

Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes

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Abstract

Many of the leading causes of death and disability in the United States and other countries are associated with socioeconomic position. The least well-off suffer a disproportionate share of the burden of disease, including depression, obesity, and diabetes. Research suggests that the adverse effects of economic hardship on both mental and physical health and functioning are evident at young ages and persist across the lifecourse. Moreover, these associations are seen across cultures. Data from four large

epidemiologic studies on the role of psychological characteristics, social factors, and behaviors in health and disease risk are presented that highlight the striking associations between socioeconomic factors and chronic diseases. Data from these studies demonstrate that the effects of economic disadvantage are cumulative, with the greatest risk of poor mental and physical health seen among those who experienced sustained hardship over time. © 2002 Elsevier Science Inc. All rights reserved.

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Introduction

Many of the leading causes of death and disability in the United States and elsewhere are related to socioeconomic position. Indeed, it has long been recognized that individuals of lower socioeconomic status (SES) suffer a disproportionate share of the burden and consequences of numerous diseases, relative to those who are of higher SES [1–3]. In addition, there is a social gradient or dose–response relationship between SES and health status, with individuals at the highest levels of SES experiencing the best health, those at the next level having slightly worse health and so on, with the worst health seen among those at the lowest SES [4]. While this observation that health is patterned by SES is very longstanding, it is important to note that the association between SES and various health outcomes has become a topic of study in its own right over the past three decades [5].

The goal of this paper is to present epidemiological evidence for the important role that SES plays in depression, obesity, and diabetes. An association between SES and these chronic diseases is highly plausible, given what is known about the mechanisms that underlie these disorders. For example, low SES individuals may be at increased risk of depression, obesity, and diabetes because of unhealthy behaviors. Factors ranging from limited availability of affordable, nutritious foods in the local supermarkets to threatening neighborhoods to the greater stress that accompanies the economic uncertainties faced by low-SES individuals may contribute to the greater prevalence of smoking, higher alcohol consumption, poorer diets, and more sedentary lifestyles reported by lower SES groups [6]. The higher levels of stress experienced by low-SES individuals also may influence chronic disease risk via physiological mechanisms [7]. For example, acute and chronic stress activate the hypothalamo–pituitary–adrenal (HPA) axis, which triggers a cascade of neuroendocrine alterations that can play a role in depression, fat metabolism, and insulin resistance. Detailed investigation of these or other putative mechanisms is beyond the purview of this paper; however, it is important to note the plausibility of these underlying factors in studying the association between SES and depression, obesity, and diabetes.

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SES and depression

Several studies have found that major depressive disorder and greater depressive symptomatology are more prevalent at lower levels of SES [8,9]. Data from the Alameda County Study, which is a community-based longitudinal study of psychological and social factors and their role in health and well-being in nearly 7000 adults from Alameda County, California [10], demonstrate a graded relationship between SES, measured by education or income, and both prevalent and incident depression. As shown in Fig. 1, the prevalence of depression, here defined as having five or more depressive symptoms based on an 18-item self-report questionnaire [11], was nearly twice as high in men and women with less than a high school education (21%), compared to those with a high school degree or more (12%). Those with 9–11 years of education also experienced a higher prevalence of depression compared to the more educated group. Defining SES by tertiles of household income yielded essentially the same pattern of results with 19% of lower income respondents reporting a high number of depressive symptoms compared to approximately 11% of higher income respondents.

Prior research from the Alameda County Study also shows a relationship between SES and incident depression. Among participants who were not depressed at the start of the study, those with less than 9 years of education were nearly twice as likely to become depressed over the next 9 years of follow-up, relative to those with a high school degree or more (OR = 1.86, 95% CI = 1.36–2.55). Men and women with 9–11 years of education also were significantly more likely to become depressed (OR = 1.53, 95% CI = 1.16–2.02) [12].

Fig. 2 highlights the relationship between depression and SES by graphing the association between three levels of education and the prevalence of depressive symptoms across four epidemiological studies. The similarity of the relationship between education and depression across the four studies is particularly striking in light of the populations included in those studies. The Alameda County Study included a community sample of 6928 adults from Alameda

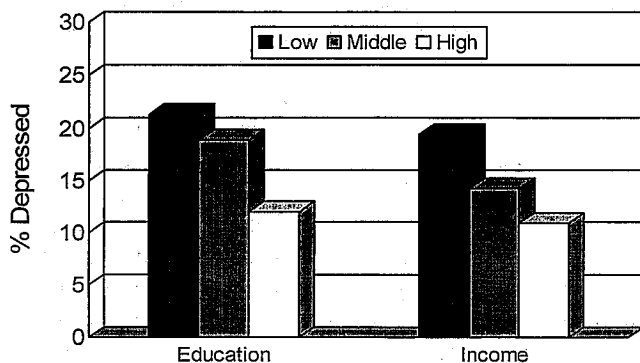


Fig. 1. Prevalence of depression by levels of education and income: Alameda County Study, 1965.

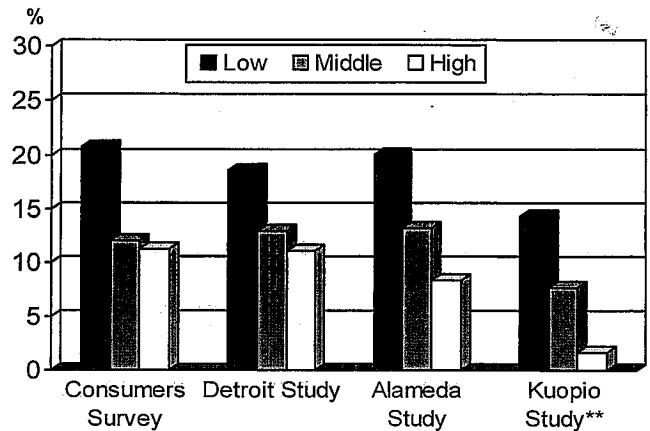


Fig. 2. Prevalence of depressive symptoms by education in four epidemiological studies. Education categories defined within each study. Data from the Kuopio Study represent hopelessness rather than overall depressive symptoms.

County, California that represented the demographic make-up of that community in 1965, when the study began [10]. The population included 78.9% Caucasians, 12.4% African Americans, and 3.9% Hispanics (with 4.8% reporting “other” racial/ethnic heritage or not identifying with a single racial/ethnic category) aged 17–94 years old in 1965. The Kuopio (Finland) Ischemic Heart Disease Risk Factor Study [13] included 2682 men from the Kuopio region of eastern Finland who were between 42 and 60 years old when they entered the study (between 1984 and 1989). This region is extremely homogenous and all participants in the study are Caucasian. The Detroit Study [14] includes 1139 participants from a three-county region that includes Detroit, Michigan. African Americans were oversampled in this study so the final sample included approximately equal numbers of Caucasians and African Americans. Data on attitudes, psychosocial characteristics, behaviors, and health were collected in 1995. The fourth study, the Consumers’ Survey, is a random-digit-dialing telephone survey that includes 1423 randomly sampled men and women from the contiguous 48 states [15]. The sample is weighted to be representative of the U.S. population according to race/ethnicity, age, and gender. The figure shows the proportion of respondents within each education group (low, middle, or high as defined within each study by years of completed schooling) that reported a high number of depressive symptoms. A clear, graded association between educational attainment and reported depressive symptoms can be seen across the four unique study populations, demonstrating the consistency of this relationship. Similar gradients are seen if income is used to define SES (data not shown).

SES and obesity

Obesity is a growing public health problem [16,17] and several sources indicate that rates of obesity are higher

among lower SES individuals [6,10]. We looked at obesity (defined as a body mass index [BMI] of 30 kg/m² or higher) rates in the Kuopio Study at the baseline exam, which occurred between 1984 and 1989, and in the Alameda County Study in 1983 (the data collection that corresponded most closely in time to the data collection in Kuopio). In the Kuopio Study, obesity rates were approximately 20%, 18%, and 14% for respondents with low, middle, and high levels of education, respectively [6]. Similarly, although the overall rates of obesity were higher in Kuopio (approximately 17% vs. 10% in Alameda), an obesity–SES gradient also was observed in Alameda County [10]. The prevalence of obesity in Alameda County was nearly 15% in the participants with a low level of education, 12% in those with a moderate level of education, and less than 9% among the best-educated respondents. These data are shown in Fig. 3.

Unpublished data from the Alameda study, which included five waves of data collection between 1965 and 1999, also show that participants have gained substantial weight over the course of the study and that these increases are related to SES, with the least educated respondents showing the greatest weight gain (P. Baltrus, personal communication, December 2001). This is consistent with other research showing that low education is associated with greater weight gain over time in young and middle adulthood [18].

SES and diabetes

Given that obesity is one of the strongest predictors of Type II diabetes, it is not surprising to learn that the prevalence of Type II diabetes also is related to several indicators of SES. Numerous studies have found an inverse relationship between Type II diabetes and education, occupation, and income that is consistent across all adult age groups [19–22]. Robbins et al. [22], who used data from the Third National Health and Nutrition Examination Survey, found that the poverty income ratio (annual family income

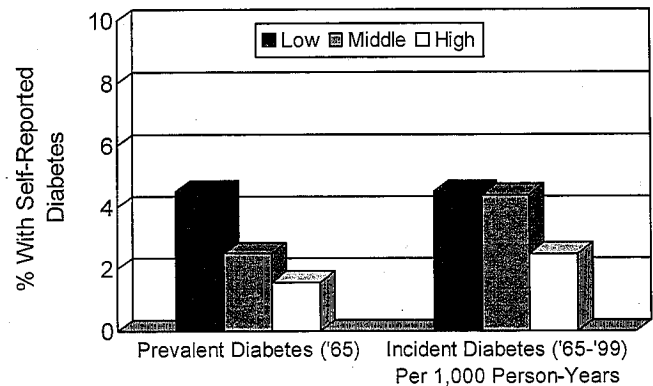


Fig. 4. Baseline prevalence and 34-year cumulative incidence of diabetes by level of education: Alameda County Study, 1965–1999.

divided by the federal poverty line) showed the strongest associations with prevalent diabetes. They also found consistent associations among women but not among men, although other studies have also reported the SES–diabetes association in men [21,23].

In the Alameda County Study, 2.3% of participants reported they had diabetes at the baseline examination in 1965; however, the highest prevalence of diabetes was reported by respondents of low SES (S. Maty, personal communication, January 2001). Indeed, men and women with less than 9 years of education had nearly three times greater prevalence of diabetes at baseline than those with at least a high school degree. The prevalence of self-reported diabetes was 4.5%, 2.5%, and 1.6% for respondents with low, moderate, and high levels of education, respectively. Similarly, the risk of developing diabetes over time is related to SES. Among the 6647 participants from the Alameda County Study who were initially free of diabetes, 5.1% developed diabetes in the subsequent 34 years and the risk of developing diabetes (again assessed via self-report) was more than 80% greater for the least educated respondents, compared to the best educated respondents (relative hazards ratio = 1.83, 95% CI = 1.33–2.53; $P < .0002$), after adjustment for age. Data for both prevalent and incident diabetes (per 1000 person-years) among Alameda County Study participants are shown in Fig. 4.

Cumulative effects of SES

In recent years, research has started to examine the cumulative effects of economic stress or disadvantage across the lifecourse and how such effects impact both physical functioning and mental health. The hypothesis underlying this work is that repeated exposure over time to the negative consequences associated with poorer socio-economic circumstances leads to significantly worse health outcomes. Published data from the Alameda County Study and Kuopio Study support this hypothesis. Lynch et al. [24] looked at the relationship between the number of times

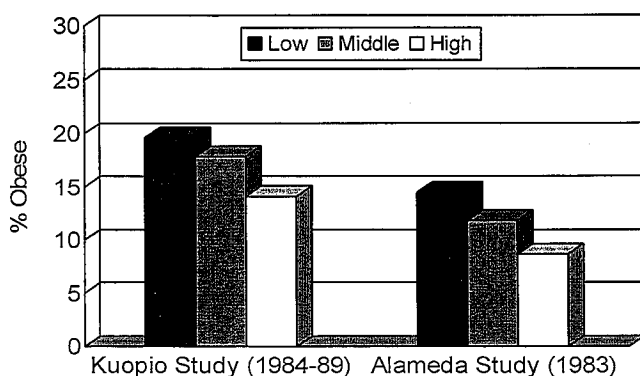


Fig. 3. Prevalence of obesity by level of education.

Alameda County Study respondents were less than 200% of the federal poverty line in the first three waves of data collection for that study (1965, 1974, and 1983) and their physical and mental health status in 1994 at the fourth wave of data collection. With respect to mental health or psychosocial functioning, respondents who reported being below 200% of the poverty line at each of the first three data collection points were 2.5 times more likely to suffer from clinical depression, and four times more likely to report high levels of cynicism and pessimism than those who had never experienced poverty, *after* controlling for age, sex, and prevalent chronic diseases. Interestingly, the associations were graded such that persons that reported poverty one or two times showed worse psychosocial functioning than those never in poverty, but better functioning than those in poverty three times. Similar patterns were observed for physical health status, with the highest levels of functional disability, obesity, diabetes, and cardiovascular diseases seen among those reporting poverty most frequently. Moreover, results were maintained when analyses were limited to the subset of respondents who were <50 years of age and in good or excellent health at the start of the study, thereby refuting the possibility that initial poor health led to poverty.

Work by Lynch and colleagues [25–27] with the Kuopio Study shows related patterns of association between SES over the lifecourse and psychosocial functioning in men at midlife. Among participants in the Kuopio Study, those who experienced lower SES in childhood *and* lower SES in adulthood, as defined by adult income, had a greater prevalence of hopelessness and depression and cynicism in middle age, compared to men of higher SES. Men who moved into a higher SES level in adulthood after experiencing lower SES in childhood also reported more hopelessness, depression, and cynicism, showing a residual effect of poorer circumstances early in life. Together, these studies clearly demonstrate cumulative effects of low SES on psychosocial functioning and chronic disease risk.

Summary

Depression, obesity, and diabetes impose an enormous public health burden and, thus, it is particularly critical to identify risk factors for these disorders. It is predicted that depression will be one of the two leading causes of disability by the year 2020 [28]. Rates of obesity have increased dramatically over the past decade in the United States [29], despite our knowledge of the importance of diet and physical activity and maintaining a healthy body weight. Coincident with rising rates of obesity, the rates of diabetes in the population also are increasing [30]. Each of these disorders is associated with several other health risks and chronic diseases, including cardiovascular disease, which is the leading cause of death in the United States

and most industrialized societies. The data summarized herein present consistent epidemiological evidence demonstrating that depression, obesity, and diabetes are associated with socioeconomic position, with the greatest burden of disease shouldered by the least well-off. Moreover, SES patterning of disease is evident early in life and persists across the lifecourse, and associations are seen across cultures and racial/ethnic groups. Ignoring the important role that SES plays in these chronic diseases will lead to an incomplete understanding of the health risks associated with depression, obesity, and diabetes.

Nevertheless, more detailed research is needed to fully characterize the prospective relationship between SES and incident disease. In particular, much remains to be learned about the underlying mechanisms that may mediate the observed associations. As noted, physiological factors related to stress mechanisms as well as behavioral factors such as physical activity, diet, and alcohol consumption may be important mediators of the relationship between SES and depression, obesity, and diabetes. Other factors such as social support, psychosocial stress, and access to health care also may be critically involved in these relationships. One study found that the association between low SES and obesity in middle-aged women was largely accounted for by unhealthy dietary habits, reproductive history, and psychosocial factors such as job strain and low self-esteem [31]. Prior research on socioeconomic differentials in cardiovascular disease morbidity and mortality point to psychosocial stress and lifestyle and behavioral characteristics as important mediating mechanisms [7,32]. In addition, one intriguing study suggests that impaired sleep duration and quality, which are associated with altered glucose metabolism and HPA function, may partially mediate the adverse impact of SES on health outcomes [33]. It remains a task of future research to determine whether these same mechanisms mediate the observed relationships between SES and depression, obesity, and diabetes across various populations. Moreover, future studies also will determine whether similar or unique pathways link SES to these three chronic diseases. Such knowledge will be particularly critical to devising successful interventions that may serve to reduce the burden of disease in the most vulnerable segments of our society.

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