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Using 1973 Current Population Survey data matched to 1973–1978 Social Security mortality records, this study measures the relationship between the income and education of men and their subsequent mortality. The estimated relationships are compared with socioeconomic mortality differentials found by Kitagawa and Hauser in their study of 1960 census–death certificate matched data. The comparison suggests that there has been no improvement in the *relative* mortality experience of low socioeconomic status men. More generally, the article discusses how Social Security data could be used to monitor, on a continual basis, our progress toward eradicating signficant mortality differentials in the United States.

This article illustrates the use of Social Security administrative record data to monitor changes in mortality differentials over time. In particular, Social Security records matched to Current Population Survey (CPS) data are used to measure mortality differentials of adult men by income and education for the years 1973–1978. These differentials are compared with mortality differentials measured by Kitagawa and Hauser (1973) using 1960 matched census–death certificate data to determine whether the relative mortality experience of low socioeconomic status persons has improved since 1960.[1] The article also discusses how Social Security administrative data could be used to track, on a continual basis, socioeconomic mortality differentials over time.

The Data

Each individual with a Social Security number has a record filed with the Social Security Administration (SSA). As a result, Social Security has the name, date of birth, race, sex, and some geographic information for almost everyone in the United States. Mortality information is an essential part of the system, since it triggers the end of earnings records as well as the commencement or end of different benefit payments; deaths are routinely posted to the beneficiary and earnings records maintained by the SSA.

Using the Social Security number and other identifying information, Social Security data can be matched to other data sources. For instance, the 1973 CPS–Internal Revenue Service (IRS)–SSA Exact Match File links 1973 CPS data and IRS income tax data to Social Security longitudinal records of mortality, earnings, and disability information (Aziz, Kilss, and Scheuren, 1978; DelBene, 1979). This study uses an enhanced version of the Exact Match File in which 1973–1978 deaths reported in the Social Security earnings and beneficiary records are linked to the individual records of the Exact Match File.[2]

In using Social Security data, an important concern is the quality of the death reporting. Their accuracy in this regard has been assessed in two ways. In one study, death rates based on Social Security sources were compared with corresponding rates based on vital statistics data (Aziz and Buckler, 1980). In another evaluative study, a sample of 25,000 death

certificates for deaths occurring in 1975 were matched to Social Security records (DelBene and Aziz, 1982).

The first study found a steady increase in the coverage of Social Security death reporting over time; the improvement is due to an expansion of persons covered by Social Security and to technical improvements in Social Security's record keeping systems. The last year of deaths studied—1977—found that 98.5 percent of all deaths were recorded in the combined earnings and beneficiary record systems. The second study determined that Social Security death reporting in 1975 was virtually complete for white males 65 years old and over; the coverage rate was about 90 percent for white adult males younger than 65. For women and blacks, the death reporting was lower.

The primary reason for the underreporting found in these studies is that the comparisons were done for the general population without regard to whether individuals were eligible for Social Security benefits. Prior to 1978, however, records on mortality were usually maintained only for persons who were in some way covered by Social Security.

To insure accurate use of the Social Security mortality data, the study population in this investigation was limited to white married men employed in Social Security covered employment with sufficient quarters in that work to be eligible for disability benefits. Death reporting for this population should be close to perfect.[3] For the years for which Social Security data are used, about 90 percent of all U.S. employment was covered by Social Security, and of adult men in covered employment, more than 95 percent were estimated to have acquired sufficient quarters of coverage for disability benefit status (Orcutt, Caldwell, and Wertheimer, 1976:184). These statistics suggest that the results of this analysis can be generalized to most of the population of white married men.

Estimation and Results

In their study of 1960 mortality, Kitagawa and Hauser (1973) summarized socioeconomic mortality differences from the matched census–death certificate data by computing mortality ratios of actual to expected deaths for each income and education category. In each ratio, the numerator is the number of deaths that actually occurred in a given education or income category. The denominator is the number of deaths that would be expected to occur in the absence of differences in mortality by education or income; expected deaths were obtained by multiplying 1960 age-specific death rates for the population of the United States by the age composition of the subpopulation in each category for which mortality ratios were calculated (Kitagawa and Hauser, 1973:198).[4] A mortality ratio less than 100 indicates that actual deaths in a particular income or education category are less than the number of deaths one would expect on the basis of age, race, and sex alone; a mortality ratio greater than 100 indicates that actual deaths exceed what one would expect solely on the basis of age, race, and sex. The 1960 mortality ratios by income and education for white male family members, 25–65 years old, are shown on the left side of Table 1.

The education and income categories used by Kitagawa and Hauser were measured in this study with 1973 CPS data and related to Social Security mortality information for the years 1973–1978. (Income categories were adjusted for price increases between 1959 and 1972.) More specifically, a logit model was used to estimate probabilities of deaths (for a six-year period) by income and education for each year of age. Logit model estimates of probability of death, solely as a function of age, were estimated to give the "expected" probability of death at any given age. (The logit models and their estimated coefficients are presented in Table 2.) Using these age-specific predicted probabilities of death, age-adjusted mortality ratios were computed to compare with the 1960 mortality ratios.

Since socioeconomic mortality differentials vary by age, the extent of a differential in a mortality ratio will vary according to the underlying age composition.[5] To help control

Table 1. Mortality Ratios by Years of School Completed and by Income Level for White Men, 25–64 Years Old

Variable	Census–death certificate data, May–August 1960	CPS–Social Security data, 1973–1978
Years of schooling		
All	1.00	1.00
0–11 years	1.07	1.19
High school, 4 years	0.92	0.88
College, 1 year or more	0.81	0.82
Total income (1959 dollars)		
All	1.00	1.00
Under $2,000	1.51	1.59
$2,000–3,999	1.20	1.79
$4,000–5,999	0.99	1.04
$6,000–7,999	0.88	0.90
$8,000–9,999	0.93	0.87
$10,000 or more	0.84	0.71

Notes: The 1960 mortality ratios are from tables 2.1 and 2.5 of Kitagawa and Hauser (1973:12, 18) They refer to white male family members (excluding persons in institutions). The 1973–1978 mortality ratios refer to noninstitutionalized white married men (spouse present) according to the definitions described in this article. Due to small sample considerations, the three lowest school categories used by Kitagawa and Hauser (0–7 years, 8 years, and high school, 1–3 years) were collapsed into the category 0–11 years.

for changes from 1960 to 1980 in the age distribution of 25- to 65-year-old white men, the 1960 age composition of white men was used to weight the numerator and denominator of each mortality ratio.[6] Actual deaths (the numerator of each mortality ratio) were computed by using the single-year age composition of white men in 1960 to weight the age-specific probabilities of death by income and education derived from the 1973–1978 Exact Match File; expected deaths (the denominator of each ratio) were computed by using the 1960 age composition of white men to weight the probability of death by age alone. The resulting mortality ratios based on the 1973–1978 Exact Match File are shown on the right side of Table 1. Comparing the right side of Table 1 with the left side reveals that mortality differentials by education and income for men 25–65 years old have not narrowed since 1960.

Caveats to Consider

The lack of any apparent improvement in the relative mortality experience of low socioeconomic status men may simply stem from differences in the population universes on which the estimates were based. The universe from which the more recent results were estimated is a subsample of the universe on which the 1960 estimates were based. The Exact Match File differentials would be "inflated," relative to the Kitagawa and Hauser estimates, if low socioeconomic status men with lower than usual death rates or high socioeconomic status men with higher than usual death rates were included in the Kitagawa and Hauser universe but excluded from the Social Security population universe.

At the low socioeconomic status end, men employed in household service or part-time agricultural work are excluded from the Social Security population, since these types of work generally lacked Social Security coverage. Also excluded are men lacking sufficient quarters of work experience to be eligible for Social Security disability coverage. It seems

Table 2. Estimation of Logit Models: White Married Men, 25–64 Years Old

Probability of death as a function of	Age	Age and income	Age and education
Explanatory variables			
Intercept	−7.3785	−7.4438	−7.3635
	(34.90)	(33.91)	(33.53)
Age	0.0961	0.0900	0.0917
	(23.15)	(23.08)	(22.36)
Income*			
$0–2,000		0.9160	
		(5.74)	
2,000–3,999		1.0579	
		(8.27)	
4,000–5,999		0.4288	
		(3.53)	
6,000–7,999		0.2649	
		(2.22)	
8,000–9,999		0.2223	
		(1.72)	
Years of schooling			
Less than 12 years			0.4134
			(4.08)
High school, 4 years			0.0754
			(0.70)

Note: 13,954 observations, 762 deaths. Asymptotic *t* statistics are in parentheses.

*Total income in 1972 as measured by Current Population Survey data. The income categories are given according to 1959 prices.

unlikely, however, that low socioeconomic status men employed in work not covered by Social Security or men with unstable work histories would have lower death rates than other low socioeconomic status men. Men at the average and high socioeconomic status end are government workers who, prior to 1983, often lacked Social Security coverage; an upward bias would occur if government employees have higher death rates than private sector employees of similar income and education. This seems unlikely.[7]

The Exact Match File estimates were measured over a longer period of time than the Kitagawa and Hauser estimates. (The Kitagawa and Hauser mortality ratios are based on four months of mortality experience.) If the mortality differential by socioeconomic status increases with age, then measuring mortality experience over a longer time period would widen the estimated differential. The "bias" in this case, however, works in the opposite direction, since differences in adult mortality by income and education diminish with age (see note 5).

Thus methodological differences aside, the results of this study suggest that the relative mortality position of low socioeconomic status men did not improve from 1960 to the mid-1970s. Nevertheless, combining the decline in overall death rates during the 1960s and 1970s with the apparent constancy of the socioeconomic mortality differential, it seems plausible that absolute death rates have decreased during this time period for both high and

low socioeconomic status persons, even though their relative mortality experiences appear to have remained the same.

Using Social Security Records to Monitor Mortality Differentials Over Time

To facilitate a comparison with the 1960 census-based mortality differentials, CPS data were used in this study to measure education as well as income. However, Social Security data could be used, by themselves, to monitor future changes in U.S. mortality differentials.

Social Security maintains an annual record of the earnings of individuals over their lifetimes. When averaged over several years, these data provide a measure of "usual" income that can be related to the mortality experience of individuals as reported in the Social Security records. As these records are maintained for administrative purposes, the marginal cost of their use for this purpose would be small, even with extremely large sample sizes. Social Security data thus provide an inexpensive vehicle for the continuous measurement of income differences in mortality. A key improvement, in this regard, is that mortality and earnings data are now maintained for all persons with a Social Security number regardless of coverage; the various restrictions placed on the sample discussed in this article would not be necessary in future analyses.

Future studies could use Social Security data to address a number of issues. For instance, the trend in absolute, as opposed to relative, mortality experience by income could be measured.

The analysis presented in this article relates to the issue of whether programs aimed directly at the poor, such as Medicaid, have improved the relative mortality experience of the poor. An alternative process of socioeconomic change and mortality reduction could occur, however, through a decline in the proportion of persons in poverty. To the extent that poverty affects mortality, reductions in the poverty rate should decrease mortality: this would be true even if the mortality differential by income remained the same. Whether such a process occurs could be directly assessed with Social Security data by measuring mortality rates over time by constant income percentiles, rather than constant income categories.

Clouding the interpretation of mortality differentials by income is the possibility that ill health preceding death may reduce income and thereby contribute to the observed negative correlation between income and mortality (Kitagawa and Hauser, 1973:ch. 2). Yet Social Security's longitudinal data on earnings, disability, and mortality facilitate a number of approaches for untangling the effect of income on mortality from the reverse effect of poor health on income. These approaches include relating mortality to a measure of usual income, distancing the income measurement from the time period in which mortality is measured, and controlling for health status in time periods up to and including the time period in which income is measured (Caldwell and Diamond, 1979; Duleep, 1986a,b; Rosen and Taubman, 1979). Using Social Security data, such techniques could be incorporated into longitudinal analyses of mortality differences by income.

In addition to the demographic information and longitudinal earnings, disability, and mortality data available on all individual records, the SSA maintains longitudinal data on industry and place of residence for a 1 percent sample of the American population. These data could improve our understanding of how workplace and environmental hazards contribute to existing mortality differentials (Duleep, 1986b). More generally, the longitudinal nature of the Social Security earnings, disability, mortality, industry, and residence data opens up new research avenues for learning the causal paths underlying large mortality differentials observed in cross-sectional data and provides a means to observe the changes in these relationships over time. Alone or in conjunction with other data sources, Social Security data could be used to monitor, on a continual basis, our progress toward eradicating significant mortality differentials in the United States.

Notes

[1] This issue was previously explored by Rosen and Taubman. The results of their study were, however, uncertain largely because an estimated 30 percent of deaths for men 25–65 years old were missing in the sample (Rosen and Taubman, 1979).

[2] Only deaths reported in the earnings records were linked to the original Exact Match File, resulting in a substantial undercoverage of deaths for the nonretired population.

[3] The restriction to married men was a further precaution taken to insure the accuracy of the death reporting.

[4] To measure the range of income (or education) differential in mortality within each color–age–sex–family status subgroup, the ratio of actual to expected deaths for each subgroup total was set equal to 1.00 (Kitagawa and Hauser, 1973:table 2.1, note a, and app. A).

[5] Kitagawa and Hauser (1973:12, table 2.1; 18, table 2.5; 27, table 2.8) found that the socioeconomic mortality differential for adults diminished with age.

[6] The Kitagawa and Hauser ratios are indirectly standardized for age. That is, the age composition of each income or education group is implicitly used as a weight in the numerator and denominator of each mortality ratio. In computing the mortality ratios based on the Exact Match File, the 1960 age composition of white men is used to approximate the 1960 age distribution of white men in each of the income and education categories. This approach helps reduce the effect on the resulting socioeconomic mortality differential of changes in the age distribution over time. (This would not be important if socioeconomic mortality differentials were constant across ages.) Note that had the indirect method been used, it would not have been possible to standardize using a 1960 age distribution. Kitagawa and Hauser showed that the indirect and direct methods produce nearly identical results (p. 33, table 2.12). The 1960 age distribution for white men used in this analysis can be found in U.S. Bureau of the Census (1973:25, table 1; 67, table 4).

[7] Another difference in the study populations is that the Exact Match File analysis is limited to married men (spouse present), whereas the 1960 results refer to male family members, including unmarried, separated, and widowed men living with one or more relatives. If the socioeconomic differential were larger for unmarried men than for married men, the comparison over time would be biased toward finding improvement.

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