, 61%) measured SES along a gradient and 59% used more than one measure of SES (n = 70). Studies that used a gradient measure of SES and/or more than one measure of SES identified significant relationships more often. These findings were essentially equivalent to those of a similar 2002 review (Cubbin & Smith, 2002). Conclusions: There remains a need to improve measurement of SES in injury research. Public health training programs should include best practices for measurement of SES, which include: measuring SES along a gradient, selecting SES indicators based on the injury mechanism, using the smallest geographic region possible for area-level measures, using multiple indicators when possible, and using both individual and area-level measures as both contribute independently to injury risk. Area-level indicators of SES are not accurate estimates of individual-level SES. Practical applications: Injury researchers should measure SES along a gradient and incorporate individual and area-level SES measures that are appropriate to the injury outcome under study.

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1. Introduction

The association between socioeconomic status (SES) and health outcomes has been observed for decades, and continues to be a major area of investigation in many areas of public health (Glymour, Avendano, & Kawachi, 2014). One of the four overarching goals of Healthy People 2020 is to achieve health equity, eliminate disparities, and improve the health of all groups; within this goal, disparities are defined as a type of health difference that is closely linked with social, economic, and/or environmental disadvantage (U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2015). Despite research and prevention efforts, injuries continue to disproportionately affect individuals and neighborhoods with lower SES (Centers for Disease Control and Prevention [CDC], 2013; Cubbin, LeClere, & Smith, 2000).

1.1. Definition of injury

The World Health Organization defines injury as “the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy” (Holder et al., 2001). In the United States in 2015, injuries were the leading killer of people ages 1 to 44, accounting for 214,008 deaths and 31.8 million emergency room visits (CDC-National Center for Injury Prevention and Control, 2017). Over 3 million of these individuals received further hospital or rehabilitation care; and injuries were responsible for 671 billion dollars of total lifetime medical and work loss costs (Florence, Haegerich, Simon, Zhou, & Luo, 2015).

1.2. Definition of SES

While there is no single definition of SES, and there is no one standard for measurement (Oakes & Rossi, 2003), for the purposes of this review this general definition is used: “SES is an indicator of an individual’s social and economic standing in society and often is determined by a combination of ratings on occupational status, income level, and education (Cralley, 2007).” SES is considered an important...
predictor of health and wellbeing across public health disciplines (Glymour et al., 2014). Individuals with high SES are likely to have more advanced education, work in prestigious positions, and earn higher salaries than individuals with low SES. These individuals have greater access to resources that can contribute to their success and to the perpetuation of similar benefits for their families (Cralley, 2007, p. 928).

SES shows a consistent inverse relationship with many types of injury (Bell, Arrington, & Adams, 2015; Denney & He, 2014). The pathways between SES and injury, as well as other health outcomes, may be causal, can indicate reverse causation (e.g., greater exposure to injury lessens one’s ability to earn money or advance one’s education), and can be confounded by third variables (Glymour et al., 2014). For example, individuals with lower educational attainment and family wealth are more likely to work in jobs with higher injury risk, such as construction, production, and mining than individuals from higher SES backgrounds (Krieger, 2010); these jobs also pay less, and during times when workers are injured, they may earn nothing at all. Children from families with lower SES are less likely to be restrained in child safety seats than children from families with higher indicators of SES (Macy & Freed, 2012). Lower safety seat utilization among families with fewer financial resources is attributable to a multitude of socioeconomic factors, including: income, which can affect the family’s ability to purchase a seat (Winston, Chen, Smith, & Elliott, 2006); education, which can impact both using the seat correctly and access to the recommendations for child passenger safety (Bilston, Finch, Hatfield, & Brown, 2008; Wegner & Girasek, 2003; Winston et al., 2006); and sociocultural norms about use of child safety seats in the community (Johnston et al., 2008; Macy & Freed, 2012). Among other factors, in other words, there is not always a clear causal link between particular measures of SES and injury, rather there is a “web of causation” between SES and injury.

1.3. Methodological considerations for the measurement of SES

A number of individual- and household-level variables have been used to assess SES in injury research (Cubbin et al., 2000), including income, educational attainment, occupational or employment status, health insurance status, and wealth. Studies also employ area-level measures of SES such as poverty, concentrated poverty, income inequality, unemployment rates, and educational attainment: Each of these factors varies in terms of their ease of measurement; usefulness, meaning and relationship to health status overall and injury risk specifically. Use of inadequate measures of SES in health and injury research is widespread (Braveman et al., 2005; Cubbin et al., 2000; Shavers, 2007). This occurs for many reasons, but commonly this is due to a lack of available data or insufficient inclusion of appropriate measures (or conceptualization of the measures) for the causal pathway under investigation (Braveman et al., 2005; Shavers, 2007). Additionally, while SES is often operationalized in a binary way that compares individuals considered to be poor to those who are not, it is important to note that SES generally has a graded association to health outcomes (Adler et al., 1994).

Studies of racial/ethnic disparities in injury require accounting for the role of SES. Severe socioeconomic disparities between racial/ethnic groups persist, causing potential confounding by socioeconomic variables in studies comparing injury and health outcomes between racial groups (Kauffman, Cooper, & McGee, 1997). As SES is often inadequately measured and/or poorly conceptualized in studies of health, racial/ethnic differences in health often persist after controlling for socioeconomic variables (Cubbin & Smith, 2002). As stated by Oakes and Rossi (2003, p. 770), in the absence of appropriate measurement of SES, “racial/ethnic disparities may continue to be construed as signs of genetic differences or behavioral choices rather than powerful clues about how forms of racial discrimination and structural constraints, past and present, harm health.”

1.4. Purpose statement

Cubbin and Smith (2002) reviewed epidemiological, population-based studies investigating the link between SES and injury from 1960 to 2001. This review was intended to provide a critical examination of the methods and measures of SES in studies of injury; the results elucidated important methodological concerns. The purpose of the current study is to update this review to assess whether the U.S. injury research field has improved along the lines recommended by Cubbin and Smith in terms of accounting for the effects of SES. The topic remains important to the field, as there is evidence that SES disparities persist and may be widening across many health outcomes and across racial lines (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Laflamme, Hasselberg, & Burrows, 2010; Singh & Kogan, 2007).

2. Methods

2.1. Locating articles for review

On September 15, 2015 a search of the PubMed database (National Library of Medicine, 2012) was conducted using the following key injury Medical Subject Heading (MeSH) terms: “wounds and injuries,” “suicide,” “homicide,” “violence,” and “poisoning” and these SES terms: “socioeconomic factors,” “wealth,” “deprivation,” “crowding,” “housing,” “occupation,” and “rent.” Within PubMed the MeSH term “wounds and injuries” encompasses all types of bodily injury, as well as burns, submersion and drownings, asphyxia (suffocation) and a number of additional terms. Similarly, the MeSH term “socioeconomic factors” includes: employment and employment characteristics (e.g., career mobility, unemployment), family characteristics, education, income, poverty, and social class and conditions, among other relevant terms. The search terms “US, USA or United States” were added to eliminate many of the studies from other countries. This search returned 4,172 studies. Study abstracts, and the full studies when necessary, were reviewed to determine whether they met the inclusion criteria.

2.2. Inclusion criteria

Original, peer-reviewed studies from the United States were retained for analysis if they were: indexed in PubMed between January 1, 2002 and August 31, 2015, focused on predictors/correlates of an injury outcome, and included one or more individual or area-level measures of SES as independent, mediating, moderating, or control variables. Articles were eliminated if they were intervention studies, case reports, comments, controlled trials, reviews or meta-analyses. Studies with an outcome variable such as violence, crime, abuse, maltreatment, suicide attempt, or collision (as opposed to actual injuries) were eliminated because injuries did not necessarily occur during these events. Studies of alcohol or drug overdose with no physical injury were not included. Studies where there could be no or very little variation in SES, including studies of institutionalized populations (e.g., prisoners) or occupational studies of a single occupation, and studies which only conducted descriptive analyses of the SES variables, were not included. Studies from the military were retained if rank and/or another measure of SES was utilized. Similarly, in studies of occupational injury, the studies were retained if there was a hierarchical assessment of the occupations (as opposed to a listing of occupations) or another measure of SES. Studies of poisoning were included as the prevention of poisoning often falls within the purview of injury prevention professionals, and are included in the scope of the CDC’s National Center for Injury Prevention and Control (CDC - NCIPC, 2015). As the primary focus was individual and area measures of SES, studies that only examined large macro-level SES, such as gross domestic product or state/national unemployment rates, were eliminated. Studies of injuries secondary to a medical condition, such as cancer or osteoporosis, were eliminated.
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