Socioeconomic and behavioral risk factors for mortality in a national 19-year prospective study of U.S. adults

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ABSTRACT

Many demographic, socioeconomic, and behavioral risk factors predict mortality in the United States. However, very few population-based longitudinal studies are able to investigate simultaneously the impact of a variety of social factors on mortality. We investigated the degree to which demographic characteristics, socioeconomic variables and major health risk factors were associated with mortality in a nationally-representative sample of 3617 U.S. adults from 1986 to 2005, using data from the 4 waves of the Americans' Changing Lives study. Cox proportional hazard models with time-varying covariates were employed to predict all-cause mortality verified through the National Death Index and death certificate review. The results revealed that low educational attainment was not associated with mortality when income and health risk behaviors were included in the model. The association of low income with mortality remained after controlling for major behavioral risks. Compared to those in the "normal" weight category, neither overweight nor obesity was significantly associated with the risk of mortality. Among adults age 55 and older at baseline, the risk of mortality was actually reduced for those were overweight (hazard rate ratio = 0.83) and those who were obese (hazard rate ratio = 0.68), controlling for other health risk behaviors and health status. Having a low level of physical activity was a significant risk factor for mortality (hazard rate ratio = 1.58). The results from this national longitudinal study underscore the need for health policies and clinical interventions focusing on the social and behavioral determinants of health, with a particular focus on income security, smoking prevention/cessation, and physical activity.

Introduction

Several decades of research conclude that mortality is strongly patterned by a number of sociodemographic variables including gender, race/ethnicity, and residential setting (Adler & Ostrove, 1999; Geronimus, Colen, Shochet, Ingber, & James, 2006; Sorlie, Backlund, & Keller, 1995). Prior research has also shown that socioeconomic position—meaning the social and economic factors that influence the positions/roles individuals hold within the structure of society, and as measured by education, income, occupational status, and/or wealth—is strongly associated with mortality (Davey Smith, Shipley, & Rose, 1990; Gerdtham & Johannesson, 2004; Kallan, 1997; Lauderdale, 2001). Across countries, socioeconomic patterns are seen for all-cause mortality and for specific causes of death, including cardiovascular disease and cancer (Faggiano, Partanen, Kogevians, & Boffetta, 1997; Fried et al., 1998).

Socioeconomic position is theorized to be a "fundamental cause" of health, whereby higher socioeconomic status confers the intra-personal, interpersonal, and contextual resources needed to more effectively produce and maintain health over the life course (Adler & Newman, 2002; Phelan, Link, Diez-Roux, Kawachi, & Levin, 2004). As a fundamental driver of the way in which societies shape health-related exposures and resources, socioeconomic position is purport-edly related to mortality risk through multiple mechanisms at both the individual and contextual level. This includes income, wealth, education, occupation, medical care, and other resources that allow people to identify and avoid environmental and personal health risks.

A prominent hypothesis in attempting to explain socioeconomic disparities in mortality is that people of lower socioeconomic position have worse health in large part because they are more likely to engage in risky health behaviors that help people to avoid or reduce these risks (Adler & Newman, 2002; Phelan et al., 2004;

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Syme, 2008). That is, socioeconomic position produces disparities in knowledge, cognition, exposures, resources and social relationships that in turn lead to different behavior and risk factor profiles across social strata.

Personal health risk factors such as smoking, alcohol abuse, sedentary lifestyle, poor nutrition, and morbid obesity have indeed been found to increase overall mortality risks and to be more prevalent among those of lower socioeconomic position (Flegal, Williamson, Pamuk, & Rosenberg, 2004; Marugame et al., 2007; Mukamal, 2006; Rehm & Monterio, 2005). However, prior research from longitudinal studies suggests that the higher prevalence of health risk factors in socially disadvantaged populations explains some but not all observed socioeconomic differentials in health status and mortality (Arendt & Lauridsen, 2008; Bassuk, Berkman, & Amick, 2002; Feinglass et al., 2007; Lantz et al., 1998). In addition, it is not always the case that groups in lower strata have higher rates of health risk behaviors. For example, Rosero-Bixby and Dow (2009) found in a longitudinal study of elderly Costa Ricans that high calorie diets, obesity and hypertension were most prevalent in higher socioeconomic groups.

Although there is a significant amount of prior population-based research regarding the socioeconomic determinants of mortality, there are some limitations in prior work, including research that aims to better understand these phenomena in the United States. First, although there are several longitudinal mortality studies of population-based samples, most have limited generalizability in that they are restricted to a specific age group (e.g., the Health and Retirement Study) or geographic area (e.g., the Alameda County Study) (Feinglass et al., 2007; Frank, Cohen, Yen, Balfour, & Smith, 2003; Wulsin et al., 2005).

Second, much of the published social epidemiological literature on mortality focuses on one particular social characteristic (e.g. race, education, gender) and/or one cause of death at a time (Meara, Richards, & Cutler, 2008; Mehrotra, Kermah, Fried, Adler, & Norris, 2008; Miller & Wolinsky, 2007; Muntaner, Hadden, & Kravets, 2004; Willcox et al., 2006). This can lead to myopic or even erroneous conclusions about the important drivers of mortality. For example, it is difficult to measure and understand educational disparities in mortality without simultaneously considering income; and a growing body of literature suggests that education and income influence health in related yet different ways (Herd, Goesling, & House, 2007; Zimmer & House, 2003). Nonetheless, many mortality studies focus exclusively on education as a single marker of socioeconomic status (Avendano et al., 2006; Elo & Preston, 1996; Meara et al., 2008).

Third, many studies investigate a broad array of demographic and socioeconomic differentials in mortality but do not include any information on health risk behaviors/exposures or just focus on one factor at a time (Lin, Rogot, Johnson, Sorlie, & Arias, 2003). For example, many of the studies estimating the impact of obesity on mortality risk likely overestimate risk because they do not control for other factors that are strongly correlated with obesity, such as physical activity and socioeconomic status (Freedman, Ron, Ballard-Barbash, Doody, & Linet, 2006; Sui et al., 2007).

Related to the hypothesis that socioeconomic disparities in behavioral risk factors are the driving force behind disparities in mortality, the literature for the U.S. experience is in fact quite limited. The two main studies on this topic that use nationally-representative, longitudinal samples are from the Health and Retirement Study (Feinglass et al., 2007) which focuses on an older population, and an older study from the American Changing Lives Study (Lantz et al., 1998) focusing on mortality between 1986 and 1994.

In this research, we extend prior research from the longitudinal, population-based Americans' Changing Lives (ACL) Study to investigate the interplay between major socioeconomic and behavioral factors that influence individuals' risk of mortality across the life course. Research questions included: 1) what are the demographic and socioeconomic patterns in adult all-cause mortality in the United States between 1986 and 2005 when all are controlled for simultaneously?; 2) to what extent are health risk behaviors related to mortality risk, and do these behaviors explain the observed demographic and socioeconomic disparities in mortality?; and 3) do socioeconomic and behavioral risk factors for mortality vary across younger and older age groups?

This work builds upon and significantly extends prior mortality research using the ACL data from 7.5 years to 19 years of follow-up (Lantz et al., 1998). The main findings include that low income (but not low education or race) remained predictive of mortality when controlling for major health risk behaviors. In addition, the risk of death is not associated with obesity or overweight; and among those age 55 and older at baseline, mortality rates were significantly *reduced* for those who were overweight or obese. Physical activity—even at relatively low levels—provided a protective effect against mortality. Our results add new and important findings to the extant literature and current public discourse regarding obesity. In addition, our results confirm and strengthen the evidence base of prior findings using a study design with a relatively long follow-up period and a nationally-representative sample.

Methods

Study design and sample

Data were from the Americans' Changing Lives (ACL) longitudinal study, which was designed to investigate social patterns of health and aging in the United States. The ACL used a stratified, multistage area sample of non-institutionalized adults age 25 and older residing in the United States in 1986. African Americans and persons age 60 and older were oversampled at baseline. The first wave of data collection (1986) used face-to-face interviews with 3617 subjects, representing a 68% response rate. Three subsequent waves of data collection were conducted in 1989, 1994, and 2001/2002, with response rates among survivors of 83%, 83% and 74% respectively. Additional information on the organization and methods of the ACL survey are documented elsewhere (House, Herd, & Lantz, 2005; House et al., 1994).

Dependent variable

The dependent variable in this study is mortality between Wave 1 (1986) and December 31, 2005. Information on deaths among sample members was obtained primarily from the National Death Index and secondarily from informant reports, with deaths validated with death certificates from state vital registration offices (Sesso, Paffenbarger, & Lee, 2000). Between Wave 1 and the end of 2005, 1409 ACL respondents died (38.9%, or 26.0% of the weighted sample), with 98% certified with a death certificate. The remaining 25 deaths were carefully reviewed, and death appears certain in all cases even though a death certificate could not be located. For these cases, the timing of death was based on informant reports.

Independent variables

All independent variables were operationalized in ways consistent with prior cross-sectional and longitudinal analyses based on the ACL data (House et al., 1994, 2005; Lantz et al., 1998). Three independent variables were based on self-reported information obtained from the ACL Wave 1 in-person interviews in 1986. This included gender (male versus female); and education (measured as completed years of schooling at Wave 1, grouped into the three categories 0–11 years, 12–15 years, and 16 or more years).