RISING INCOME INEQUALITY AND THE SOCIOECONOMIC GRADIENT IN SELF-RATED HEALTH: AN EXAMINATION OF THE UNITED STATES FROM 1975 TO 2010

by

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ABSTRACT

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This study explores the relationship between socioeconomic status (SES) and health, and examines how that relationship may be affected in the context of rising income inequality. Using General Social Survey (GSS) data from 1975 to 2010 to perform a series of logistic regressions, this study examines the relationship between health and three common measures of socioeconomic status—household income, education, and occupational prestige—to determine if all three measures of SES are significantly associated with self-rated health when controlling for socio-demographic variables. Full model odds ratios are plotted by year to provide a visual illustration of the change in the association from 1975 to 2010, in the context of a significant increase in U.S. income inequality. Next, year interaction effects are considered for each SES measure to determine if there is a significant difference in the effect from the base year of 1975.

The study provides two major findings. First, household income and education are significantly associated with self-rated health across all years, but occupational prestige is not a significant predictor of self-rated health when controlling for household income and education. And secondly, there is no overall clear pattern in the change in the effect of household income,

education, or occupational prestige throughout all years of the study. However, the interaction effects, when compared to the base year of 1975, demonstrate a significant difference in the effect of income for some years between 1977 and 1991 and in the effect of education for some years between 1990 and 2006.

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CHAPTER 1

INTRODUCTION

The relationship between socioeconomic status (SES) and health has long been established in the field of medical sociology (Frank et al. 2003; Kennedy et al. 2007; Kitagawa and Hauser 1973; McDonough, Worts, and Sacker 2010; Olafsdottir 2007; Pappas et al. 1993; Ross and Wu 1995; Schnittker 2004; Siegrist and Marmot 2006; Williams 1990). Lower-SES groups are at risk of increased rates of mortality and infant mortality (Frank et al. 2003; Hajat et al. 2011; Pappas et al. 1993; Williams 1990), higher incidence of psychiatric conditions (Williams and Collins 1995), and higher morbidity (Banks et al. 2006, Frank et al. 2003). Kitagawa and Hauser (1973), in their foundational book on the association between mortality and socioeconomic factors, state that the association holds whether socioeconomic status is measured by education, income, or occupational prestige. However, socioeconomic status is typically measured in the United States using only one or two of these measures, primarily income and education (Goesling 2007; Gravelle 2003; Kennedy et al. 2007; Lynch et al. 2005; Pappas et al. 1993; Ross and Wu 1995; Schnittker 2004; van Doorslaer et al. 1997).

Further complicating matters, income inequality at the community, state, or country level may exacerbate the impact that socioeconomic factors have on health. There is a large body of literature examining whether and how income inequality at the macro level impacts health outcomes (Babones 2008; Deaton and Lubotsky 2003; Fiscella and Franks 1997; Lobmayer and Wilkinson 2000; Lynch et al. 2005; Mellor and Milyo 2001; Mellor and Milyo 2003; Subramanian and Kawachi 2006; Wilkinson 2006). A majority of this research has focused on aggregate measures of health, such as mortality (Babones, 2008; Daly 1998; Dowd et al. 2010; Lobmayer and Wilkinson 2000; Lynch et al. 2005), morbidity (Marmot and Wilkinson 2001; Mellor and Milyo 2001), and life expectancy (Babones 2008). However, there is a large

gap in the research concerning the modifying effect of rising income inequality on health, especially at the individual level. The relatively small body of literature that looks at the effect of income inequality on the socioeconomic health gradient focuses primarily on aggregate measures of health at single points in time. Furthermore, the literature regarding the impact of income inequality on the SES gradient in health, especially in the United States, focuses primarily on income and education as indicators of SES (Christ et al. 2012, Craig 2005; Dowd et al. 2011; Fiscella and Franks 1997; Stringhini et al. 2011; Subramanian and Kawachi 2006; Zheng and George 2012). Few recent studies examine the relationship between occupational prestige and individual-level health (Aldabe et al. 2011; Christ et al. 2012; Dahl 1994; Fujishiro, Xu, and Gong 2010; McDonough et al. 2010), and virtually no studies have been conducted on this relationship in the context of rising income inequality. Using data from the General Social Survey from 1975 to 2010, this study will examine the association between the three most common measures of socioeconomic status—income, education, and occupational prestige—and self-rated health, and how this association is modified by increasing levels of income inequality in the United States.

The aim of this study is to address two primary research questions. First, what is the association between SES and individual health when examining all three measures of SES simultaneously? And second, when all three measures of socioeconomic status are taken into account, what is the trend for the socioeconomic gradient in health in the context of rising inequality? In other words, is there a discernible trend in the relationship between measures of SES and self-rated health over time, particularly a time during which income inequality increased significantly? Examining the socioeconomic health gradient in the context of rising income inequality may provide a greater understanding of how to direct public policies and social programs in order to return the greatest benefits in reducing socioeconomic inequalities in health. As Marmot (2002) explains, the debate regarding income inequality and socioeconomic status, and their interrelated impact on health, is a question of poverty versus inequality. While

many governmental and social policies are aimed at reducing material deprivation (Marmot 2002; Waddan 2010), the key to reducing inequalities in health outcomes and improving the health of lower-SES individuals may lie instead in focusing on policies that reduce overall income inequality in a society.

This paper is organized as follows: In Chapter Two, I present the theoretical background that frames the study. This includes a literature review summarizing previous research on the association between socioeconomic status and health, both at the aggregate and individual levels, as well as across countries and throughout different periods of time. I then turn my focus to describing potential pathways between socioeconomic status and health outcomes. In Chapter Three, I summarize major changes in income inequality in the United States and throughout the world from 1970 to the present, and the existing literature on the association between income inequality and health. I also summarize the relatively small body of literature that examines the modifying effect of income inequality on the socioeconomic gradient in health. In Chapter Four, I describe the General Social Survey data used for this study, the dependent, independent, and control variables, and the method of data analysis. Chapter Five contains my findings from statistical analyses that indicate the relationship between various SES measures and health, as well as trends in the association between measures of socioeconomic status and health from 1975 to 2010. Finally, Chapter Six concludes the paper with the interpretation and discussion of my findings and suggestions for future research.

CHAPTER 2

THEORETICAL BACKGROUND

2.1 The Relationship between Socioeconomic Status and Health

The association between socioeconomic status (SES) and health outcomes—across societies and at different time periods—has been one of the most consistent findings in medical sociology (Olafsdottir 2007). Socioeconomic differentials in health persist even in developed countries, despite a decrease in infectious diseases, increased availability of adequate housing, water, nutrition, and sanitation, and more widespread social safety nets that provide medical care for the poor (Williams 1990). Numerous studies have described a link between SES and health using common measures of SES. Some examine the relationship along one measure only, typically either income (Frank et al. 2003; Gravelle 2003; Hajat et al. 2011; Petrou, Kupek, and Gray 2007; Sacker et al. 2007; Schnittker and Bhatt 2008; van Doorslaer et al. 1997), or education (Goesling 2007; Liu and Hummer 2008; Ross and Wu 1995). Other studies examine the simultaneous effect of both income and education on health (Banks et al. 2006; Kennedy et al. 2007; Lynch 2005; Olafsdottir 2007; Schnittker 2004). Only very recently have researchers begun to examine how all three measures of SES together affect health (Christ et al. 2012; Fujishiro et al. 2010; McDonough et al. 2010).

Use of occupational prestige as a socioeconomic measure is common in European countries but rare in the United States, where education and income are the favored measures (Christ et al. 2012; Dahl 1994). Fujishiro and colleagues (2010) hypothesize that this is because income and education represent access to material resources (income) and social resources (education), whereas the representation of occupational prestige is more ambiguous. European studies, which include the foundational Whitehall II study (Marmot and Smith 1991), have often used occupational prestige as a measure of SES, many times in combination with income and

education. In the Whitehall II study, researchers found strong health gradients among British civil servants, based on the grade of employment as defined by the British Registrar General's scale. Grade of employment in this instance was considered a measure of SES comparable to occupational prestige. In another European study, Dahl (1994) examined the link between SES and poor health among Norwegians, and found that even when controlling for education and income, occupational status was the most important and most consistent predictor of health outcomes, and that education was not a significant determinant.

The use of occupational status as a measure of SES in the United States has provided mixed results, and study findings are only now being released that are generalizable to the U.S. population. For example, Christ et al. (2012) state that theirs was the first generalizable study to examine the association between occupational prestige and mortality for U.S. workers. They found that when controlling for education and income, occupational prestige was a significant predictor of mortality, but only among white-collar workers and service occupations. Furthermore, among white-collar workers, the effect was significant only for men. Fujishiro et al. (2010), in a U.S. study that examined the relationship between SES and occupational prestige along with controls for education and income, found that higher occupational prestige was associated with better health outcomes.

In terms of health measures, studies in the relationship between SES and health use aggregate-level measures, such as mortality and morbidity, as well as individual-level measures, such as self-rated health, levels of depression and mental illness, individual risk for certain diseases, and so on. The following sections will discuss the current literature on the relationship between SES and both aggregate and individual-level measures of health.

2.1.1 Aggregate Measures of Health

At the aggregate level, studies have documented a consistent inverse relationship between socioeconomic status and mortality across diverse populations (Williams 1990). In

their foundational and exhaustive study of mortality in the United States, Kitagawa and Hauser (1973) found that the death rate for lower-SES groups was greater than for higher-SES groups, regardless of the measure used for SES (income, education, or occupation). This landmark study used U.S. Census data to examine national socioeconomic differentials in mortality, and for the first time allowed for examination of differences in mortality based on family income level (Dow and Rehkopf 2010). The study showed that for whites, mortality rates differed by as much as 105 percent between low- and high-SES groups, and for nonwhites, the difference was as much as 70 percent.

While overall mortality rates have declined in developed countries in recent decades for all SES groups, the poor continue to have higher death rates than their wealthier counterparts (Hajat et al. 2011; Pappas et al. 1993), and these differences have continued to increase over the past several decades. Pappas et al. (1993) examined the association between mortality rates and SES as measured by income and educational level in the United States and found that the differences in mortality have increased since 1960, regardless of race, sex, or family status.

In relation to aggregate measures of health, Dowd et al. (2011) assert that the socioeconomic gradient is often mistakenly envisioned as a linear relationship, which would imply that increases in income or educational level are associated with lower rates of mortality for the very poor and the very wealthy equally. However, in their examination of the shape of the relationship between income and mortality, they showed that the association between SES and mortality is non-linear; that is, additional income has a greater impact at the lower end of the SES distribution. Likewise, Williams and Collins (1995) document a socioeconomic threshold, generally around median income, beyond which there are diminishing returns. Frank et al. (2003) described a non-linear relationship between SES and health as well. They followed a cohort of 1190 men and 1302 women in Alameda County, California, over a 29-year period in order to examine morbidity rates for seven self-reported health outcomes in relation to income.

They found that while all of the gradients were inverse, with the poor reporting greater incidence of illness, the gradients tended to be non-linear, especially among the males in the study. The poorest men showed the highest rates of morbidity.

2.1.2 Individual-level Measures of Health

Individual-level measures of health demonstrate the same inequities in relation to SES. Dow and Rehkopf (2010) argue that measures of health at the individual level are more robust and generalizable indicators than aggregate measures of the association between SES and health. Self-ratings are a common measure of individual-level health in medical research, and are useful in capturing perceptions of health that are both broad and inclusive (Idler and Benyamini 1997). A review of 27 studies conducted by Idler and Benyamini (1997) shows that the measure of self-rated health is a reliable predictor of mortality. Other studies have shown that self-rated health is useful in predicting the onset of disability (Kennedy et al. 1998). Multiple studies find that higher SES is positively correlated with better self-rated health, while lower SES is predictive of worse self-rated health (Hajat 2011; Kennedy et al. 2007; Kim 2011; McDonough et al. 2010; Olafsdottir 2007; Schnittker 2004).

Other individual-level health outcomes have been examined as well. Cohen, Kaplan, and Salonen (1999), in their examination of the relationship between health and SES, included measures of psychological variables (*e.g.*, stress, personal control, anger/hostility, depression, and social support) and health behaviors (*e.g.*, smoking, alcohol consumption, and exercise) in addition to a measure of self-rated health. The authors found that increases in SES (measured in terms of income and educational level) were associated with increased personal control and social support, and with decreased perceived stress, anger, and depression. They also found that increases in income and education were associated with a greater likelihood of exercising, but the findings in regards to smoking and drinking were inconsistent.

2.1.3 Changing Patterns over Time and across Countries

Dow and Rehkopf (2010) assert that disparities in health outcomes related to SES are subject to changes across time and in different contexts. Using early mortality records from the seventeenth and eighteenth centuries, Antonovsky (1967) found the existence of a strong inverse relationship between SES and mortality. According to Dow and Rehkopf (2010), data from the late nineteenth to the mid twentieth century showed significant socioeconomic gradients in health in terms of life expectancy and mortality, but these studies were not representative. As stated previously, the Kitagawa and Hauser (1973) study was a landmark study that for the first time provided representative data showing a clear association between mortality and SES. Studies conducted in the nearly four decades since the seminal Kitagawa and Hauser study have continued to show a consistent relationship between SES and health. For example, Dowd et al. (2011) found that the socioeconomic health gradient has not only persisted over the three decades from the 1970s to the 1990s, but that the risk of death associated with lower income increased over the same time.

Fewer studies have been conducted that compare the socioeconomic gradient in health in the United States to that in other countries, and those studies that have been conducted overwhelmingly show a similar relationship as that which may be found in the United States. In a study examining the relationship between self-rated health and SES in eight European countries and the United States, van Doorslaer et al. (1997) found significant inequalities in health based on household income in every country studied, and in all cases the higher income groups were better off. The United States was found to have the largest inequality in health, followed closely by the United Kingdom. In a cross-national comparison of the association between SES and health in the United States and Iceland, Olafsdottir (2007) found that in both countries, education and labor force participation had a positive effect on self-rated health, although a stronger social safety net in Iceland appears to lessen the harmful effects of having a more vulnerable family structure than it might in the United States. Comparisons between the

United States and non-European countries, such as Korea, China, and India, are of interest as well, but according to Dow and Rehkopf (2010), few studies of this type have been conducted. However, studies of this type are planned and should be available in the next several years.

2.2 Pathways from Socioeconomic Status to Health

While the link between SES and health is well-established, the pathways explaining this link are not entirely clear. Early explanations focused on material living conditions of the poor, such as overcrowding, poor housing, and malnutrition (Williams 1990). However, despite the fact that these conditions have been ameliorated to some degree, socioeconomic differentials have not lessened. Four primary explanations have been offered to explain the relationship between SES and health. These include the artifact/drift hypothesis, explanations involving material deprivation and structural conditions, psychosocial factors, and fundamental cause theory.

*S*ome explanations propose that the socioeconomic health gradient is merely an artifact of the data. For example, Kadushin (1964) argues that lower-SES individuals simply react differently to illness, "feeling sicker" and thereby reporting more illness. In a similar fashion, the drift hypothesis, as described by Williams (1990), argues that chronic illness *leads* to lower SES, since an individual with chronic illness is unable to work and earn sufficient income. Williams explains that downward mobility caused by chronic illness may in fact occur, but it is not widespread enough to explain the prevailing association between SES and health.

Material deprivation and structural conditions, such as those related to economic forces and working conditions, may also serve as an explanatory factor in the relationship between SES and health. For a variety of reasons, low income may be linked to inadequate use and relative ineffectiveness of medical care (Williams 1990, Williams and Collins 1995). For example, the Black Report on Inequalities in Health (1980) showed that middle class patients in the United Kingdom tended to have more consultations with General Practitioners than their

working class counterparts, despite universal access to medical care, and the same middle class patients appeared to receive higher quality care than lower-SES patients (Townsend and Davidson 1982). Boulton et al. (1986) explain this as a possible function of (1) the social distance between the presumably high-SES doctor and low-SES patient, (2) class-related differences in knowledge and beliefs regarding medical issues, and/or (3) the professional control maintained by the doctor. Lack of health insurance also impacts health by restricting access to health care. This is especially true in the United States, since it is the only industrialized nation that does not have some form of government-provided universal healthcare for its residents (Banks et al. 2006). Many low-income and working-class individuals are employed at jobs that do not provide health insurance, and thus routine health care is largely inaccessible to these groups (Kim 2011).

Structural inequalities based on gender and race may also mediate the socioeconomic gradient in health. For example, according to Kim (2011), women are more likely to suffer greater financial hardships than men, since they are more likely to move in and out of the workforce and to be employed on a part-time basis. Kim reports that younger and middle-aged women are more likely to report worse health, but that the gap between men and women diminishes in later years. Race may also have a large impact on the SES-health relationship, since racism restricts access to services that may promote good health, such as public education, health care, housing, and recreational facilities (Williams and Collins 1995). Furthermore, racial discrimination may induce psychological distress, which negatively impacts health.

Psychosocial factors are predictive of morbidity and mortality, and are related systematically to SES and are embedded in structural conditions (Williams 1990). Higher-SES individuals have been found to have a high sense of personal control and access to economic resources and social support (Ross and Wu 1995), all important factors for good health. Lower SES, on the other hand, is related to deleterious health behavior choices and greater quantities

of stress that result from high rates of crime, high unemployment, and marital instability (Williams 1990). Lower-SES individuals may also be at greater risk of exposure to environmental hazards at their homes or their place of employment.

Programs aimed at changing health and lifestyle behaviors generally have little success in improving health among lower-SES individuals, and are on the whole more successful in changing behaviors among higher-SES groups (Williams 1990). Adler and Newman (2002) even go so far as to argue that programs aimed at promoting health may actually increase SES disparities, since high-SES groups are more equipped to act on the information. As a result, higher-SES individuals are more likely than their lower-SES counterparts to have a healthy lifestyle—they get more exercise, drink moderately, are less likely to smoke, and are more likely to receive preventive medical care (Ross and Wu 1995). According to Williams (1990), education may be the link that explains this discrepancy, since more highly-educated individuals are aware of health risks and are more able to take steps to reduce the risks.

Link and Phelan (1995) argue that material, structural, and psychosocial factors are superficial causes of disease, or what they refer to as “risk of risks”. They argue that these risk factors are an insufficient explanation for disparities in health outcomes. Their fundamental causes theory contends that while proximate causes of disease and mortality—such as cigarette smoking and excessive alcohol consumption, poor sanitation, lack of medical care, and so on—may be reduced by targeted interventions, the link between inequities in socioeconomic status and health will persist. Until inequities are addressed, other proximate causes will emerge. Therefore, inequities in socioeconomic status are what they refer to as “fundamental causes” of disease. In order to reduce susceptibility to disease, one must have access to resources associated with socioeconomic status, such as money, knowledge, power, and social networks. While these resources may be used to avoid and/or minimize health risks, they are inequitably distributed among members of the society (Olafsdottir 2007). In this sense,

for health to be improved in vulnerable populations, fundamental social causes, such as unequal income distribution and access to resources, must be addressed (Syme 1994).

CHAPTER 3

CONTEXT

3.1 Income Inequality in the United States

Aside from the link between SES and health, income inequality at the community, state, and country levels has been shown to impact health outcomes, both at the aggregate and the individual level. Global income inequality has risen since the early 1970s and has recently reached the same level as the record-setting highs of the 1920s (Saith 2011). Many of the countries in the Organization for Economic Cooperation (OECD) have experienced increases in inequality (Smeeding 2005) during the past three to four decades. However, none have experienced such a large, sustained increase in income inequality as in the United States, as measured by the percentage of income accruing to the top 90th percentile in the income distribution. As of 2000, Canada, Australia, and the United Kingdom exhibited only slightly more equality than the United States. Within Europe, the Northern European countries and the Czech Republic had the least amount of inequality.

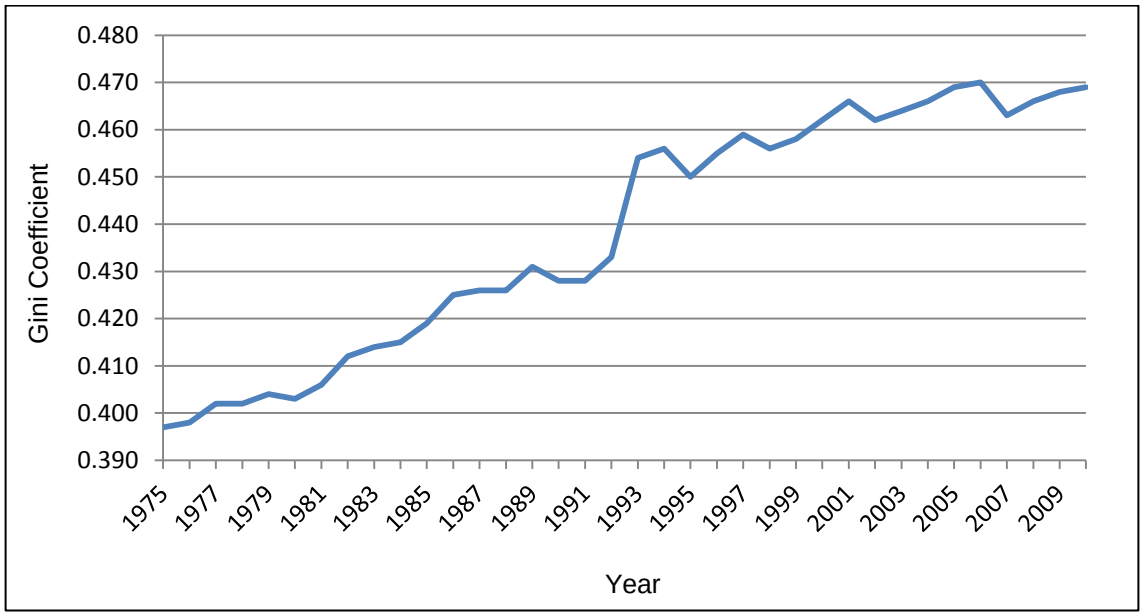
In the United States, income inequality peaked during the period between the World Wars, and then began a steady decline during World War II (Piketty and Saez 2003). By the end of World War II, the income share of the top ten percent of the distribution was 30 percent, and this measure remained steady at 31 to 32 percent until the early 1970s. During this period of economic stability, the annual income of the average worker more than doubled, and those at the bottom of the earnings scale saw increases that were even larger (Morris and Western 1999). The year 1973 is often cited as a watershed year—the year in which median wages began to stagnate and decline. The resultant rise in income inequality has been characterized by economists as “The Great U-Turn” (Nielsen and Alderson 1997). From that point, income inequality began a steady climb from the mid-1970s onward. Whereas in 1970, the top .01

percent of the income distribution earned 50 times the average, by 1998, the top .01 percent earned 250 times the average (Pikkety and Saez 2003). By the mid-1990s, the United States had the highest level of inequality among the rich OECD nations, and in 1993, income inequality reached a new high (Smeeding 2005). In 1971, prior to the spike in inequality, the richest 95th percentile had an income that was approximately two and a half (2.5) times the median income. By 1993, the income of the 95th percentile reached a new precipitous peak at approximately three (3.0) times the median income. In the early decades of the twenty-first century, the United States continues to have the highest income inequality in the rich world.

Data from the U.S. Census Bureau, including the Gini coefficient of income inequality and the ratio of the 95th percentile to the median (50th percentile) income, illustrate the steep rise in income inequality in the United States. The Gini coefficient is the most commonly used measure of income inequality (World Bank 2013) and ranges in value from zero (complete equality) to one (complete inequality – one person owns everything). It is derived from the Lorenz curve, which displays the percentage of total income received by an individual or household against the number of recipients. The U.S. Bureau of the Census (2011) reports yearly Gini coefficient data based on the income distribution of households. For U.S. Census purposes, a household is defined as all people who occupy a housing unit, including related family members and all unrelated people (Jones and Weinberg 2000). Figure 3.1 represents the Gini coefficient for the years 1975 to 2010 in the United States.

Between 1975 and 2010, the United States experienced an 18 percent increase in the Gini coefficient from 0.397 to 0.469. From 1975 to 1980, income inequality remained relatively stable, as measured by the Gini coefficient (0.397 in 1975, 0.403 in 1980), but began increasing in 1981. The period from 1981 to 1992 was marked by steadily increasing income inequality, with an increase of approximately 9 percent in this time period. The Gini coefficient rose sharply from 0.433 in 1992 to 0.454 in 1993, and has remained between 0.450 in 1995 and 0.469 in

2010. Table A.2 in Appendix A presents the Gini coefficients with standard errors from 1975 to 2010, as reported by the U.S. Bureau of the Census (2011).

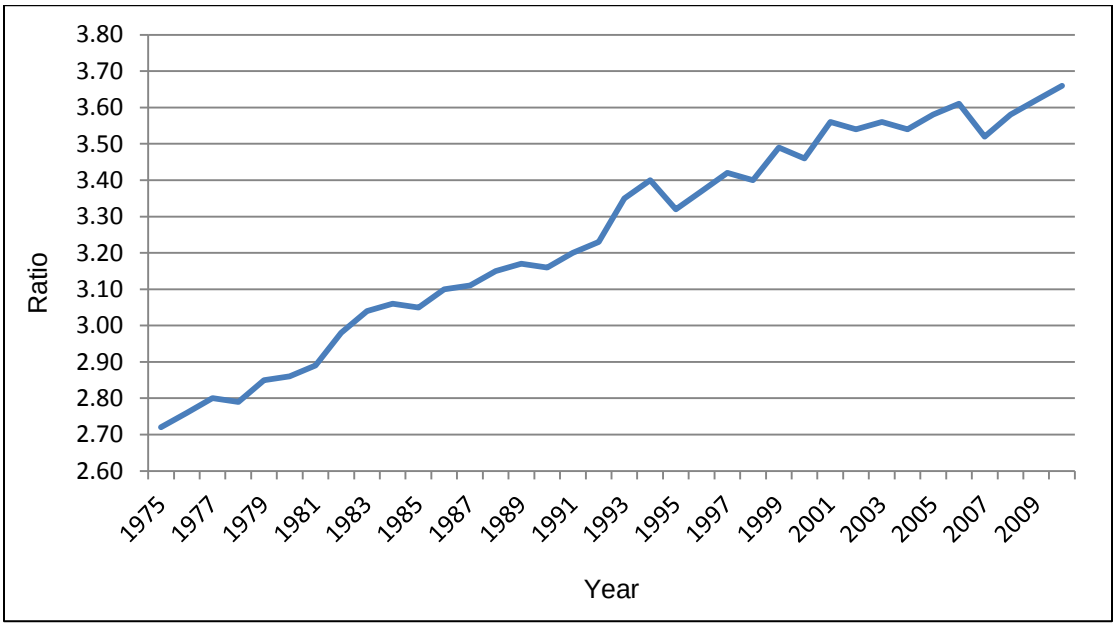


Source: U.S. Bureau of the Census (2011)

Figure 3.1 Gini Coefficient of Income Inequality in the United States, 1975 – 2010

Income inequality may also be measured by the ratio of household income at the 95th percentile to the median (50th percentile) income. An examination of the change in this ratio reveals an increase in income inequality similar to that shown by the Gini coefficient. Table A.3 in Appendix A shows the ratio of 95th percentile to the median income from 1975 to 2010, as reported by the U.S. Bureau of the Census (2011). The total increase in the ratio from 1975 to 2010 was approximately 33 percent, from 2.75 to 3.66. In the early 1970's, the 95th percentile had an income that was approximately 2.5 times the median income (Smeeding 2005). By the mid-1970's, the United States had experienced stagnation of wages and a sharp rise in income inequality, and subsequently by the mid-1990's, inequality reached a new high, with the 95th percentile receiving approximately 3 times the median income (3.32 in 1995). From 1993 until

2010, income inequality continued to rise, and in 2010, the 95th percentile received approximately 3.7 times the median income (DeNavas-Walt, Proctor, and Smith 2011, U.S. Bureau of the Census 2011). Figure 3.2 represents the steady increase in the ratio from 1975 to 2010.



Source: U.S. Bureau of the Census (2011)

Figure 3.2 Household Income Ratio of the 95th Percentile to the 50th Percentile, 1975 – 2010

3.2 The Association between Income Inequality and Health

Given this backdrop of increasing income inequality, a multitude of studies have examined the association between income inequality and health (Babones 2008; Dowd et al. 2011; Fiscella and Franks 1997; Kennedy et al. 1998; Lobmayer and Wilkinson 2000; Lynch et al. 2005; Mellor and Milyo 2001 and 2003; Subramanian and Kawachi 2006; Welch et al. 2002; Wilkinson and Pickett 2008; Zheng 2009; Zheng and George 2012). Despite this large body of research, the findings on the relationship between inequality and health continue to be somewhat mixed. For example, Wilkinson and Pickett (2006), in a review of 168 peer-reviewed

studies, found that 78 percent of the studies demonstrated at least some statistically significant evidence of a relationship between income inequality and health, and 70 percent were “wholly supportive” of such a link. Health was indicated using a variety of measures, which included life expectancy, mortality (infant and adult), and self-reported health. For the unsupportive studies, they offered three possible explanations: (1) the study measured inequality in an area that was too small (such as a census tract) to detect large inequalities in income that might be present in the larger society; (2) the study controlled for factors that may actually be mediators between class and health; or (3) the study was conducted during the mid-1980s and early 1990s, when much of the relation between inequality and health temporarily disappeared due to rapidly widening income differences in many countries. According to Wilkinson and Pickett (2006), this may have happened due to a combination of several factors. First, the age distribution of poverty shifted downward, so that young people with families, rather than the elderly, were more affected by relative poverty. Secondly, death rates began to decline during this period among older adults, particularly those related to cardiovascular illnesses, which may have affected international comparisons of mortality. And lastly, changes in the income distribution had lagged effects on mortality, especially among older adults. As such, they argue that the population health outcomes that are measured at any given time may actually reflect past inequality.

Kennedy et al. (1998), examining inequality at the state level and its relationship with self-rated health, found that in states with the highest income inequality, respondents were 30 percent more likely to report poor or fair self-rated health than individuals in states with the lowest income inequality. In a study that also examined income inequality at the state level and its association with self-rated health, Subramanian and Kawachi (2006) found that a 5 percent increase in a state’s income inequality made an individual 30 percent more likely to report poor health, and that the effect was statistically significant. They found also that the relationship between income inequality and self-rated health appears to be stronger for relatively advantaged socioeconomic groups, indicating that rising income inequality may have more of

an impact on the health of those in high-SES groups. Conversely, Dowd et al. (2011) examined income inequality and mortality and found that there is a strong positive association that has increased in the U.S. population over time, but that the association is stronger at the low end of the socioeconomic scale. This may in fact reflect the difference between using individual-level and aggregate measures of health.

As discussed previously, income inequality has risen worldwide, and as such, some studies have examined the impact of inequality cross-nationally. In an examination of the relationship between inequality and mortality in fourteen developed OECD countries, including the United States, Lobmayer and Wilkinson (2000) found that higher mortality was positively associated with greater income inequality in all countries for those under the age of 65. After 65, the authors found an inverse relationship between mortality and inequality. Similarly, Babones (2008) examined life expectancy and infant mortality, along with murder rates, for a large panel of developing and developed countries. He found a strong, consistent, statistically significant correlation between aggregate measures of health and income inequality. However, the findings are mixed, as some studies (Deaton and Lubotsky 2003; Fiscella and Franks 1997; Mellor and Milyo 2001 and 2003; Lynch et al. 2004) find no significant relationship between income inequality and health.

3.3 The Modifying Effect of Income Inequality on the Socioeconomic Gradient in Health

While there has been no lack of research examining the association between SES and health (independent of income inequality) and the association between country- and state-level income inequality and health (independent of socioeconomic factors), little research has been conducted on the *modifying effect of rising macro-level income inequality* on the association between SES and individual-level health. According to Dowd et al. (2011), there have been no studies to date that examine changes in the association between income and health over time, with respect to income inequality. In response, the authors examine income and mortality data

to determine if the gradient changes over time. They find that the association does in fact change from 1970 to 1999, with an increased risk of death applying to an increasing proportion of the population over that time period. Subramanian and Kawachi (2006) examine self-rated health measures in relation to state inequality levels and find that the relationship between SES and self-rated health is impacted primarily among relatively advantaged socioeconomic groups. However, their findings did not indicate a strong association across different population groups.

3.4 Research Questions and Contributions of this Study

Given the lack of research on the impact of income inequality on the socioeconomic health gradient, and particularly when occupational prestige is used as a measure of SES, this study will undertake to examine two research questions:

(1) Are all three measures of SES—education level, income, and occupational prestige—significantly and consistently associated with self-rated health; and

(2) Is there a discernible trend in the relationship between measures of SES and individual-level health in the context of rising income inequality?

This study fills a gap in the current research, which tends to examine *only* the association between health and SES *or* between health and income inequality. Furthermore, most current research in the United States examines the socioeconomic gradient in health using education and income as measures of SES, giving little attention to occupational status. This study contributes to current research by examining whether all three of the most common measures of SES, considered simultaneously, are associated with health. For the purposes of this study, health is measured at the individual level using self-rated health, rather than at the aggregate level (*e.g.*, mortality rates, infant mortality rates, life expectancy, and so on). Babones (2008) suggests that migrating to the individual level will be the most productive route for determining the complicated relationships between income inequality, SES, and health.

The current study also expands the boundaries of current research by examining the relationship between SES and health *in the context of rising income inequality*. Where other studies have examined cross-sectional data at single points in time, this study will examine trends in the socioeconomic health gradient across time from 1975 to 2010 to determine if and how the association has changed in the context of rising income inequality. Link and Phelan (1995) describe income inequality as a fundamental social cause of poor health outcomes, and it is important to understand the effect of income inequality on the socioeconomic health gradient in order to determine the best course for reducing health inequalities.

3.5 Hypotheses

Based on the review of the literature, I have two primary expectations. First, I hypothesize that when examining all three measures of SES simultaneously and controlling for socio-demographic variables, each of the measures will be significantly associated with self-rated health, and that the finding will be consistent across years from 1975 to 2010. Secondly, I hypothesize that a discernible trend will emerge in the data in which the association of income, education, and occupational status with good or excellent health will become increasingly smaller from 1975 to 2010. In other words, at higher levels of income inequality, respondents will be *less* likely to report being in good or excellent health based on measures of SES.

CHAPTER 4

METHODOLOGY

4.1 Data

The individual level data for this study were drawn from the 1975 to 2010 waves of the General Social Survey (GSS). The GSS is funded by the Sociology Program of the National Science Foundation and is conducted by the National Opinion Research Center (NORC) at the University of Chicago. The GSS is administered in the United States at least biennially and consists of a standard core questionnaire of recurring demographic and attitudinal questions, along with rotating topical sections of special interest (Smith et al. 2011). The GSS uses a standardized questionnaire administered through face-to-face and some telephone interviews. Respondents are non-institutionalized adults, aged 18 years or older, and prior to 2006, the GSS sampled the English-speaking population only. Approximately 98 percent of the adult household population in the United States was English speaking as of the 1983 to 1987 waves of the GSS, and 60 to 65 percent of the language exclusions in those samples were Spanish speakers. The GSS began sampling Spanish-speaking households in 2006.

From 1972 to 1974, respondents were selected using modified probability sampling based on a quota element at the block level. Quotas were based on sex, age, and employment status, and were informed by 1970 U.S. Census tract data. Beginning in 1975, surveys were conducted using full probability sampling, thus ensuring that each U.S. household had an equal probability of being included in the survey and that the sample more closely resembled demographic distributions reported in the U.S. Census. However, Smith et al. (2011) report that blacks were oversampled in 1982 and 1987, with an extra 354 and 544 black respondents, respectively. Using the SAMPLE variable, these oversamples were eliminated from the data. This study used data from the years 1975 to 2010, with a total of 50,486 respondents. Because

the key dependent variable for this study—overall self-rated health—is not part of the standard core questionnaire but is a rotating question, respondents were not presented with this question in the following years: 1978, 1979, 1981, 1983, 1986, 1992, 1995, 1997, 1999, 2001, 2003, 2005, 2007, and 2009. Thus, these years were excluded from this analysis. Because Medicare health benefits currently begin at the age of 65, adults 65 years and older were excluded from the sample. The final sample included only adults between the ages of 18 and 64. This eliminated 11,859 respondents from the final sample. After eliminating adults 65 and older, and eliminating years for which there was no self-rated health data, as well as missing data on any key variables, the final sample included 24,549 respondents. Table A.1 in Appendix A shows the GSS response rates for each year included in the analysis, which ranged from a low of 70.0 percent in 2000 to a high of 82.4 percent in 1993.

The GSS was chosen for this analysis for two primary reasons: First, in each included wave of the survey, the respondent was asked to rate overall health (self-rated health), and the question format was consistent in each wave, ensuring that the measure was the same from year to year. (The self-rated health measure will be discussed in more detail in Section 4.2 of this paper.) And secondly, the GSS provides high quality, cross-sectional data. The decision to use data from the years 1975 to 2010 was informed by the research on rising income inequality in the United States and was based on marked increases in both the Gini coefficient of income inequality and the ratio of income of the top 95th percentile to the median (50th percentile) income during this time period, as described in Chapter Three of this paper.

4.2 Measures

4.2.1 Dependent Variable: Self-Rated Health

This study examined self-rated health (SRH) as the dependent variable. This individual-level variable of well-being has been shown to be both valid and reliable and is recommended for cross-national research by the World Health Organization (Olafsdottir 2007). In a review of

27 studies conducted by Idler and Benyamini (1997) concerning the validity and reliability of self-rated health, the authors found the SRH measure to be an independent predictor of mortality in 23 of the 27 studies examined. While the effect is significant for both men and women, SRH is more strongly predictive of mortality for men, as shown in five of the seven studies reviewed by Idler and Benyamini (1997) that estimated risk ratios separately by gender. The authors suggest that this may be because poor ratings by men are more indicative of a serious condition (Idler and Benyamini 1997), coupled with the fact that women tend to experience more non-fatal chronic and acute conditions (Verbrugge and Ascione 1987).

GSS respondents were asked to assess their health by answering the following question: “Would you say your health, in general, is excellent, good, fair, or poor?” Respondents answered on a 4-point scale from ‘excellent’ (coded 1) to ‘poor’ (coded 4). For ease of interpretation, the SRH variable was recoded with 4 being ‘excellent’, 3 being ‘good’, 2 being ‘fair’, and 1 being ‘poor’. Table 3.1 shows the distribution of self-rated health responses for each year included in this study.

Table 4.1 Distribution of Self-rated Health by Year (N=24,549)

Year	Number of Cases	Excellent N %	Good N %	Fair N %	Poor N %
1975	530	187 35.3	218 41.1	102 19.2	23 4.3
1976	520	180 34.6	231 44.4	75 14.4	34 6.5
1977	1122	400 35.7	495 44.1	179 16.0	48 4.3
1980	1034	352 34.0	448 43.3	180 17.4	54 5.2
1982	1065	377 35.4	463 43.5	177 16.6	48 4.5
1984	1065	360 33.8	524 49.2	151 14.2	30 2.8

Table 4.1 – C*ontinued*

1985	1120	423	492	155	50
		37.8	43.9	13.8	4.5
1987	1075	397	490	147	41
		36.9	45.6	13.7	3.8
1988	697	249	329	94	25
		35.7	47.2	13.5	3.6
1989	706	269	327	95	15
		38.1	46.3	13.5	2.1
1990	635	232	299	88	16
		36.5	47.1	13.9	2.5
1991	680	231	322	113	14
		34.0	47.4	16.6	2.1
1993	781	268	375	109	29
		34.3	48.0	14.0	3.7
1994	1443	484	704	214	41
		33.5	48.8	14.8	2.8
1996	1813	600	897	257	59
		33.1	49.5	14.2	3.3
1998	2037	701	979	297	60
		34.4	48.1	14.6	2.9
2000	1631	538	814	231	48
		33.0	49.9	14.2	2.9
2002	1337	450	620	210	57
		33.7	46.4	15.7	4.3
2004	979	325	492	136	26
		33.2	50.3	13.9	2.7
2006	2437	744	1168	420	105
		30.5	47.9	17.2	4.3
2008	936	260	454	184	38
		27.8	48.5	19.7	4.1
2010	906	247	428	187	44
		27.3	47.2	20.6	4.9

Source: Smith et al. (2011)

It is common practice in health research to convert self-rated health from a multiple-category variable to a variable that is dichotomous (Cohen, Kaplan, and Salonen 1999; van

Doorslaer et al. 1997). Dahl (1994) defends the use of dichotomous measures of health as following the traditional biomedical model of either the presence or absence of disease. He points out that it is common for individuals to mentally assign themselves and others into dichotomous categories of either 'healthy' or 'unhealthy'. Therefore, for data analysis purposes, the self-rated health variable was transformed into a dichotomous variable, with the categories 'excellent' and 'good' being collapsed into one category (coded as '1'), and the categories 'fair' and 'poor' being collapsed into another (coded as '0'). For the pooled sample, 80.8 percent of respondents reported having either excellent or good health, while 19.2 percent reported having fair or poor health.

4.2.2 Explanatory Variables

Socioeconomic status was measured using three separate variables: (1) household income, (2) years of education, and (3) occupational prestige. According to Krieger, Williams, and Moss (1997), measures of socioeconomic status should take into account both resource-based and prestige-based measures, and may be measured at three complementary levels: individual, household, and community. Family income is a household-level measure of available resources, while education and occupational prestige are both individual-level measures of prestige as well as access to resources.

Respondents' reports of real household income are adjusted for inflation to 2000 dollars. Household income for the entire sample ranged from a minimum of $402.00, to a maximum of $180,386.00, with a mean household income of $49,015.00. Because the association between household income and SRH is non-linear, the logarithmic transformation of income was used for all analyses. The logged income for the entire sample ranged from a minimum of 5.56 to a maximum of 12.00, with a mean logged income of 10.08. Education is measured by the number of years of formal education respondents had completed at the time of

the survey. Reported years of education in the GSS ranged from a minimum of 0 years to a maximum of 20 years, with a mean of 13.33 for years 1975 to 2010.

Occupational prestige is described as the estimation of the social standing of a respondent's occupation (Smith et al. 2011). The occupational prestige scores reported in the GSS were derived from rating systems developed in 1963-1965 by Robert W. Hodge, Paul S. Siegel, and Peter H. Rossi (Smith et al. 2011), based on data from the 1960 U.S. Census of Population. As a result of changes to the U.S. Census classification of occupations in 1980, the scale was updated in 1989 by Keiko Nakao, Robert W. Hodge, and Judith Treas (1990). The authors argue that the reclassification based on the 1980 U.S. Census is theoretically and methodologically consistent with the previous 1970 rating scale and that the changes generally represent either (1) minor shifts of particular jobs from one occupational category to another, or (2) splitting of earlier occupational codes into new categories, which could then be combined to recreate the previous classifications.

In the GSS, respondents were asked questions about their work, such as what their job was called, the kind of work they did, and the kinds of things that were produced by their job. This information was then coded into an occupational prestige score based on the 1970 or 1980 classifications mentioned previously. Occupational prestige scores were reported in two separate variables, depending on the survey year: the variable PRESTIGE used the 1970 scale and reported the respondent's occupational prestige rating for the years 1972 to 1990, and the variable PRESTG80 used the updated 1980 scale and reported the respondent's occupational prestige rating for the years 1988 to 2010. For ease of analysis, the two variables were combined into one. Where there was overlap in the data (years 1988 to 1990), the most recent data was used from the 1980 occupational prestige score. Occupational prestige scores ranged from a minimum of 12 (*e.g.,* non-farm laborers and cleaning service workers) to a maximum of 86 (*e.g.,* physicians), with a mean score of 42.67. Table 4.2 presents descriptive information on measures of socioeconomic status for the total sample.

Table 4.2 Descriptive Statistics for Dependent and Explanatory Variables

	Description	N	Mean	SD	Min	Max
Dependent Variable						
HEALTH	Self-rated health 4=excellent 3=good 2=fair 1=poor	24549	3.11	0.79	1	4
Explanatory Variables						
LOGGED INCOME	Log of household income in 2000 dollars	24549	10.47	0.93	6.00	12.10
EDUCATION	Years of education completed	24549	13.33	2.89	0	20
PRESTIGE	Respondent's occupational prestige score	24549	42.66	14.05	12	86
WORK STATUS	1=employed at least part time 0=others	24549	0.76	0.43	0	1
Control Variables						
MARITAL	1=married 0=others	24549	0.55	0.50	0	1
RACE	1=white 0=other races	24549	0.82	0.39	0	1
SEX	1=male 2=female	24549	0.47	0.50	0	1
AGE	Respondent's age at time of survey	24549	39.93	12.15	18	64

Source: Smith et al. (2011)

4.2.3 Socio-Demographic Control Variables

Demographic and social control variables used in this study included age, marital status, race, sex, and employment status, due to the associations of these variables with both income and self-rated health outcomes. The mean age for the final sample was 39.93 years. Marital status was recoded into a dichotomous variable, with 1 being married. The 'not married' category included those who were widowed, divorced or separated, or never married. In the final sample, 54.9 percent of respondents were married and 45.1 percent were not.

The GSS survey asked respondents to self-identify their race as either 'white', 'black', or 'other'. For the entire sample, 81.6 percent of respondents identified as white, 12.6 identified as black, and 5.8 percent identified as some other race. Race was recoded into a dichotomous minority/non-minority variable, with the category of 'white' being coded as 1 and the categories of 'black' and 'other' being combined and coded as 0. Sex was coded as a dichotomous variable, with 1 being male and 0 being female. In the final sample, there were 46.9 percent males and 53.1 percent females. Respondents were asked to indicate whether they were employed full time, part time, or were not employed because they had been laid off or retired, were in school or were keeping house, or were unemployed for some other reason. Employment status was recoded into a dichotomous variable with 1 being employed full time or part time and 0 being not employed. Table A.6 in Appendix A presents the distribution of the employment status variable, prior to recoding into a dichotomous variable. After recoding, 75.7 percent of respondents were employed at least part time.

4.3 Procedure of Analysis

This study proposed to examine two research questions: (1) are all three measures of SES—income, education level, and occupational prestige—significantly and consistently associated with SRH when controlling for socio-demographic variables; and (2) Is there a discernible trend

in the relationship between measures of SES and individual-level health in the context of rising income inequality from 1975-2010?

In the first step of my analysis, I calculated the percentage distribution for health by different groups and reported the chi-square value to determine if there is any significant difference in the percentage of those who report good or excellent health between groups. Next, because the dependent variable—self-rated health—is recoded into a dichotomous measure, I performed a series of logistic regressions to examine the association between the dependent variable and measures of SES. First, I analyzed the measures of SES in the final pooled sample (N=24,549) with no control variables in model 1. In model 2, I controlled for the following demographic variables: marital status (reference group was 'married'); race (reference group was 'white'); sex (reference group was 'male'); age (in years); and employment status (reference group was 'employed'). In the next step of the analysis, logistic regressions were performed separately for each year for which there was self-rated health data in the GSS, and the significance of each measure was examined from year to year. In order to provide a visual picture of the relationship between socioeconomic status and self-rated health in the context of rising income inequality, the full model odds ratios (controlling for demographic control variables and the remaining two SES measures) were also plotted on a graph by year so as to discern trends over time or significant differences for certain years. The odds ratios were entered into an Excel spreadsheet and linear trend lines were created by the Excel software program. Then I entered interaction variables for each year in the sample with each SES variable. This allowed me to determine whether the effect of the SES variable for each year was significantly different from the reference year, 1975.

This multi-step approach allowed me to examine first whether self-rated health was significantly associated with all three measures of SES for the entire sample. Secondly, I was able to examine the significance of the SES measures for self-rated health separately for each year, providing a more complete understanding of the possible associations between self-rated

health and SES. Furthermore, because it has been established that income inequality increased significantly during the time period from 1975 to 2010, plotting the trends in the odds ratios for each measure of SES from years 1975 to 2010 (a proxy for income inequality) allowed me to examine the trend in the socioeconomic gradient in health in the context of increasing income inequality. Lastly, the addition of interaction effects between each year and each measure of SES allowed for a more complete understanding of the effect of SES on self-rated health. In other words, I was able to determine if the association between each independent measure of SES and self-rated health for every year in the sample was significantly different from the reference year of 1975.

CHAPTER 5

RESULTS

This chapter reports the results of the analyses of GSS data and is organized as follows. First, I discuss the characteristics of the respondents on key variables and the percentage distribution for those reporting good or excellent health. Secondly, I examine the relationship between self-rated health and measures of SES and control variables using logistic regression for the complete sample, then for each year for which self-rated health was reported, along with year interaction effects. Lastly, I report the trends in the relationship between each measure of SES and self-rated health from 1975 to 2010—a period of substantial increase in income inequality—to determine if the socioeconomic gradient in health has been impacted by this increase.

5.1 Characteristics of the Respondents and Percentage Distributions by Group

The total sample size for the final 1975 to 2010 data set is 24,549 respondents. Table 5.1 summarizes characteristics of the respondents and the percentage reporting good or excellent health. The control variables include marital status, race, sex, employment status, and age. All of the variables under examination are significantly associated with self-rated health at the $p < .05$ level, and all but one variable (sex, $p = .007$) are significant at the $p < .001$ level.

Measures of socioeconomic status used in this analysis include household income, educational level, and occupational prestige score. As stated previously, household income is adjusted for inflation and reported in 2000 dollars. For this analysis, household income is divided into quintiles. In the lowest quintile ($18,745 or less), 65.8 percent of respondents report good or excellent health compared with 90.2 percent in the highest quintile ($72,224 or greater). This represents a 37 percent increase from the lowest to the highest quintile in the percentage

of respondents indicating good or excellent health. The gradient from the lowest to the highest quintile follows a steady increase, with 78.3 percent of those in the second quintile ($18,746 to $33,079), 83.0 percent in the third quintile ($33,080 to $48,149), and 86.6 percent of those in the fourth quintile ($48,150 to $72,223) reporting good or excellent health. Of particular interest is the large difference between the first and second quintiles. As stated previously, 65.8 percent of respondents in the lowest quintile report good or excellent health compared with 78.3 percent in the second quintile, a difference of 19.0 percent. This is the largest increase from one quintile to the next and is significantly greater than the others; the increase between the other quintiles ranges from 6.0 percent (second to third quintile) to 9.6 percent (fourth to fifth quintile).

For the purposes of the group comparisons, education is categorized into four levels, based on the number of years of education the respondent reports having completed: less than high school (11 years or fewer); high school diploma (12 years); some college (13 to 15 years); and bachelor's degree or higher (16 or more years). These categories were chosen because high school and college completion are significant milestones and represent differing levels of opportunity that might have an effect on health. For example, a person who has completed 12 years of high school and has received a high school diploma is likely to have somewhat more job opportunities than a person who has completed only 11 years of schooling. Despite the fact that the high school graduate has only a year's worth more of education, completing high school makes a difference in terms of employment.

Level of education is significantly associated with having good or excellent health; of those who completed a bachelor's degree or higher, 90.4 percent report having good or excellent health, while 61.6 percent of those who completed less than high school report the same. This represents a nearly 50 percent increase. As expected, completing high school does appear to have an effect on one's health when compared with those who completed less than high school. Of those who completed high school, 80.0 percent report being in good or excellent health, representing a 30 percent increase over those who did not complete a high school

education. The difference between having completed some college (with no degree) and completing a bachelor's degree or higher is not quite as drastic, but there is somewhat of an association: 84.3 percent of those who completed some college report being in good or excellent health, compared to 90.4 percent of college graduates.

Occupational prestige scores are also significantly associated with self-rated health in the group comparisons, although the differences between categories are not as wide as those for household income and education. For ease of comparison, occupational prestige scores are categorized into quartiles from 12 to 31 for the first quartile, 32 to 41 for the second quartile, 42 to 50 for the third quartile, and 51 to 86 for the fourth quartile. In the first quartile, 72.6 percent of respondents report good or excellent health compared with 87.0 percent in the fourth quartile. This is an increase of approximately 20 percent.

A greater percentage of married respondents report good or excellent health than do non-married respondents (82.7 percent v. 78.5 percent). Likewise, more non-minority white respondents report good or excellent health than minority non-whites (82.1 percent v. 75.0 percent). Of the control variables, age and employment status appear to be the most strongly associated with health. In terms of age, the gradient ranges from 70.9 percent of those in the eldest category (50-64) reporting good or excellent health, to 86.2 percent of those in the youngest category (18-29) reporting the same, an increase of nearly 22 percent. Likewise, more employed respondents report good or excellent health than those who were not employed (85.1 percent v. 67.6 percent) at the time of the survey, an increase of 26 percent. Among all of the control variables, sex appears to have the weakest association with self-rated health, with an increase of only 1.7 percent of males to females reporting good or excellent health.

In the percentage distributions, all three of the socioeconomic measures are significantly associated with self-rated health. Respondents at the highest levels of income report good or excellent health more often than those at the lowest levels, and the gradient rises

steadily from the first quintile to the fifth. Those who completed a high school education more frequently report good or excellent health than those who did not, and college graduates report good or excellent health more than all other categories. Occupational prestige scores are significantly associated with self-rated health, with those at the higher end of the scale more frequently reporting good or excellent health than those at the lower end. However, the gradient is not as steep as that for educational attainment and household income.

Table 5.1 Characteristics of Respondents and Percentage Reporting Good or Excellent Health (N=24,549)

Characteristic	N (%)	N (%) Reporting Good or Excellent Health	Pearson's Chi-Square	df	p
Marital Status			68.102	1	<.001
Married	13486 (55.0)	11154 (82.7)			
Not married	11063 (45.1)	8689 (78.5)			
Race			122.322	1	<.001
White	20033 (81.6)	16457 (82.1)			
Other	4516 (18.4)	3386 (75.0)			
Sex			7.310	1	.007
Male	11514 (46.9)	9390 (81.6)			
Female	13035 (53.1)	10453 (80.2)			
Employment Status			892.723	1	<.001
Employed	18579 (75.7)	15808 (85.1)			
Not employed	5970 (24.3)	4035 (67.6)			
Age			616.564	3	<.001
18 – 29	5871 (23.9)	5060 (86.2)			
30 – 39	6814 (27.8)	5856 (85.9)			
40 – 49	5732 (23.3)	4579 (79.9)			
50 – 64	6132 (25.0)	4348 (70.9)			

Table 5.1 – *Continued*

Educational Level			1385.073	3	<.001
Less than high school	4026 (16.4)	2481 (61.6)			
High school	7597 (30.9)	6080 (80.0)			
Some college	6569 (26.8)	5538 (84.3)			
Bachelor's degree or higher	6357 (25.9)	5744 (90.4)			
Household income ($)[a]			1385.073	3	<.001
1st Quintile (≤18,745)	4898 (20.0)	3224 (65.8)			
2nd Quintile (18,746 – 33,079)	4880 (19.9)	3823 (78.3)			
3rd Quintile (33,080 – 48,149)	4878 (19.9)	4048 (83.0)			
4th Quintile (48,150 – 72,223)	4917 (20.0)	4258 (86.6)			
5th Quintile (≥72,224)	4976 (20.3)	4490 (90.2)			
Occupational Prestige			455.191	3	<.001
1st Quartile (12 – 31)	5683 (23.1)	4125 (72.6)			
2nd Quartile (32 – 41)	6459 (25.1)	4872 (79.1)			
3rd Quartile (42 – 50)	5885 (24.0)	4910 (83.4)			
4th Quartile (51 – 86)	6822 (27.8)	5936 (87.0)			

Source: Smith et al. (2011)
a. Adjusted for inflation and reported in year 2000 dollars

5.2 Logistic Regression Results

5.2.1 Self-Rated Health Regressed on All SES Measures

I hypothesized that income, education, and occupational prestige would all be significantly associated with self-rated health when controlling for socio-demographic variables. Overall, the percentage distributions and chi-square values from the previous section suggest an association between each measure of SES and self-rated health; however, this simple analysis does not control for the

effects of other SES and socio-demographic controls. To explore the relationship further, I performed a series of logistic regressions, first for the pooled sample, then for each SES measure separately for each year in the sample. Table 5.2 summarizes the findings from the regression of self-rated health on measures of socioeconomic status and control variables for the pooled sample. Tables 5.3 through 5.5 summarize the findings from the regressions of the dependent variable on independent measures of SES separately for each year. In each regression, the reference category for the dependent variable is fair or poor health.

In Table 5.2, model one presents the regression of self-rated health on all measures of SES (years of education completed, logged household income, and occupational prestige score) for the entire sample. Model two introduces the control variables of marital status, race, sex, age, and employment status. The group comparisons from the previous section indicated that household income, years of education, and occupational prestige are all positively associated with self-rated health. However, the results in Table 5.2 do not support this expectation. In model one, without any control variables, logged household income and education are significantly associated with self-rated health. As expected from the percentage distributions in the previous section, income has a large effect on the likelihood of reporting good or excellent health. For each one-unit increase in logged income, respondents are 50.1 percent more likely to report being in good or excellent health. Education is also significant, with each year of completed education making one 17.0 percent more likely to report being in good or excellent health. The model one findings for income and education are significant to the $p < .001$ level. In model two, after adding the control variables, household income and education are still strongly significant predictors of self-rated health. When controlling for demographic variables and employment status, each one-unit increase of logged income makes an individual 44.6 percent more likely to report good or excellent health, and each year of education makes one 13.2 percent more likely to report the same.

On the measure of occupational prestige, the percentage distribution showed a 20 percent increase in the number of respondents reporting good or excellent health from the lowest quarter to the highest. It is reasonable to expect from this finding that occupational prestige might have a significant association with self-rated health. However, occupational prestige is not a significant predictor of self-rated health when controlling for income and education. Interestingly, when socio-demographic control variables are entered into the model, occupational prestige becomes significant at the $p < .05$ level, perhaps due to the effect of employment status being added into the model. However, even though occupational prestige is significant in model two, the magnitude of the relationship to self-rated health is small—each one-unit increase in the occupational prestige score raises the likelihood of reporting good or excellent health by only .4 percent.

All of the control variables in model two are significantly associated with self-rated health. Marital status, race, age, and employment status are all strongly significant at the $p < .001$ level. However, the odds ratio for the sex variable borders on insignificant ($p = .035$). The relationship between sex and self-rated health is weak as well, with males being 7.7 percent *less* likely than females to report good or excellent health. Age is also a weak indicator of self-reported health, with every year of age decreasing the odds of reporting good or excellent health by only 3.2 percent. Among the control variables, employment status has the greatest association with health. Those who are employed either part- or full-time are 92.1 percent more likely to report good or excellent health, and the finding is significant to the $p < .001$ level.

In summary, of the three indicators of SES, only two—logged income and years of education—have a strong positive association with self-rated health when controlling for demographic variables and employment status. The third SES indicator, occupational prestige, is significant when controlling for demographic variables and employment status, but the increase in the likelihood of reporting good or excellent health is very small. Of the control variables, employment status is the most significant predictor of reporting good or excellent

health, after having accounted for education and household income. Marital status and race are also significant and have a moderate impact on the likelihood of reporting good or excellent health. While age and sex are significant (sex only slightly so), the effect of each on self-rated health is slight.

Table 5.2 Logistic Regression of Self-Rated Health[a] on Years of Education, Logged Household Income, and Occupational Prestige Score (N=24,549)

INDEPENDENT VARIABLES	MODEL 1	MODEL 2
Measures of Socioeconomic Status		
Logged household income (in 2000 dollars)	1.501*** (.007)	1.446*** (.021)
Education (years completed)	1.170*** (.007)	1.132*** (.007)
Occupational prestige score[b]	1.001 (.007)	1.004** (.007)
Control Variables		
Marital status (1=married)		1.136*** (.039)
Race (1=white)		1.240*** (.043)
Sex (1=male)		0.923* (.035)
Age (years)		0.968*** (.001)
Employment status (1=employed)		1.921*** (.038)
Constant	0.008*** (.007)	.031*** (.196)
–2 log likelihood	22266.72	21316.74
Nagelkerke Pseudo R^2	.109	.166

Source: Smith et al. (2011)
**p < .05 **p < .01 ***p < .001*
a. Dependent variable is self-rated health (good or excellent=1, fair or poor=0)
b. Based on the U.S. Bureau of the Census 3 digit industrial classifications for 1972-1990 and the 1980 Census occupational and industrial classifications for 1988 to the present.

5.2.2 Self-Rated Health Regressed on Logged Income by Year

Tables 5.3 through 5.5 present the logistic regression results for each measure of SES separately by year, which will be used to discuss changing trends in the relationship between SES and self-rated health. The years included are those for which self-rated health data was available, since this is a rotating question and was not asked in certain years. The regressions proceed in three models. Model one presents the unadjusted odds ratio with no control variables for a given indicator of SES (income, education, or occupational prestige) for each year. Model two presents the odds ratio for the chosen measure of SES when controlling for marital status (married=1), race (white=1), sex (male=1), age (in years), and employment status (employed=1). And finally, model three presents the odds ratio for the selected SES measure when all control variables and other measures of SES are entered into the regression.

Table 5.3 indicates the results of the logistic regression of self-rated health on logged income by year. In model one, prior to adding any control variables, logged income is a highly significant predictor of self-rated health for all years reported. This supports the findings of the earlier percentage distribution, in which there was a 24.4 percent increase from the lowest quintile to the highest. When controlling for demographic variables and employment status (model two), logged income remains highly significant at the $p < .001$ level for all years reported. When years of education and occupational prestige score are also controlled for (model three), logged income is still significantly associated with self-rated health in all but one year—2008. Income returns to significance in 2010 ($p < .01$), but the relationship is not as strong as in years prior to 2008. The odds of reporting good or excellent health in 2006 increase by 55.9 percent for each one unit increase in logged income, and for the entire decade of the 2000s prior to 2008, the odds did not drop below 40.2 percent (2004, $p < .001$). By 2008, the odds of reporting good or excellent health increase by only 9.6 percent for each one unit increase in logged income (and are not significant), and only increase back to 26.2 percent in 2010. The decrease in the latter part of the 2000s in both the significance and the positive effect

of income for self-rated health may be related to the major downturn in the economy that began in 2007 (DeNavas-Walt, Proctor, and Smith 2011). That is, as the economy worsens, the positive effect of income on self-rated health appears to trend downward. This may be due to cutbacks in social spending coinciding with increases in mental illness and stress-related physical illnesses (Waddan 2010). More data will need to be collected in coming years to detect a changing pattern in the relationship.

As hypothesized, the overall pattern shows household income to be significantly associated with self-rated health between the years 1975 to 2010, when controlling for education, occupational prestige, and socio-demographic variables. The odds ratios in model three also show a strong positive relationship between logged income and self-rated health for nearly all reported years from 1975 to 2010, ranging from a high of 1.803 ($p < .001$) in 2000, to a low of 1.096 (not significant) in 2008.

Table 5.3 Logistic Regression of Self-Rated Health[a] on Logged Income by Year, 1975 – 2010

YEAR	MODEL 1[b]		MODEL 2[c]		MODEL 3[d]	
	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2
1975	1.952*** (.131)	551.83 .075	1.904*** (.153)	514.13 .173	1.545* (.168)	484.76 .245
1976	1.805*** (.138)	515.47 .054	1.819*** (.161)	469.81 .181	1.511* (.176)	460.51 .205
1977	1.735*** (.096)	1096.54 .046	1.627*** (.108)	1010.69 .159	1.403*** (.119)	995.42 .178
1980	1.678*** (.086)	1068.82 .054	1.744*** (.103)	988.83 .163	1.480*** (.111)	969.50 .188
1982	1.622*** (.083)	1064.46 .049	1.505*** (.099)	984.19 .158	1.322*** (.108)	965.70 .182
1984	1.939*** (.089)	912.62 .089	2.031*** (.106)	857.85 .168	1.786*** (.114)	847.37 .183
1985	1.577*** (.085)	1037.81 .041	1.590*** (.099)	980.07 .121	1.344*** (.108)	950.71 .160
1987	2.121*** (.090)	924.32 .112	1.863*** (.108)	830.14 .237	1.552*** (.117)	812.34 .261

Table 5.3 – *Continued*

1988	1.676*** (.103)	612.26 .058	1.669*** (.124)	553.93 .188	1.360* (.137)	526.64 .245
1989	2.082*** (.115)	567.68 .103	1.978*** (.136)	523.14 .202	1.442*** (.147)	518.01 .213
1990	1.687*** (.118)	546.66 .052	1.592*** (.138)	524.27 .108	1.358* (.148)	513.75 .135
1991	1.634*** (.107)	633.86 .049	1.626*** (.125)	607.33 .109	1.547*** (.135)	603.05 .119
1993	1.994*** (.100)	676.51 .106	1.828*** (.114)	653.51 .151	1.629*** (.125)	635.42 .185
1994	1.684*** (.072)	1292.34 .060	1.645*** (.086)	1239.61 .117	1.500*** (.091)	1226.55 .131
1996	1.737*** (.064)	1601.36 .068	1.789*** (.079)	1504.19 .151	1.498*** (.084)	1450.50 .195
1998	1.658*** (.057)	1810.95 .064	1.601*** (.067)	1731.18 .125	1.406*** (.072)	1693.67 .153
2000	1.957*** (.068)	1387.58 .104	1.979*** (.080)	1337.94 .151	1.803*** (.084)	1327.51 .161
2002	1.729*** (.068)	1267.01 .081	1.638*** (.079)	1215.42 .137	1.431*** (.083)	1190.56 .164
2004	1.608*** (.077)	839.90 .065	1.559*** (.088)	816.81 .103	1.402*** (.094)	792.59 .142
2006	1.704*** (.049)	2415.42 .077	1.666*** (.058)	2297.02 .146	1.559*** (.060)	2251.39 .172
2008	1.360*** (.067)	1004.38 .034	1.294*** (.079)	953.43 .111	1.096 (.087)	920.55 .159
2010	1.523*** (.067)	987.85 .065	1.470*** (.078)	951.31 .121	1.262** (.085)	930.21 .152

Source: Smith et al. (2011)
**p < .05 **p < .01 ***p < .005*
a. Dependent variable is self-rated health (good or excellent=1, fair or poor=0)
b. Unadjusted odds ratio
c. Odds ratio adjusted for marital status, race, sex, age, and employment status
d. Odds ratio adjusted for marital status, race, sex, age, employment status, years of education, and logged income
e. Nagelkerke Pseudo R^2

In order to detect a trend in the association between household income and self-rated health across years, I plotted the odds ratios from the full model (model three) for each year in a graphic representation, and then created a trend line using Microsoft Excel. It is important to note that odd ratios for each year in the sample, whether significant or not, are plotted in the

figures. While this provides a more complete illustration of the trends (or lack thereof), some years are not significant. Figure 5.1 shows the trend in the odds ratios for self-rated health regressed on logged income from 1975 to 2010. Based on the hypothesis, it was expected that the association between income and reporting good or excellent health would become increasingly smaller from 1975 to 2010. Contrary to expectations, the odds ratios do not appear to follow any systematic pattern, and the trend line is relatively flat. There is a great deal of variation in the odds ratios from year to year.

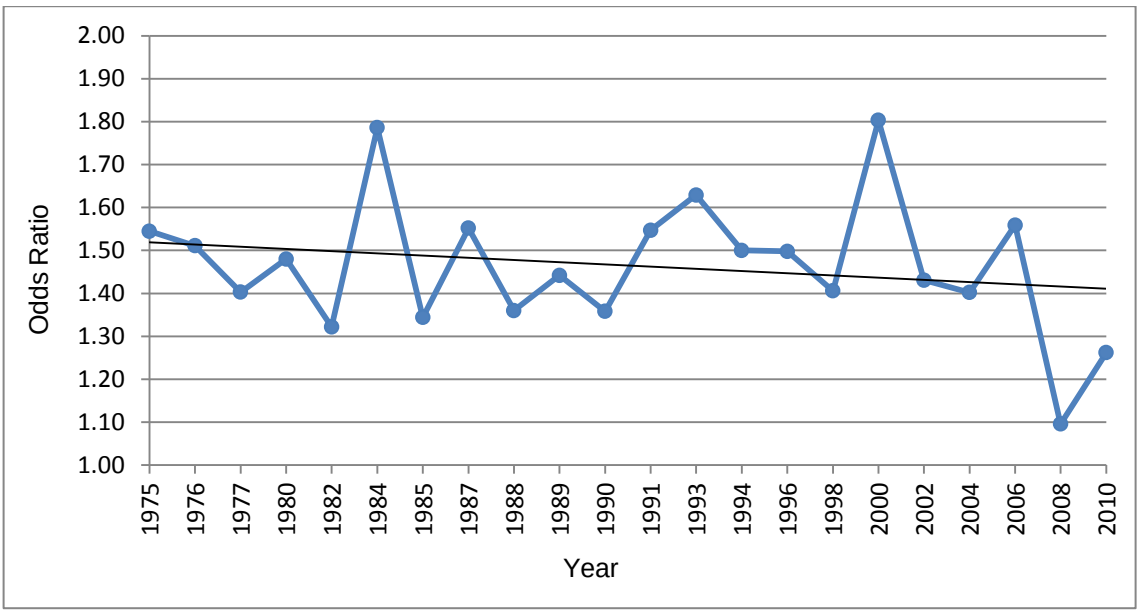


Figure 5.1 Odds Ratios for Self-Rated Health Regressed on Logged Income, 1975 – 2010 (Controlled for Demographic Variables, Years of Education, and Occupational Prestige)

5.2.3 Self-Rated Health Regressed on Years of Education by Year

Table 5.4 displays the results for the logistic regression of self-rated health on education by year from 1975 to 2010. Prior to entering any controls into the model (model one), education is a strongly significant ($p < .001$) predictor of self-rated health for all years reported. With demographic control variables and employment status added (model 2), education

remains a strongly significant predictor for each year in the model, but the relationships are reduced somewhat. Finally, when controlling for household income and occupational prestige in addition to control variables (model 3), education does not appear to be as consistently significant for self-rated health. For example, education is no longer significantly related to reporting good or excellent health in 1976 or in 1990 and it is only weakly significant in 1989, 1991, and 2000. However, in all other years, education remains significant when controlling for household income and self-rated health. Overall, given the fact that education is strongly significant in all but five of the years reported, and is still weakly significant in three of those five years, it is reasonable to conclude that education has an overall significant association with self-rated health from year to year, though not as consistently significant as the association between household income and health.

Table 5.4 Logistic Regression of Self-Rated Health[a] on Education by Year, 1975 – 2010

YEAR	MODEL 1[b]		MODEL 2[c]		MODEL 3[d]	
	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2
1975	1.369*** (.047)	524.14 .148	1.336*** (.050)	492.15 .227	1.289*** (.057)	484.76 .245
1976	1.259*** (.041)	498.36 .103	1.174*** (.043)	468.71 .184	1.097† (.052)	460.51 .205
1977	1.218*** (.027)	1073.37 .078	1.153*** (.028)	1003.59 .168	1.123*** (.035)	995.42 .178
1980	1.241*** (.028)	1040.84 .093	1.179*** (.029)	983.87 .169	1.122*** (.034)	969.50 .188
1982	1.253*** (.030)	1034.41 .090	1.171*** (.031)	972.34 .173	1.153*** (.037)	965.70 .182
1984	1.252*** (.031)	912.56 .089	1.187*** (.033)	875.07 .144	1.110** (.039)	847.37 .183
1985	1.261*** (.030)	998.11 .096	1.212*** (.031)	958.10 .150	1.194*** (.037)	950.71 .160
1987	1.284*** (.031)	920.74 .113	1.201*** (.032)	829.20 .239	1.126*** (.038)	812.34 .261
1988	1.271*** (.039)	593.26 .102	1.230*** (.041)	541.35 .214	1.132** (.046)	526.64 .245

Table 5.4 – *Continued*

1989	1.237*** (.037)	574.55 .087	1.170*** (.039)	532.92 .181	1.104* (.046)	518.01 .213
1990	1.184*** (.041)	548.44 .047	1.148*** (.042)	524.52 .108	1.070 (.049)	513.75 .135
1991	1.150*** (.036)	638.84 .038	1.110** (.037)	614.27 .094	1.093* (.044)	603.05 .119
1993	1.308*** (.040)	676.90 .105	1.248*** (.041)	650.88 .156	1.206*** (.047)	635.42 .185
1994	1.201*** (.028)	1299.83 .052	1.155*** (.029)	1246.62 .110	1.113*** (.033)	1226.55 .131
1996	1.306*** (.027)	1559.19 .105	1.265*** (.027)	1474.39 .176	1.218*** (.031)	1450.50 .195
1998	1.232*** (.023)	1803.35 .070	1.195*** (.024)	1720.62 .133	1.137*** (.027)	1693.67 .153
2000	1.198*** (.026)	1440.94 .052	1.162*** (.026)	1382.55 .109	1.076* (.032)	1327.51 .161
2002	1.199*** (.026)	1283.32 .062	1.180*** (.027)	1215.67 .137	1.116*** (.030)	1190.56 .164
2004	1.234*** (.034)	835.79 .072	1.220*** (.034)	805.98 .120	1.184*** (.038)	792.59 .142
2006	1.178*** (.016)	2431.27 .067	1.163*** (.017)	2297.83 .146	1.108*** (.020)	2251.39 .172
2008	1.206*** (.028)	976.61 .076	1.198*** (.029)	922.37 .157	1.172*** (.034)	920.55 .159
2010	1.179*** (.028)	990.17 .061	1.175*** (.028)	942.20 .134	1.115*** (.033)	930.21 .152

Source: Smith et al. (2011)

*$^{\dagger}p < .10$ *$p < .05$ **$p < .01$ ***$p < .005$*

a. Dependent variable is self-rated health (good or excellent=1, fair or poor=0)
b. Unadjusted odds ratio
c. Odds ratio adjusted for marital status, race, sex, age, and employment status
d. Odds ratio adjusted for marital status, race, sex, age, employment status, years of education, and logged income
e. Nagelkerke Pseudo R^2

Figure 5.2 represents the full model odds ratios for each year from the regression of self-rated health on years of education. As in the relationship between income and self-rated health, there is no discernible pattern in the relationship between education and health from 1975 to 2010, and the trend line is relatively flat. However, some interesting findings emerge in certain years when comparing the odds ratios for income and health (Figure 5.1) with those for

education and health (Figure 5.2). In 1975, the odds ratio for education is exceptionally high, at 1.289. It is also strongly significant, at $p < .001$. The odds ratio for income in the same year is relatively high at 1.545, but the association is less significant ($p < .05$) than the odds ratio for education. In the full model, only two other years have odds for education that are greater than 20 percent: 1993, at 20.6 percent; and 1996, at 21.8 percent. Interestingly, the odds ratio for household income also reaches a relative high in 1993 (but not in 1996).

In the years 1984 and 2000, the odds ratios for income reach their highest peak, at 1.786 and 1.803 respectively (both are significant at $p < .01$). That is, for each additional year of education, the odds of reporting good or excellent health were 11.0 percent higher ($p < .01$) in 1984, and 7.6 percent higher ($p < .05$) in 2000. Interestingly, both of these peaks correspond with relatively low points in the odds ratios for education. The odds ratios for education range as high as 1.289 (1975) and as low as 1.070 (1990), so these are comparatively low odds ratios on the education variable. It appears that in 1984 and 2000, education is a more significant and important predictor of self-rated health than household income, although the reason is not clear.

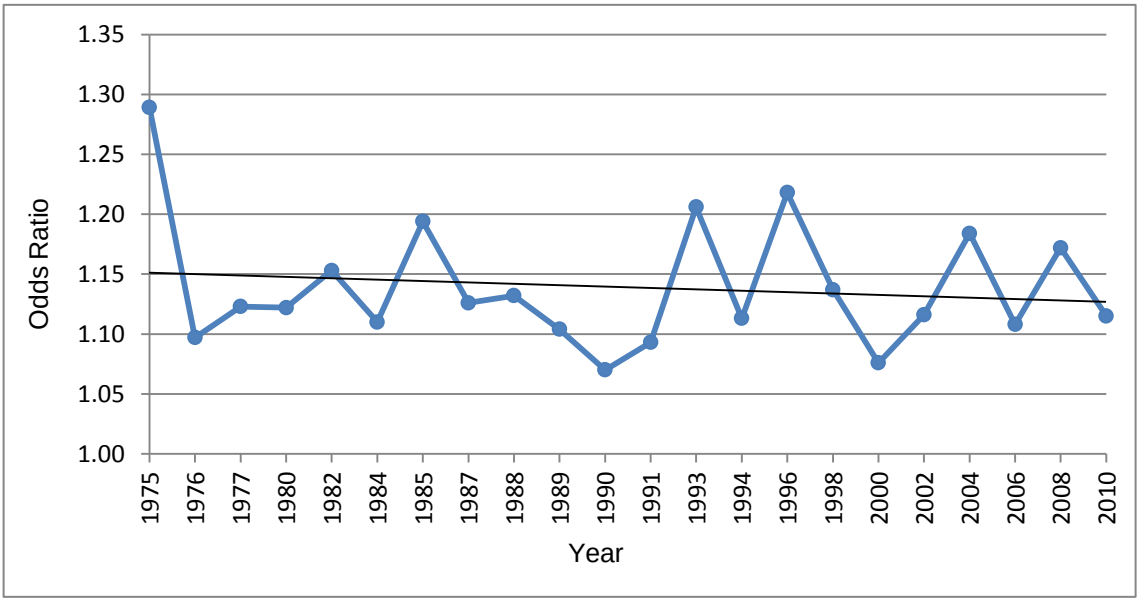


Figure 5.2 Odds Ratios for Self-Rated Health Regressed on Years of Education, 1975 – 2010 (Controlled for Demographic Variables, Logged Income, and Occupational Prestige)

5.2.4 Self-Rated Health Regressed on Occupational Prestige Score by Year

In the logistic regression of self-rated health on occupational prestige score, the unadjusted odds ratios for occupational prestige (model one) are significant in all years, with the exception of 1991, as shown in Table 5.5. In model two, with controls for marital status, race, sex, age, and employment status, occupational prestige remains a significant predictor of self-rated health, again in all years but 1991. However, when accounting for household income and education, the measure of occupational prestige ceases to be significant in nearly every year reported, with the exception of 1988 and 1990. These two years appear to be anomalies in the data; the years 1988 and 1990 have exceptionally high odds ratios, at 1.030 and 1.023, respectively. It is not clear why occupational prestige is significant only in those two years, but they do correspond with a decrease in the odds ratios for both income (1.360 and 1.358, respectively) and education (1.132 and 1.070, respectively). Also of interest is that many of the odds ratios are below one, indicating a very slightly negative (albeit insignificant) relationship in some years between occupational prestige and self-rated health.

Table 5.5 Logistic Regression of Self-Reported Health[a] on Occupational Prestige by Year, 1975 - 2010

YEAR	MODEL 1[b]		MODEL 2[c]		MODEL 3[d]	
	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2	Exp(B) (Standard Error)	–2 Log Likelihood [e]Pseudo R^2
1975	1.039*** (.008)	555.56 .065	1.035*** (.009)	515.83 .169	1.002 (.011)	484.76 .245
1976	1.036*** (.009)	516.45 .052	1.032*** (.009)	471.04 .178	1.013 (.011)	460.51 .205
1977	1.021*** (.006)	1115.34 .021	1.019*** (.006)	1020.00 .147	0.999 (.007)	.995.42 .178
1980	1.028*** (.006)	1081.63 .035	1.026*** (.006)	1000.55 .147	1.006 (.007)	969.50 .188
1982	1.023*** (.006)	1081.20 .025	1.018*** (.006)	991.98 .148	0.996 (.008)	965.70 .182
1984	1.030*** (.006)	946.72 .037	1.024*** (.007)	891.84 .120	1.002 (.008)	847.37 .183

Table 5.5 – *Continued*

1985	1.022*** (.005)	1050.34 .023	1.021*** (.006)	988.35 .109	0.995 (.007)	950.71 .160
1987	1.036*** (.006)	961.76 .053	1.030*** (.007)	844.83 .218	1.008 (.008)	812.34 .261
1988	1.045*** (.009)	607.89 .069	1.047*** (.009)	543.13 .211	1.030** (.011)	526.64 .245
1989	1.021* (.008)	603.97 .017	1.018* (.009)	545.58 .153	0.998 (.010)	518.01 .213
1990	1.040*** (.009)	546.05 .053	1.035*** (.010)	521.68 .115	1.023* (.011)	513.75 .135
1991	1.011 (.007)	652.48 .006	1.006 (.008)	621.89 .076	0.988 (.009)	603.05 .119
1993	1.028*** (.008)	714.72 .029	1.021** (.008)	675.77 .108	0.991 (.010)	635.42 .185
1994	1.021*** (.005)	1329.81 .018	1.017*** (.006)	1264.46 .091	0.999 (.007)	1226.55 .131
1996	1.026*** (.005)	1647.33 .027	1.025*** (.005)	1535.22 .125	0.999 (.006)	1450.50 .195
1998	1.029*** (.005)	1851.36 .032	1.027*** (.005)	1750.36 .110	1.008 (.006)	1693.67 .153
2000	1.026*** (.005)	1462.68 .030	1.024*** (.005)	1394.54 .097	1.005 (.006)	1327.51 .161
2002	1.028*** (.005)	1307.99 .034	1.027*** (.006)	1233.64 .118	1.011† (.006)	1190.56 .164
2004	1.026*** (.006)	862.41 .027	1.024*** (.007)	830.10 .081	0.999 (.008)	792.59 .142
2006	1.029*** (.004)	2481.14 .037	1.027*** (.004)	2332.99 .126	1.008† (.005)	2251.39 .172
2008	1.025*** (.006)	1007.12 .029	1.023*** (.006)	949.05 .118	1.005 (.007)	920.55 .159
2010	1.030*** (.006)	1002.54 .042	1.028*** (.006)	954.94 .115	1.011 (.007)	930.21 .152

Source: Smith et al. (2011)

*†p < .10 *p < .05 **p < .01 ***p < .005*

a. Dependent variable is self-rated health (good or excellent=1, fair or poor=0)

b. Unadjusted odds ratio

c. Odds ratio adjusted for marital status, race, sex, and age

d. Odds ratio adjusted for marital status, race, sex, age, years of education, and logged income

e. Nagelkerke Pseudo R^2

Figure 5.3 shows the trend in the full model odds ratios for self-rated health regressed on occupational prestige scores from 1975 to 2010. It is important to note that none of the plotted odds ratios were significantly associated with health in the model. Furthermore, the odds ratios do not appear to follow any systematic pattern, and the trend line is nearly flat, with a great deal of variation in the odds ratios from year to year. This lack of pattern is similar to that found in the association between income and health and education and health. Thus, it can be concluded that, contrary to my hypothesis, there is no discernible trend in the association of income, education, and occupational status from 1975 to 2010.

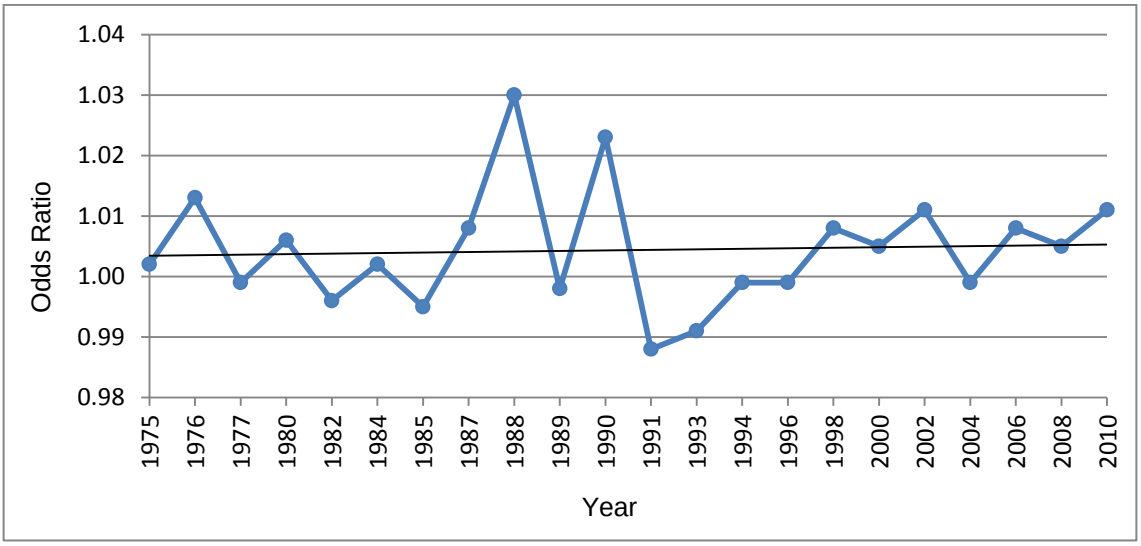


Figure 5.3 Odds Ratios for Self-Rated Health Regressed on Occupational Prestige, 1975 – 2010 (Controlled for Demographic Variables, Years of Education, and Logged Income)

5.2.5 Interaction Effects

In order to compare the effects of each SES variable on self-rated health to the reference year of 1975, I performed a logistic regression for the entire sample that included interaction variables. To calculate the variables, I coded each year as a dummy variable, with the year in question equal to 1 and all other years in the sample equal to 0. Then I calculated an interaction variable using these dummy year variables and each measure of SES separately.

So, for example, my interaction variables included year 1976 times logged income, year 1976 times education, and year 1976 times occupational prestige score, and so on. The reference category was 1975 and was therefore left out of the regression. The regression includes the independent measures of SES (logged household income, years of education, and occupational prestige score), socio-demographic control variables, and all of the interaction variables. The results of selected years are shown in Table 5.6. Only those interaction variables with a p value of less than .10 are reported.

The analysis of the significant interaction effects reveals interesting findings that were not immediately obvious in the previous regressions. Between 1977 and 2006, there are seven years in which income has a significantly greater effect on self-rated health than in 1975. These are 1977, 1984, 1989, 1991, 1994, 2000, and 2006. In three intervening years (1982, 1987, and 1990) the coefficient approaches near significance, at $p < .100$. For the years in which the coefficient is significant at $p < .05$, the coefficients on the interaction variables follow a steadily increasing trend until the early 1990s—from .141 in 1975 to .221 in 1991. Then the coefficient decreases from .200 in 2000 to .119 in 2006. Although the coefficients decrease, the coefficients for those two years are still highly significant, meaning that income still has a significantly greater effect in the years 2000 and 2006 than in 1975.

The interaction effect for education by year is significant for three of the years reported—1990, 2000, and 2006—and is nearing significance ($p < .100$) for the years 1984, 1991, 1994, 2002, and 2010. Interestingly the coefficients are negative, meaning that education has less of an effect on self-rated health in these years than in 1975. The only year in which education has a greater effect is in 2002, in which the coefficient is .081, but this is not a significant finding. There appears to be no clear pattern in the magnitude of the effect of education, with the exception of the three years in which the coefficient is significant (1990, 2000, and 2006). For each of these three years, the size of the coefficient decreases, indicating that while education has less of an impact in these years than in 1975 on self-rated health, the

gap is narrowing as time passes. However, caution should be used in determining a pattern from only three data points; more data is needed to discern a clear pattern

In the context of rising income inequality, much of the explanatory power for the relationship between SES and self-rated health appears to reside in the household income and education variables, with income being somewhat more important of the two. Furthermore, the effect of occupational prestige is not robust when factoring in income and education. This is contrary to my expectation that occupational prestige is significantly associated with self-rated health.

Table 5.6 Logistic Regression of Self-Rated Health[a] on Logged Household Income, Education, and Occupational Prestige Score, with Interaction Effects for Selected Years[b] (N=24,549)

Variables	B	S.E.	Exp(B)
Measures of SES			
Logged Income (in 2000 dollars)	.261	.057	1.298***
Education (years completed)	.208	.051	1.232***
Occupational Prestige[c]	.006	.010	1.006
Control Variables			
Marital Status (1=married)	.112	.039	1.119***
Race (1=white)	.201	.044	1.222***
Sex (1=male)	-.076	.036	0.927*
Age (years)	-.032	.001	0.969***
Employment Status (1=employed)	.648	.038	1.913***
Interaction Effects for Selected Years[b]			
Year 1977 x Logged Income	.141	.063	1.152*
Year 1982 x Logged Income	.115	.066	1.122†
Year 1984 x Logged Income	.172	.067	1.188*
Year 1987 x Logged Income	.113	.067	1.119†
Year 1989 x Logged Income	.194	.076	1.214*
Year 1990 x Logged Income	.130	.079	1.139†
Year 1991 x Logged Income	.221	.074	1.247**
Year 1994 x Logged Income	.160	.066	1.173*
Year 2000 x Logged Income	.200	.064	1.222**
Year 2006 x Logged Income	.119	.059	1.126*

Table 5.6 – *Continued*

Year 1984 x Education	-.108	.062	0.898†
Year 1990 x Education	-.150	.069	0.861*
Year 1991 x Education	-.117	.066	0.890†
Year 1994 x Education	-.100	.060	0.905†
Year 2000 x Education	-.148	.059	0.862*
Year 2002 x Education	-.101	.058	0.904†
Year 2006 x Education	-.106	.054	0.899*
Year 2010 x Education	-.102	.060	0.903†
Constant	-3.576	.198	.028***
–2 Log Likelihood	21200.36		
Nagelkerke R^2	.172		

Source: Smith et al. (2011)

*†p < .10 *p < .05 **p < .01 ***p < .005*

a. Dependent variable is self-rated health (good or excellent=1, fair or poor=0)

b. Year interaction effects reported are those for which p < .10.

c. Based on the U.S. Bureau of the Census 3 digit industrial classifications for 1972-1990 and the 1980 Census occupational and industrial classifications for 1988 to the present.

CHAPTER 6

DISCUSSION AND CONCLUSIONS

6.1 Discussion

This study examined the relationship between health and three common measures of socioeconomic status—household income, education, and occupational prestige. Both household income and education were found to be significantly associated with self-rated health in the pooled sample. When examining each SES variable by year, household income was significant in every year under study and was found to be strongly related to health, with each one unit increase in logged income increasing the likelihood of reporting good or excellent health by as much as 80 percent. Education was also significantly associated with self-rated health. The association was significant in all but two of the years under study, and each additional year of education increased the likelihood of reporting good or excellent health by as much as 22 percent.

Contrary to expectations, this study did not provide evidence of a significant relationship between occupational prestige and self-rated health when controlling for household income and education. Based on the results of previous studies that found occupational prestige to be a significant predictor of self-rated health, especially those conducted in European nations, I expected occupational prestige to be significantly associated with self-rated health, independent of income and education. I did see some evidence of a gradient based on occupational prestige in percentage distributions by group. However the introduction of income and education reduced the occupational prestige score to insignificance. When demographic and social control variables were added to the model, occupational prestige became significantly associated with self-rated health, but this is likely due to the introduction of employment status as a demographic variable.

As part of the GSS questionnaire, respondents were asked to indicate the work they do or used to do, even if by the time of the survey they were unemployed due to retirement, a decision to become a homemaker after a period in the work force, and so on. As such, there were 5970 respondents, or about 24.3 percent, who were unemployed but were assigned an occupational prestige score. A former occupation may continue to carry a certain amount of prestige without the benefits of access to resources. Retired doctors are still considered prestigious and may derive some residual benefits from that prestige, but they likely do not have access to the same income or the same networks they once did when active in the profession. Not only is this true for those who are no longer employed, but this effect may also apply to professions which carry a certain amount of prestige, such as fire fighter or teacher, yet receive only a moderate income (Christ et al. 2012). As such, it seems reasonable that controlling for employment status will have an effect on the significance of occupational prestige. However, the relationship between occupational prestige and self-rated health, when controlling for education and income as well as employment status, was very modest. Each incremental increase in occupational prestige score improved the odds of reporting good or excellent health by only .4 percent. Furthermore, the full model odds ratios for each separate year in the study revealed an overall pattern in which occupational prestige was insignificant in almost all years studied, and the odds ratio was close to 1.000, indicating no relationship between occupational prestige and self-rated health.

Given the disparate findings between studies conducted in Europe versus studies conducted in the United States, it is worth exploring why occupational prestige is not significant for self-rated health in the United States. According to Dahl (1994), disposable household income and educational attainment may be an important mediating factor in the relationship between occupational prestige and health. In European social democratic welfare states in which income distribution is more equitable, occupational prestige may be a stronger and more consistent predictor of health, since income and education are somewhat more level. Even in

countries like the United Kingdom, with income inequality comparable to the United States, the effects of inequality are ameliorated by the presence of a strong social safety net, high benefit equality, and a highly progressive taxation (McDonough et al. 2010). Because of the large variation in income and education and a lack of a strong social safety net that is unique to the United States among developed Western nations, it appears that household income and education explain a great deal of the association between SES and health, with household income being the more important of the two in this study. In the United States at least, the results of this study do not provide evidence that occupational prestige has a robust association with self-rated health, and the association appears to be mediated by household income and education.

The second major finding of this study is that in regards to rising income inequality, there seems to be no consistent trend in the strength of the relationship between SES and health on any of the three measures of health. Introducing interaction effects between year and the three separate measures of health did not reveal any outstandingly clear trends, but it did reveal some interesting patterns. From 1977 to the early 1990s, the effect of income in relation to the reference year of 1975 grew increasingly large over time. It appears that the effect of income stabilizes for a period of a few years, then abruptly rises, then once again stabilizes, and so on. This may be due to lagged effects of the economy on the relationship between household income and self-rated health. By the year 2000, however, the effect of income began to lessen. The interaction effects between education and year also revealed an interesting pattern in which education had less of an impact on self-rated health in the early 1990s than it did in the reference year of 1975. From 1990 to the mid-2000s, the effect of education increased, although not to the extent of household income, which is somewhat more important in the context of growing income inequality.

Based on the large body of literature that indicates that income inequality impacts the SES gradient in health, it is surprising that this study did not find any systematic trends in the

relationship between measures of SES and health during a period of rapid increase in income inequality. This may be related to the fact that income inequality is not directly measured in the study; instead, year is used as a proxy for income inequality. It is clear that there is a significant upward trend in income inequality during the years under study. However, technological advances in medicine and distributive social policies like welfare and Medicaid programs, may have mediated the impact that increasing income inequality has had on the relationship between socioeconomic status and health. The European literature on the relationship between socioeconomic prestige and health indicates that a strong social safety net and a progressive taxation system seem to ameliorate the effect of income inequality on socioeconomic status. This may be true also of programs in the United States that aid the poor. It will be interesting to see the impact on the SES health gradient as austerity measures continue to take effect in European countries as well as the United States.

Another possible explanation for the lack of a clear trend in the relationship between SES and health over time may have to do with the possibility of a threshold in income and development beyond which income inequality may not affect the association between SES and health. That is, once a nation reaches a certain level of development, there may be a threshold beyond which there are diminishing returns in health, since in most cases even the poorest citizens have access to clean water, sanitary housing conditions, and life-saving medical interventions like vaccinations. This may begin to address what Link and Phelan (1995) refer to as the 'fundamental causes' of disease. More research is needed in the area of cross-national health comparisons, although such comparisons are made difficult by the lack of data for many developing countries and by a lack of standardization of key measures, such as income, education, and health.

6.2 Contributions and Limitations

This study makes two major contributions to the existing research on the association between SES and self-rated health in the context of increasing income inequality. First, it

provides evidence that in the United States, occupational prestige may not be a robust measure of SES in relation to health. Income and education appear to have more explanatory power in the relationship between SES and health. However, the occupational prestige measures used in this study are based on 1970 and 1980 Census data and may be outdated. Furthermore, the measure of occupational prestige may capture something different in the United States than in European countries, in which society remains somewhat divided among more hierarchical, or "class" lines. Disentangling the complicated relationships between income, education, and occupational prestige may depend on arriving at more accurate means of measuring these variables and the meanings behind them.

Secondly, this study shows that there is no systematic pattern in the SES gradient related to rising income inequality, whether measured by household income, education, or occupational prestige. However, the effect of income, when compared to the base year of 1975, seems to indicate somewhat of a pattern from 1977 until 2006. It appears that during this time period, the effect of income increases significantly, then levels off for a few years, then increases significantly again. After 2006, the effect of income is no longer significantly different from the reference year of 1975. Similarly, in 1990 the effect of education on self-rated health is significantly less than the effect in 1975, and decreases even more in 2000 and 2006. For every reported year prior to 1990, however, the effect of education is not significantly different from that in 1975. At any rate, these findings of a significant pattern in some years do not change the overall lack of a clear pattern. The findings should be interpreted with caution, however, for two primary reasons: first, income inequality was not measured directly, but year was used as a proxy for income inequality; and secondly, the GSS did not include data for all years between 1975 and 2010, since the measure of health was a rotating question. A clearer pattern might emerge given a direct measure of income inequality and data for each year under study. Further research may be concentrated around determining macro- and micro-level factors, such as

strong social safety nets or diminishing returns on inputs to health that may be affecting the SES gradient.

In conclusion, the results of this study confirm the research showing a significant association between socioeconomic status and health. The association is dependent, however on the measure(s) of SES used. According to the results of this study, income and education are significantly associated with self-rated health, but there appears to be no significant relationship between occupational prestige and health when controlling for income and education. Additionally, income inequality may have an impact on the socioeconomic health gradient, but the results of this study do not support an overall pattern of change in the gradient.

APPENDIX A

SUPPLEMENTAL TABLES

Table A.1 Response Rates on the 1975 – 2010 General Social Surveys

Year	Original Sample	Net Sample	Completed Cases	Eligibility Rate[a]	Response Rate[b]
1975	1102	972	735	0.882	0.756
1976	1113	991	744	0.890	0.751
1977	2317	1999	1530	0.863	0.765
1980	2210	1933	1468	0.875	0.759
1982	2221	1942	1506	0.874	0.775
1984	2157	1873	1473	0.868	0.786
1985	2201	1948	1534	0.885	0.787
1987	2250	1945	1466	0.864	0.754
1988	2250	1916	1481	0.852	0.773
1989	2250	1981	1537	0.884	0.776
1990	2165	1857	1372	0.858	0.739
1991	2312	1950	1517	0.843	0.778
1993	2296	1950	1606	0.849	0.824
1994	4559	3846	2992	0.844	0.778
1996	4559	3814	2904	0.837	0.761
1998	4567	3745	2832	0.820	0.756
2000	4883	4026	2817	0.824	0.700
2002	4890	3943	2765	0.806	0.701
2004	6260	4713	2812	0.753	0.704
2006	9535	7987	4510	0.838	0.712
2008	4220	3548	2023	0.833	0.704
2010	4093	3418	2044	0.835	0.703

Source: Smith et al. (2011)
a. Net Sample/Original Sample
b. Completed Cases/Net Sample

Table A.2 Gini Coefficient of Income Inequality, 1975 – 2010

Year	GINI Index	Standard Error
1975	0.397	0.0056
1976	0.398	0.0041
1977	0.402	0.0039
1978	0.402	0.0039
1979	0.404	0.0038
1980	0.403	0.0036
1981	0.406	0.0038
1982	0.412	0.0038
1983	0.414	0.0037
1984	0.415	0.0037
1985	0.419	0.0037
1986	0.425	0.0038
1987	0.426	0.0038
1988	0.426	0.0041
1989	0.431	0.0040
1990	0.428	0.0039
1991	0.428	0.0038
1992	0.433	0.0038
1993	0.454	0.0042
1994	0.456	0.0042
1995	0.450	0.0043
1996	0.455	0.0043
1997	0.459	0.0043
1998	0.456	0.0042
1999	0.458	0.0041
2000	0.462	0.0030
2001	0.466	0.0030
2002	0.462	0.0029
2003	0.464	0.0028
2004	0.466	0.0029
2005	0.469	0.0029
2006	0.470	0.0028
2007	0.463	0.0027
2008	0.466	0.0027
2009	0.468	0.0028
2010	0.469	0.0027

Source: U.S. Bureau of the Census (2011)

Table A.3 Household Income Ratio of the 95th Percentile to the 50th Percentile, 1975 – 2010

Year	Ratio	Standard Error
1975	2.72	0.019
1976	2.76	0.020
1977	2.80	0.018
1978	2.79	0.020
1979	2.85	0.020
1980	2.86	0.019
1981	2.89	0.020
1982	2.98	0.021
1983	3.04	0.019
1984	3.06	0.020
1985	3.05	0.028
1986	3.10	0.018
1987	3.11	0.020
1988	3.15	0.023
1989	3.17	0.021
1990	3.16	0.022
1991	3.20	0.021
1992	3.23	0.021
1993	3.35	0.022
1994	3.40	0.024
1995	3.32	0.023
1996	3.37	0.022
1997	3.42	0.022
1998	3.40	0.024
1999	3.49	0.024
2000	3.46	0.026
2001	3.56	0.023
2002	3.54	0.022
2003	3.56	0.021
2004	3.54	0.025
2005	3.58	0.028
2006	3.61	0.025
2007	3.52	0.021
2008	3.58	0.023
2009	3.62	0.022
2010	3.66	0.023

Source: U.S. Bureau of the Census (2011)

Table A.4 Statistics for Key Explanatory Variables by Year, 1975 – 2010

Year	N	Logged Income[a]				Education				Occupational Prestige[b]			
		Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
1975	530	10.47	0.77	7.34	11.49	12.42	2.71	4	20	39.68	13.75	12	78
1976	520	10.33	0.75	7.26	11.42	12.24	2.94	3	20	38.03	13.78	12	82
1977	1122	10.53	0.76	7.20	12.10	12.24	2.95	0	20	38.97	14.19	12	82
1980	1034	10.54	0.84	7.00	11.91	12.62	2.93	1	20	40.07	13.52	12	82
1982	1065	10.37	0.86	6.81	11.64	12.61	2.81	0	20	38.62	13.96	12	82
1984	1065	10.37	0.88	6.71	11.61	12.86	2.89	0	20	39.39	14.10	12	82
1985	1120	10.44	0.86	6.67	11.64	13.04	2.89	1	20	41.65	14.74	12	82
1987	1075	10.49	0.87	6.62	11.63	13.11	2.93	0	20	41.00	14.08	12	82
1988	697	10.44	0.90	6.59	11.63	13.10	2.95	0	20	42.89	13.87	17	86
1989	706	10.52	0.86	6.55	11.59	13.29	2.98	0	20	43.87	13.72	19	86
1990	635	10.54	0.86	6.51	11.66	13.23	2.72	0	20	42.69	13.35	17	86
1991	680	10.39	0.87	6.46	11.67	13.41	2.84	0	20	43.24	13.48	17	75
1993	781	10.49	0.93	6.40	11.73	13.60	2.71	0	20	43.78	13.41	17	86
1994	1443	10.46	0.90	6.38	11.71	13.58	2.64	3	20	43.47	13.55	17	86
1996	1813	10.49	0.91	6.33	11.71	13.78	2.71	0	20	43.66	13.83	17	86
1998	2037	10.48	0.95	6.28	11.91	13.66	2.70	0	20	44.33	13.51	17	86
2000	1631	10.50	0.95	6.25	12.02	13.66	2.70	0	20	44.45	14.30	17	86
2002	1337	10.52	1.00	6.19	11.98	13.62	2.81	0	20	43.80	13.86	17	86
2004	979	10.55	1.03	6.15	11.93	13.92	2.77	1	20	45.27	14.11	17	86
2006	2437	10.51	0.99	6.09	12.09	13.55	3.10	0	20	44.08	14.05	17	86
2008	936	10.46	1.10	6.03	12.08	13.66	2.97	2	20	43.72	14.03	17	86
2010	906	10.35	1.13	6.00	11.94	13.88	2.74	0	20	44.20	13.91	17	86

Source: Smith et al. (2011)

a. Log of household income adjusted to year 2000 dollars.

b. Based on the U.S. Bureau of the Census 3 digit industrial classifications for 1972-1990 and the 1980 Census occupational and industrial classifications for 1988 to the present.

Table A.5 Distribution of Employment Status

Employment Status	Frequency	Percent	Valid Percent	Cumulative Percent
Working full time	15757	64.2	64.2	64.2
Working part time	2822	11.5	11.5	75.7
Temporarily not working	631	2.6	2.6	78.3
Unemployed, laid off	913	3.7	3.7	82.0
Retired	772	3.1	3.1	85.1
Attending school	559	2.3	2.3	87.4
Keeping house	2671	10.9	10.9	98.3
Unemployed, other	424	1.7	1.7	100.0
TOTAL	24549	100.0	100.0	

Source: Smith et al. (2011)

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