American Journal of Epidemiology
Vol. 155, No. 6
Printed in U.S.A.

Socioeconomic Status and Mortality among the Elderly: Findings from Four US Communities

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The effect of socioeconomic status (SES) on mortality was examined in the community-dwelling elderly. Data were obtained from four population-based studies that enrolled elderly residents of four US communities (East Boston, Massachusetts; New Haven, Connecticut; east-central Iowa; and the Piedmont region of North Carolina) and followed them for 9 years, starting in 1982 or 1986. Higher SES, whether measured by education, by household income, or by occupational prestige, was generally associated with lower mortality. However, the pattern of findings varied by gender and by community. For men, all three SES indicators were associated with mortality in the majority of cohorts. For women, this was true only for income. SES-mortality associations were attenuated but not eliminated after adjustment for behavior and health status. SES-mortality associations were stronger in New Haven and North Carolina than in East Boston and Iowa. The latter communities are more homogeneous with respect to ethnicity, urbanization, and occupational history than the former. Future research should investigate the relative validity of traditional SES measures for men and women and develop more balanced assessment methods. These findings also suggest that it is important to consider not only individual characteristics but also community attributes that mediate or modify the pathways through which socioeconomic conditions may influence health. *Am J Epidemiol* 2002;155:520–33.

aged; cohort studies; mortality; socioeconomic factors; survival analysis

The inverse relation between socioeconomic status (SES) and health is a well-documented epidemiologic observation. Studies carried out in the United States (1–19), Canada (20–22), Europe (23–29), the Netherlands (30), Scandinavia (31–34), Israel (35), Russia (36), and New Zealand (37) have found that socioeconomically disadvantaged individuals have higher mortality than persons with higher education, income, or occupational status.

Evidence relating SES to mortality among elderly individuals is less consistent. Attenuation of the SES-mortality relation with age has been observed in most studies that have compared older and younger populations (1, 2, 4–6, 12, 13, 16, 17, 22, 25, 28, 30, 32, 33, 35, 36); in some studies, socioeconomic differentials in mortality persist at older ages (6, 17, 25, 28, 32, 33, 38), but in others, no associations or modest associations are found (4, 5, 30, 39). There have been few empirical attempts to explore behavioral and biologic pathways by which SES and mortality are linked in the elderly. The underlying mechanisms that produce SES-mortality gradients may vary in importance over the life course (40). For example, alcohol abuse may lead to increased risk of suicide, homicide, and accidents, which are prevalent causes of death in early adulthood (41); social disengagement and the resulting lack of mental stimulation and support provided by one's social network may be critical in late life (42, 43). When attempts to delineate pathways are undertaken, differential adjustments for confounding or mediating variables render it difficult to assess the consistency of the SES-mortality association across studies. Finally, the extent to which observed differences in the relation between SES and mortality arise from the use of different SES indices rather than from actual intercommunity differences is unclear. With few exceptions (2, 18, 22), there are no direct comparisons of the relative ability of different SES measures to predict mortality in a given elderly population, even though education, income, and occupation may operate through different pathways to affect health (44).

We examined the impact of education, income, and occupational prestige on all-cause mortality in four community-based elderly cohorts. We addressed these questions: Are SES-mortality patterns similar across communities? Which SES indicator is the strongest predictor of mortality? Do associations differ by gender, age, race, marital status, or urban/rural residence? Can SES-mortality associations be accounted for by SES differences in morbidity, behaviors, or other social conditions?

Received for publication August 31, 2000, and accepted for publication October 4, 2001.

Abbreviations: CI, confidence interval; EPESE, Established Populations for Epidemiologic Studies of the Elderly; SES, socioeconomic status.

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MATERIALS AND METHODS

Respondents

Data were obtained from the Established Populations for Epidemiologic Studies of the Elderly (EPESE), which comprises four geographically defined populations: East Boston, Massachusetts; two counties in rural Iowa; New Haven, Connecticut; and five counties in the Piedmont region of North Carolina. In East Boston and Iowa, all community-dwelling residents aged 65 years or more in 1982 were invited to participate. At other sites, complex sampling designs were used to identify representative samples of residents aged 65 years or more in 1982 (New Haven) and 1986 (North Carolina). Baseline response rates were 84 percent (n = 3,809) in East Boston, 80 percent (n = 3,673) in Iowa, 82 percent (n = 2,812) in New Haven, and 80 percent (n = 4,162) in North Carolina. Respondents were interviewed in person in 1982 or, in North Carolina, in 1986. Follow-up interviews were conducted in person 3 and 6 years after baseline and by telephone in intervening years. Institutional review boards at Brigham and Women's Hospital, the University of Iowa, Yale University, and Duke University approved the study protocol. Details are provided elsewhere (45).

The availability of common measures of not only SES but also potential confounders and mediating variables provided an opportunity to compare findings for different types of communities. New Haven represents an urban community of diverse ethnic and SES origins. Many of the men formerly worked in skilled manufacturing jobs, while many women worked in service industries. East Boston is an urban community of predominantly Italian Americans in which persons of both genders have a work history similar to that of New Haven men. The Iowa sample, mostly persons of Scandinavian and German extraction, is drawn from rural communities where farming is the primary occupation for men and homemaking is primary for women. The North Carolina cohort contains a mixture of urban and rural residents, with many Blacks. Comparisons across cohorts thus permit an assessment of the consistency of the SES-mortality association among older men and women and across communities characterized by varying degrees of urbanization and ethnic homogeneity.

Measures

Predictors were measured by self-report or proxy report at baseline.

Socioeconomic status. Education. Education, defined as years of schooling completed, was categorized as 0–7, 8–9, 10–12, ≥13, and unknown.

Income. Income, defined as household income from all sources in the year before baseline, was categorized as \$0–\$4,999, \$5,000–\$9,999, \$10,000–\$14,999, ≥\$15,000, and unknown. Income was not adjusted for household size.

Occupational prestige. Usual lifetime occupation was coded using three-digit US Census occupational codes from the 1970 Bureau of the Census Index of Industries and Occupations, which were then grouped into hierarchical categories using an established prestige scale, the Duncan Socioeconomic Index (46). The 1970 time frame was chosen because it was the period when many respondents were at the height of their careers. Prestige rankings derived from the total labor force were used. Rankings were divided into quartiles based on gender-specific distributions across the combined sites; quartiles were ordered from low prestige ("1") to high prestige ("4").

Covariates. Demographic covariates. Demographic covariates included gender, age, race (White/Nonwhite; New Haven and North Carolina only), and degree of urbanization (urban/rural; North Carolina only).

Behavioral covariates. Behavioral covariates included pack-years of smoking (number of years for which the person smoked multiplied by number of cigarette packs per day); body mass index (defined as weight (kg)/height (m)^2 and categorized as <20, 20–<30, and ≥30); alcohol consumption in the past month (none, <1 ounce/day (<30 ml/day), or ≥1 ounce/day (≥30 ml/day) (47)); physical activity (defined in appendix 1); number of social ties (presence of a spouse, contact with two or more relatives or friends, attendance at religious services, and membership in other groups (48)); and access to health care (defined as availability of a regular health care provider).

Health status. Health status included number of chronic conditions (the sum of "yes" responses to items asking whether a physician had ever diagnosed high blood pressure, heart attack, stroke, diabetes, cancer, a broken hip, or other broken bones); depressive symptoms (Center for Epidemiologic Studies Depression Scale (49) score (appendix 2)); cognitive function (Short Portable Mental Status Questionnaire (50) score); and physical function, measured with three self-report scales. The modified Katz Activities of Daily Living Scale (51) assessed the ability to perform basic activities without assistance; scores were dichotomized into no disability versus any disability. Items from the Rosow-Breslau Functional Health Scale (52) assessed gross mobility. A physical performance scale measured difficulty in pushing/pulling large objects; in stooping, crouching, and kneeling; in reaching above shoulder level; and in writing/handling small objects (53). The latter scales were scored for the number of activities for which difficulty was reported.

Mortality. Dates of death were obtained from proxy informants and newspaper obituaries. Study records were matched to the National Death Index, and death certificates were obtained for nearly all deaths. Ascertainment through 9 years of follow-up was virtually complete (99 percent).

Analysis

The percentage of respondents who were deceased at the end of 9 years was computed for each SES level. Wald tests from logistic regression models (54) that took vital status at 9 years as an outcome and included baseline age as a covariate were used to assess the statistical significance of SES-mortality relations. Proportional hazards regression (55, 56) was then used to quantify the impact of education, income, and occupational prestige on mortality while adjusting for other covariates, and Wald tests were used to test the statistical significance of these associations. Survival time was defined as time from the baseline interview to the date of death or 9 years later, whichever was earlier. Initial models adjusted for demographic factors; additional models also controlled for health status and behaviors. Covariates were modeled as continuous when preliminary analyses suggested that it was valid to do so. Analyses were stratified by gender. Additional stratification by age, race, marital status, and urban/rural residence was undertaken to determine whether these factors modified SES-mortality relations.

Computing was done using the SUDAAN statistical package, version 7.0 (57). The generalized estimating equations approach (58) was used to adjust standard errors for clustering induced by the sampling scheme. Estimates were weighted to reflect differential sampling, coverage, and response rates within sampling strata.

RESULTS

The Iowa cohort was the most socioeconomically advantaged group and the East Boston cohort the most disadvantaged (table 1). In all cohorts, men reported significantly higher incomes than did their female counterparts; gender differences in education were less consistent. In New Haven and East Boston, men reported higher mean education levels than did women, but at other sites, the reverse was true. Gender differences in education were statistically significant only in New Haven and North Carolina.

Cross-site comparisons revealed generally similar distributions of other demographic, behavioral, and health covariates (table 2). However, East Bostonians had a higher prevalence of obesity, smoking, and alcohol use than did other respondents.

Table 3 shows gender-specific mortality according to SES. For men, there was a generally consistent gradient of decreasing mortality with increasing education or income. Men in the highest quartile of occupational prestige had consistently lower mortality than did the lowest-ranking men, but a monotonic relation was observed only in East Boston. Weaker SES-mortality gradients were observed for education and income among women, and associations did not conform to a strictly monotonic pattern. In North Carolina, women in the highest quartile of occupational prestige had significantly lower mortality than did other women.

Similar conclusions can be drawn from table 4, which presents hazard ratios adjusted for age, race, and urban/rural residence. Education was a significant predictor of male mortality in all cohorts except the Iowa cohort; there was a steady decline in risk as education increased. Income was a strong predictor of mortality in all male cohorts, although there was no clear gradient in New Haven. Occupational prestige also had a protective effect in all male cohorts; compared with those in the bottom quartile, the highest-ranking men were approximately 25 percent less likely to die during follow-up. When education, income, and occupational prestige were simultaneously entered into a regression model in cohorts in which all SES variables predicted mortality, education and income remained significantly associated with mortality but the relation between occupational prestige and mortality largely disappeared.

For women, the relation between SES and mortality was less consistent. There was a strong and significant association between income and female mortality in three of the four cohorts; only in East Boston was no effect found. On the other hand, there was an appreciable relation between education and female mortality in only one of the four cohorts; education was protective in the North Carolina cohort. Thus, income appears to be a more robust predictor than education for older women. However, when education and income were simultaneously entered into a regression model, both variables remained strongly associated with mortality in North Carolina women. Low occupational prestige was strongly predictive of increased mortality only in North Carolina women.

We next determined the degree to which observed SES-mortality relations could be accounted for by socioeconomic variations in baseline health status (table 5). Among men, the income-mortality association persisted in three of the four cohorts after adjustment for health status. On the other hand, the education-mortality association persisted only in New Haven, and the occupation-mortality association persisted only in East Boston. Among women, the income-mortality association persisted in two of three cohorts, but the strong education- and occupational prestige-mortality associations in North Carolina were no longer observed. Health-adjusted income-mortality associations generally did not follow a monotonic pattern in either gender; although respondents with incomes of \$5,000–\$14,999 had significantly greater mortality than those with the highest incomes, they had comparable or somewhat greater mortality than those with the lowest incomes. Surprisingly, in East Boston women, weak inverse SES-mortality gradients (i.e., decreasing mortality with increasing SES) became more pronounced after adjustment for health status.

We also examined how SES-mortality relations would be affected by adjustment for health behaviors (table 6). Significant relations between education and mortality persisted in all cohorts. Significant elevations in risk associated with low income and occupational prestige also persisted, except in East Boston men and Iowa men and women.

When data were simultaneously adjusted for health status and behaviors (table 7), the pattern of results was very similar to that observed in table 5.

We stratified the data by age, race, marital status, and degree of urbanization to determine whether these factors modified SES-mortality relations in men or women. Socioeconomic gradients in mortality were stronger at ages 65–74 years than at older ages; the attenuation with age was more pronounced for income than for education or occupation. On the other hand, there was no evidence of effect modification of SES-mortality relations by race.

In North Carolina, SES gradients in mortality were somewhat stronger among unmarried women than among married women. In New Haven, however, SES-mortality associations were much stronger in married women than in unmarried women. There was no effect modification by marital status among East Boston or Iowa women. We found

TABLE 1. Sex-specific baseline distributions of data on socioeconomic status, Established Populations for Epidemiologic Studies of the Elderly*

	East Boston, Massachusetts (1982)				Iowa (1982)				New Haven, Connecticut* (1982)				North Carolina* (1986)			
	Men		Women		Men		Women		Men		Women		Men		Women	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	1,449	100.0	2,360	100.0	1,420	100.0	2,253	100.0	1,169	100.0	1,643	100.0	1,458	100.0	2,704	100.0
Education (years)																
No data†	48	3.3	60	2.5	13	0.9	24	1.0	28	2.2	59	2.5	27	2.1	40	1.7
0–7	481	33.2	712	30.2	140	9.9	106	4.7	342	28.5	470	24.6	696	40.0	1,109	32.8
8–9	394	27.2	797	33.8	598	42.1	779	34.6	306	22.7	477	29.3	196	12.7	414	14.8
10–12	412	28.4	675	28.6	464	32.7	876	38.9	302	25.6	454	29.6	319	26.0	775	33.6
≥13	114	7.9	116	4.9	205	14.4	468	20.8	191	21.1	183	13.9	220	19.2	366	17.1
Annual income (dollars)																
No data†	199	13.7	355	15.0	328	23.1	562	25.0	128	10.5	252	14.5	285	19.2	501	20.4
0–4,999	193	13.3	781	33.1	136	9.6	453	20.1	264	17.8	709	35.5	303	15.4	1,133	31.4
5,000–9,999	698	48.2	977	41.4	345	24.3	640	28.4	456	37.1	496	32.1	367	22.8	600	23.1
10,000–14,999	232	16.0	174	7.3	251	17.7	321	14.3	168	15.6	104	9.5	173	13.0	194	9.1
≥15,000	127	8.8	73	3.1	360	25.3	277	12.3	153	19.1	82	8.4	330	29.6	276	16.0
Mean education (years)	8.44		8.21		10.10		10.85		9.58		9.25		8.97		9.41	
Mean annual income (dollars)‡	9,025		6,518		12,235		9,248		10,081		7,331		11,977		8,836	

* Numbers are unweighted; percentages are weighted.
† Missing data, respondent refusal, or respondent did not know.
‡ Mean income levels are approximate. Each respondent provided an estimate of household income within six ranges: $0–<$2,000, $2,000–$4,999, $5,000–$6,999, $7,000–$9,999, $10,000–$14,999, and ≥$15,000. Mean income levels are computed by assigning each individual the midpoint of the indicated ranges; $20,000 is used for the top income category.

TABLE 2. Sex-specific baseline distributions of data on covariates, Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts (1982)		Iowa (1982)		New Haven, Connecticut* (1982)		North Carolina* (1986)	
	Men	Women	Men	Women	Men	Women	Men	Women
Mean age (years)	73.4	73.9	74.1	75.2	73.4	74.4	72.7	73.8
Race (% Black)	0.0	0.0	0.0	0.0	17.3	18.4	36.0	36.1
Mean pack-years of smoking	41.8	11.6	26.8	3.5	37.1	13.3	31.2	9.3
Body mass index† (%)								
<20	4.8	7.7	4.8	11.7	5.1	11.2	7.2	10.0
20–<26	42.9	35.0	43.5	44.8	51.4	41.6	50.5	42.1
26–<30	32.9	23.3	26.2	18.5	28.0	20.4	27.4	21.6
≥30	16.1	23.6	8.0	11.1	12.3	16.7	10.7	14.5
Alcohol use (ounces/day)‡ in the past month (%)								
0	31.7	52.9	46.4	72.2	35.4	54.7	60.3	78.9
<1	43.2	42.9	27.1	18.0	45.4	40.6	24.0	14.0
≥1	23.4	3.0	9.0	1.5	18.3	4.3	8.2	2.3
Mean no. of physical activities	1.10	0.60	1.29	1.14	0.86	0.52	NA§	NA
Mean no. of social ties	2.34	2.05	2.67	2.58	2.33	2.06	2.89	2.62
Mean no. of chronic conditions	0.98	1.18	1.09	1.19	1.04	1.23	1.28	1.34
Mean CES-D¶ score	1.80	2.81	2.57	3.28	6.76	8.82	2.55	3.38
Activities of Daily Living disability# (% yes)	15.7	21.7	9.8	11.9	12.5	17.4	15.3	20.1
Mean Rosow-Breslau score**	0.64	1.00	0.58	0.70	0.51	0.81	0.67	0.99
Mean Nagi score††	0.95	1.66	1.02	1.40	0.77	1.25	1.28	1.69
Mean score on the Short Portable Mental Status Questionnaire	7.46	7.18	8.06	8.10	7.75	7.46	7.45	7.34

* Data are weighted.
† Weight (kg)/height (m)^2.
‡ 1 ounce = 30 ml.
§ NA, not available.
¶ CES-D, Center for Epidemiologic Studies Depression Scale. Scoring is not consistent across sites. See text for details.
\# Inability to perform one or more Activities of Daily Living (walking across a room, dressing, eating, transferring from bed to chair, bathing, grooming, and using the toilet).
** Rosow-Breslau Functional Health Scale score = self-reported difficulty with gross mobility (walking half a mile (0.8 km), climbing stairs, and doing heavy work around the house).
†† Nagi physical performance score = self-reported difficulty with physical performance activities (pushing or pulling large objects; stooping, crouching, or kneeling; reaching above shoulder level; and writing or handling small objects).

few differences in the pattern of SES-mortality associations by marital status among men.

The North Carolina cohort contained a mix of urban and rural residents. For women, much stronger SES-mortality associations were observed among urban dwellers than among rural dwellers. In urban women, these associations were as follows: for education of 0–7 years vs. ≥13 years, hazard ratio = 1.62 (95 percent confidence interval (CI): 1.22, 2.14); for income of $0–$4,999 vs. ≥$15,000, hazard ratio = 2.31 (95 percent CI: 1.58, 3.36); and for the lowest quartile of Duncan Socioeconomic Index versus the highest, hazard ratio = 1.46 (95 percent CI: 1.11, 1.92). In rural women, the corresponding figures were: for education, hazard ratio = 1.18 (95 percent CI: 0.80, 1.73); for income, hazard ratio = 1.75 (95 percent CI: 0.96, 3.22); and for Duncan Socioeconomic Index, hazard ratio = 1.13 (95 percent CI: 0.76, 1.67). For men, however, mortality gradients by education and income occurred in both urban and rural respondents, and occupational prestige more strongly predicted mortality in rural respondents than in urban respondents.

To test the sensitivity of the findings to alternative SES specifications, we repeated our analyses after reclassifying education, income, and occupational prestige into quartiles according to site- and gender-specific distributions. The pattern of results was very similar to that reported above.

DISCUSSION

These findings indicate that higher SES, whether measured as education, as income, or as occupational prestige, is associated with decreased mortality among persons aged 65 years or more. Significant associations between at least one SES indicator and mortality were observed in all four populations studied. In accordance with other reports (19, 59, 60), adjustment for social and behavioral factors reduced but did not eliminate the SES-mortality associations. Such factors explained only a small proportion of the SES-mortality gradient; in none of the communities did adjustment for social and behavioral factors cause hazard ratios comparing the lowest

TABLE 3. Nine-year mortality by socioeconomic status, Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts				Iowa				New Haven, Connecticut†				North Carolina†			
	Men		Women		Men		Women		Men		Women		Men		Women	
	No.	% dead	No.	% dead	No.	% dead	No.	% dead	No.	% dead	No.	% dead	No.	% dead	No.	% dead
Total	1,449	50.9	2,360	37.4	1,420	50.3	2,253	32.8	1,169	52.7	1,643	40.0	1,458	52.9	2,704	37.7
Education (years)		**								***				***		***
No data‡	48	75.0	60	71.7	13	61.5	24	54.2	28	76.9	59	74.8	27	74.0	40	73.3
0–7	481	61.5	712	44.7	140	63.6	106	38.7	342	60.8	470	42.6	696	60.2	1,109	42.3
8–9	394	48.5	797	32.4	598	51.7	779	37.9	306	57.1	477	39.7	196	58.8	414	45.9
10–12	412	41.5	675	32.9	464	46.3	876	28.0	302	50.6	454	37.6	319	43.9	775	32.1
≥13	114	38.6	116	36.2	205	45.4	468	31.2	191	37.1	183	34.4	220	43.6	366	29.1
Annual income (dollars)						***		***		***		***		***		***
No data‡	199	60.3	355	40.0	328	59.8	562	42.3	128	53.2	252	47.1	285	61.3	501	43.8
0–4,999	193	55.4	781	42.3	136	62.5	453	42.4	264	58.5	709	43.5	303	59.5	1,133	45.5
5,000–9,999	698	53.6	977	35.4	345	51.9	640	29.7	456	59.3	496	38.0	367	61.1	600	37.3
10,000–14,999	232	40.0	174	24.7	251	46.2	321	19.0	168	55.4	104	39.5	173	46.6	194	29.1
≥15,000	127	35.4	73	30.1	360	38.3	277	21.3	153	32.2	82	20.2	330	40.6	276	19.7
Duncan Socioeconomic Index§		*				**		*		**						*
No data‡	42	76.2	90	50.0	16	43.8	31	29.0	6	62.1	40	57.5	19	33.9	26	70.7
Housewife	NA¶		666	42.8	NA		1,181	37.1	NA		346	43.0	NA		551	39.4
Quartile 1	481	52.6	542	32.1	107	60.8	78	25.6	382	57.7	269	40.3	356	54.2	589	41.2
Quartile 2	448	52.0	456	37.1	183	55.7	235	32.3	204	51.5	364	38.8	268	54.8	416	39.1
Quartile 3	260	49.6	397	33.0	749	46.7	300	26.0	179	55.9	251	35.4	427	58.3	609	38.4
Quartile 4	218	41.7	209	37.8	365	52.0	428	27.8	398	47.5	373	38.7	388	48.1	513	30.8

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Significance tests are age-adjusted and exclude missing categories.
† Numbers are unweighted; percentages are weighted.
‡ Missing data, respondent refusal, or respondent did not know.
§ Quartiles are based on the sex-specific distributions across the combined sites. Quartile 1 is the lowest in occupational prestige, and quartile 4 is the highest.
¶ NA, not applicable.

TABLE 4. Hazard ratios for socioeconomic status as a predictor of mortality over a follow-up period of 9 years, after adjustment for demographic covariates,† Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts				Iowa				New Haven, Connecticut				North Carolina			
	Men		Women		Men		Women		Men		Women		Men		Women	
	HR‡	95% CI‡	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Education (years)																
0–7	1.57	1.16, 2.13****	0.85	0.62, 1.18	1.19	0.89, 1.60	1.10	0.78, 1.55	1.68	1.27, 2.22****	1.10	0.79, 1.53	1.66	1.22, 2.26*****	1.44	1.15, 1.81****
8–9	1.33	0.97, 1.82*	0.77	0.55, 1.06*	1.06	0.84, 1.35	1.05	0.86, 1.29	1.64	1.21, 2.22****	1.06	0.75, 1.48	1.59	1.13, 2.23***	1.73	1.34, 2.23*****
10–12	1.22	0.89, 1.68	0.92	0.66, 1.28	1.07	0.83, 1.37	0.97	0.79, 1.19	1.47	1.08, 1.99***	1.09	0.80, 1.49	1.13	0.81, 1.58	1.29	1.01, 1.65**
≥13	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Annual income (dollars)																
0–4,999	1.33	0.94, 1.88*	0.92	0.62, 1.36	1.55	1.18, 2.04****	1.45	1.07, 1.97**	1.72	1.20, 2.48****	2.13	1.34, 3.38*****	1.70	1.22, 2.37****	2.12	1.54, 2.92*****
$5,000–9,999	1.31	0.97, 1.78*	0.84	0.57, 1.24	1.22	0.97, 1.53*	1.21	0.90, 1.63	1.94	1.42, 2.66*****	1.87	1.17, 2.98****	1.61	1.24, 2.10*****	1.76	1.31, 2.38*****
10,000–14,999	1.05	0.74, 1.49	0.77	0.48, 1.24	1.25	0.97, 1.61*	0.85	0.59, 1.22	1.80	1.28, 2.53*****	2.21	1.31, 3.73****	1.23	0.86, 1.76	1.59	1.06, 2.38**
≥15,000	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Duncan Socio-economic Index§																
Housewife	NA¶		0.96	0.75, 1.23	NA		1.15	0.93, 1.41	NA		1.15	0.87, 1.52	NA		1.16	0.94, 1.45
Quartile 1	1.24	0.98, 1.57*	0.76	0.58, 0.99**	1.38	1.06, 1.79**	0.76	0.49, 1.19	1.31	1.03, 1.67**	1.20	0.87, 1.65	1.24	0.96, 1.60*	1.35	1.08, 1.69***
Quartile 2	1.38	1.09, 1.74***	0.85	0.65, 1.11	1.06	0.84, 1.34	1.11	0.83, 1.48	1.10	0.82, 1.47	1.16	0.84, 1.60	1.25	0.99, 1.57*	1.40	1.09, 1.80***
Quartile 3	1.31	1.01, 1.71**	0.82	0.62, 1.10	0.85	0.71, 1.01*	0.97	0.73, 1.29	1.16	0.88, 1.53	0.96	0.72, 1.38	1.21	0.96, 1.53	1.24	0.99, 1.54*
Quartile 4	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.005$; ***** $p < 0.001$.
† Demographic covariates: age, gender, race (New Haven and North Carolina only), and degree of urbanization (North Carolina only).
‡ HR, hazard ratio; CI, confidence interval.
§ Quartiles are based on the sex-specific distributions across the combined sites. Quartile 1 is the lowest in occupational prestige, and quartile 4 is the highest.
¶ NA, not applicable.

TABLE 5. Hazard ratios for socioeconomic status as a predictor of mortality over a follow-up period of 9 years, after adjustment for demographic and health status covariates,† Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts				Iowa				New Haven, Connecticut				North Carolina			
	Men		Women		Men		Women		Men		Women		Men		Women	
	HR‡	95% CI‡	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Education (years)																
0–7	1.28	0.92, 1.77	0.73	0.52, 1.03*	0.93	0.68, 1.28	0.93	0.66, 1.30	1.44	1.07, 1.94**	0.91	0.62, 1.33	1.23	0.89, 1.68	1.04	0.83, 1.31
8–9	1.26	0.91, 1.74	0.78	0.56, 1.09*	0.98	0.77, 1.25	0.90	0.73, 1.11	1.58	1.16, 2.14****	0.98	0.69, 1.40	1.36	0.99, 1.88	1.34	1.05, 1.75**
10–12	1.16	0.84, 1.62	0.94	0.67, 1.32	1.03	0.80, 1.33	0.91	0.74, 1.12	1.41	1.04, 1.92**	1.03	0.73, 1.45	1.04	0.75, 1.44	1.15	0.90, 1.47
≥13	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Annual income (dollars)																
0–4,999	0.97	0.68, 1.38	0.80	0.54, 1.19	1.41	1.07, 1.85**	1.20	0.89, 1.62	1.50	1.03, 2.20**	1.78	1.06, 2.98**	1.23	0.90, 1.68	1.55	1.11, 2.18**
5,000–9,999	1.06	0.78, 1.44	0.53	0.53, 1.16	1.12	0.89, 1.41	1.06	0.79, 1.42	1.85	1.34, 2.56*****	1.86	1.11, 3.11**	1.43	1.11, 1.83***	1.54	1.14, 2.08***
10,000–14,999	0.96	0.68, 1.35	0.77	0.48, 1.26	1.17	0.90, 1.53	0.84	0.59, 1.21	1.83	1.29, 2.59*****	2.53	1.45, 4.41****	1.15	0.81, 1.64	1.60	1.07, 2.40**
≥15,000	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Duncan Socio-economic Index§																
Housewife	NA¶		0.76	0.59, 0.99**	NA		1.05	0.84, 1.30	NA		1.05	0.79, 1.39	NA		1.00	0.82, 1.22
Quartile 1	1.11	0.87, 1.40	0.68	0.52, 0.89***	0.99	0.73, 1.35	0.60	0.38, 0.95**	1.21	0.94, 1.56	1.08	0.79, 1.48	1.06	0.82, 1.38	1.17	0.95, 1.46*
Quartile 2	1.29	1.02, 1.64**	0.80	0.61, 1.05	1.04	0.83, 1.31	1.00	0.74, 1.35	1.08	0.80, 1.46	1.11	0.80, 1.53	1.10	0.89, 1.37	1.14	0.92, 1.45
Quartile 3	1.31	1.01, 1.71**	0.78	0.58, 1.04*	0.81	0.68, 0.98**	0.96	0.71, 1.29	1.19	0.90, 1.56	0.99	0.72, 1.37	0.97	0.77, 1.21	1.09	0.88, 1.34
Quartile 4	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.005$; ***** $p < 0.001$.

† Demographic covariates: age, gender, race (New Haven and North Carolina only), and degree of urbanization (North Carolina only). Health status covariates: number of chronic conditions, depressive symptoms, cognitive function, and physical function.

‡ HR, hazard ratio; CI, confidence interval.

§ Quartiles are based on the sex-specific distributions across the combined sites. Quartile 1 is the lowest in occupational prestige, and quartile 4 is the highest.

¶ NA, not applicable.

TABLE 6. Hazard ratios for socioeconomic status as a predictor of mortality over a follow-up period of 9 years, after adjustment for demographic and behavioral covariates,† Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts				Iowa				New Haven, Connecticut				North Carolina			
	Men		Women		Men		Women		Men		Women		Men		Women	
	HR‡	95% CI‡	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Education (years)																
0–7	1.48	1.09, 2.02**	0.72	0.52, 1.00**	0.84	0.62, 1.16	0.97	0.68, 1.37	1.44	1.08, 1.94**	1.04	0.72, 1.51	1.46	1.06, 2.00**	1.29	1.02, 1.63**
8–9	1.26	0.93, 1.72	0.65	0.47, 0.89***	0.89	0.70, 1.14	0.96	0.78, 1.19	1.52	1.11, 2.07***	0.96	0.67, 1.37	1.46	1.04, 2.05**	1.59	1.24, 2.04*****
10–12	1.24	0.91, 1.70	0.82	0.60, 1.14	0.88	0.68, 1.13	0.90	0.73, 1.12	1.43	1.05, 1.95**	1.05	0.75, 1.46	1.06	0.76, 1.48	1.19	0.94, 1.51
≥13	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Annual income (dollars)																
0–4,999	1.09	0.77, 1.56	0.73	0.49, 1.09	1.20	0.90, 1.60	1.16	0.84, 1.66	1.34	0.94, 1.90	1.77	1.06, 2.95**	1.42	1.01, 1.99**	1.84	1.31, 2.59*****
5,000–9,999	1.22	0.91, 1.65	0.67	0.45, 1.00*	1.02	0.81, 1.28	1.04	0.77, 1.42	1.64	1.20, 2.24****	1.76	1.06, 2.91**	1.49	1.15, 1.94****	1.66	1.21, 2.28****
10,000–14,999	1.07	0.76, 1.50	0.71	0.44, 1.14	1.15	0.89, 1.48	0.76	0.53, 1.10	1.63	1.16, 2.28****	2.15	1.23, 3.75***	1.11	0.78, 1.58	1.52	1.01, 2.28**
≥15,000	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Duncan Socioeconomic Index§																
Housewife	NA¶		0.88	0.68, 1.15	NA		1.16	0.94, 1.43	NA		1.21	0.91, 1.61	NA		1.11	0.90, 1.38
Quartile 1	1.16	0.92, 1.46	0.75	0.57, 0.99*	1.07	0.81, 1.41	0.67	0.42, 1.07	1.24	0.98, 1.57*	1.23	0.89, 1.71	1.10	0.84, 1.43	1.24	0.98, 1.56*
Quartile 2	1.25	0.99, 1.58*	0.79	0.60, 1.04*	0.89	0.70, 1.13	1.04	0.77, 1.40	1.08	0.81, 1.44	1.17	0.84, 1.63	1.14	0.90, 1.44	1.31	1.02, 1.68**
Quartile 3	1.36	1.05, 1.76**	0.76	0.57, 1.02*	0.82	0.68, 0.98**	0.98	0.74, 1.31	1.06	0.79, 1.41	1.06	0.76, 1.47	1.07	0.84, 1.36	1.15	0.92, 1.44
Quartile 4	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.005$; ***** $p < 0.001$.

† Demographic covariates: age, gender, race (New Haven and North Carolina only), and degree of urbanization (North Carolina only). Behavioral covariates: pack-years of smoking, body mass index, current alcohol consumption, physical activity level (not North Carolina), number of social ties, and having a regular health care provider.

‡ HR, hazard ratio; CI, confidence interval.

§ Quartiles are based on the sex-specific distributions across the combined sites. Quartile 1 is the lowest in occupational prestige, and quartile 4 is the highest.

¶ NA, not applicable.

TABLE 7. Hazard ratios for socioeconomic status as a predictor of mortality over a follow-up period of 9 years, after adjustment for demographic, behavioral, and health status covariates,† Established Populations for Epidemiologic Studies of the Elderly

	East Boston, Massachusetts				Iowa				New Haven, Connecticut				North Carolina			
	Men		Women		Men		Women		Men		Women		Men		Women	
	HR‡	95% CI‡	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Education (years)																
0–7	1.32	0.95, 1.83	0.74	0.53, 1.04*	0.77	0.56, 1.07	0.87	0.61, 1.23	1.30	0.96, 1.75*	0.96	0.64, 1.44	1.18	0.84, 1.64	1.04	0.84, 1.30
8–9	1.25	0.90, 1.72	0.75	0.54, 1.03*	0.91	0.71, 1.16	0.87	0.71, 1.08	1.46	1.07, 1.98**	0.98	0.68, 1.43	1.26	0.90, 1.75	1.36	1.06, 1.75**
10–12	1.21	0.87, 1.68	0.91	0.66, 1.27	0.92	0.71, 1.19	0.87	0.71, 1.08	1.38	1.02, 1.87**	1.05	0.73, 1.49	0.98	0.70, 1.37	1.10	0.87, 1.39
≥13	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Annual income (dollars)																
0–4,999	0.94	0.65, 1.34	0.80	0.52, 1.23	1.18	0.89, 1.58	1.03	0.76, 1.41	1.28	0.89, 1.83	1.71	0.97, 3.00*	1.21	0.87, 1.67	1.49	1.06, 2.11**
5,000–9,999	1.09	0.81, 1.47	0.75	0.49, 1.16	0.99	0.78, 1.25	0.97	0.71, 1.31	1.62	1.17, 2.23****	1.90	1.09, 3.32**	1.42	1.10, 1.84***	1.52	1.11, 2.08***
10,000–14,999	1.00	0.71, 1.40	0.79	0.48, 1.32	1.13	0.88, 1.47	0.79	0.55, 1.14	1.69	1.20, 2.38****	2.52	1.40, 4.56****	1.16	0.82, 1.66	1.56	1.04, 2.33**
≥15,000	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Duncan Socio-economic Index§																
Housewife	NA¶		0.79	0.61, 1.02*	NA		1.10	0.88, 1.36	NA		1.09	0.82, 1.46	NA		1.06	0.87, 1.29
Quartile 1	1.09	0.86, 1.39	0.74	0.57, 0.98**	0.93	0.69, 1.27	0.57	0.36, 0.92**	1.20	0.94, 1.53	1.15	0.83, 1.59	1.01	0.78, 1.32	1.21	0.97, 1.51*
Quartile 2	1.26	0.99, 1.59*	0.81	0.61, 1.06	0.95	0.75, 1.20	0.97	0.72, 1.32	1.09	0.82, 1.45	1.12	0.81, 1.56	1.07	0.86, 1.34	1.18	0.93, 1.50
Quartile 3	1.36	1.04, 1.77**	0.77	0.58, 1.02*	0.85	0.71, 1.03	0.98	0.74, 1.32	1.10	0.82, 1.46	1.03	0.75, 1.42	0.93	0.74, 1.18	1.11	0.90, 1.38
Quartile 4	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.005$; ***** $p < 0.001$.

† Demographic covariates: age, gender, race (New Haven and North Carolina only), and degree of urbanization (North Carolina only). Behavioral covariates: pack-years of smoking, body mass index, current alcohol consumption, physical activity level (not North Carolina), number of social ties, and having a regular health care provider. Health status covariates: number of chronic conditions, depressive symptoms, cognitive function, and physical function.

‡ HR, hazard ratio; CI, confidence interval.

§ Quartiles are based on the sex-specific distributions across the combined sites. Quartile 1 is the lowest in occupational prestige, and quartile 4 is the highest.

¶ NA, not applicable.

category of education, income, or occupational prestige with the highest to be reduced by more than 30 percent. The average reduction was 15.3 percent for men and 10.9 percent for women. Adjustment for baseline health status produced larger attenuations (18.2 percent for men and 15.9 percent for women), but SES disparities in mortality still persisted in some communities, even after simultaneous adjustment for health behaviors and health status.

However, it is likely that health-damaging behaviors and poor health status constitute steps in the causal pathway between low SES and high mortality. While the mechanisms by which SES affects the development and maintenance of social and health behaviors are not entirely clear (34, 61), it is likely that adjustment for a more comprehensive and precisely measured set of health-behavior and health-status indicators than was available in this study (or many others) would eliminate SES-mortality associations, because there must be a set of defined mediators, including behaviors and physical health parameters, that serve as links between SES and mortality. Thus, the association between SES and mortality will be underestimated in models that factor out the effects of these intervening variables (33, 60). For this reason, controlling for health behaviors or health status when quantifying the strength of SES-mortality gradients may be inappropriate. Analyses adjusted for demographic factors may provide the best estimates of the impact of SES on mortality.

In this study, there were intercommunity differences in the strength of the SES-mortality associations. Associations were stronger in New Haven and North Carolina than in East Boston and Iowa. What might account for such intercommunity variation? We measured SES in an identical fashion across sites, minimizing the likelihood that intercommunity variation was attributable to differences in operationalizing SES. However, it is possible that intercommunity differences could be explained by the relative deprivation hypothesis (62). A low income may be more deleterious in communities where the majority of the population is wealthy than in poorer communities, either because of invidious social comparison processes or because of economic barriers to purchasing goods and services at prices geared toward more affluent residents. Nevertheless, when we reclassified education, income, and occupational prestige into quartiles according to site- and gender-specific distributions, we found similar heterogeneity of results across communities; this suggests that differences in relative deprivation are not responsible for intercommunity variations in the strength of SES-mortality associations.

Our analyses also suggest that differences in SES-mortality associations are not entirely accounted for by intercommunity variations in social patterning of behaviors such as social interaction, smoking, alcohol consumption, and physical activity, since adjustments for these factors produced proportionately similar reductions in hazard ratios across cohorts. Indeed, even after data were controlled for health status itself, intercommunity differences in SES-mortality associations persisted. The communities that exhibited the strongest SES gradients before adjustment also exhibited the strongest SES gradients after adjustment.

Income is thought to promote health partly because it provides access to material goods and services. Such access may not be as closely tied to income among the elderly as it is among working-age persons, since informal social networks, government subsidies for housing and medical care, and accumulated assets may provide post-retirement resources that were obtained with earned income at earlier ages. This explanation has been posited for the apparent attenuation of the SES-mortality relation among older persons as compared with younger persons (59, 63), and it could account for this finding in our data. If income is a less valid marker of economic resources in East Boston or Iowa than in New Haven or North Carolina, this could also explain the stronger income-mortality associations observed in the latter communities. New Haven and North Carolina residents are more diverse with respect to ethnicity, urbanization, and occupational history than residents of East Boston and Iowa. It is possible that elderly East Bostonians, primarily Italian Americans who live in close proximity to each other and to the main neighborhood health clinic, or Iowans, who live in a rural, agrarian community, have access to more diverse social and economic resources than is reflected by traditional SES measures. The possibility that traditional SES measures have less salience in rural settings is supported by the fact that these measures were far less predictive of mortality among rural women than among urban women in North Carolina. However, this explanation is rendered less compelling by two pronounced *intra*community gender differences. In East Boston, lower-SES men were at significantly increased risk of death compared with higher-SES men, whereas this was not true for women. In addition, the striking effect modification of the SES-mortality relation by urban/rural residence among North Carolina women was not observed among the men.

Of the SES indicators considered here, income was the most consistently associated with mortality among elderly men and women. This is somewhat unexpected, since the cohorts were, for the most part, composed of persons who were not working, and incomes were reported within restricted ranges. For men, low education and occupational prestige also predicted mortality in the majority of cohorts (in demographic-adjusted analyses). For women, however, low education and occupational prestige were predictive of increased mortality in just one of the cohorts. One reason may be that respondents estimated household income from all sources, including spouses, whereas education and occupation measures focused on the individual alone. Among the birth cohorts of 1900–1920, women's education and occupational status may be less indicative of household SES than their husbands' education and occupational status or a combined measure of their status and their husbands' status (63, 64). Because information on spouse's occupation was not available, we could not classify female respondents by their husbands' occupations. While SES inequalities in mortality are generally weaker in women than in men (3, 10, 12, 13, 16, 33, 36, 65), steeper gradients are observed when women are classified by their husbands' occupations than when they are classified by their own (66). Moreover, within strata defined by women's own occupations, there are gradients by husband's occupation (66). Using 1980 Finnish census data linked to mortality records, Koskinen and Martelin (67) found smaller educational and occupational mortality gradients among working-age women than among working-age men, but only for married individuals. In unmarried persons, SES-mortality gradients were equally steep for both genders. Consistent with this finding, we also observed stronger SES-mortality associations among unmarried women than among married women. However, this was true only in North Carolina.

Because mortality differentials based on income at only one time point are not as reliable as results based on accumulated wealth or income over many years (9), our estimates of the income-mortality association may be conservative. Stronger income-mortality associations have been observed when earnings have been averaged over multiple years (20, 68, 69). On the other hand, it is possible that we overestimated the impact of income on mortality, as the relation between income (or occupation) and health may be bidirectional. Persistently low income or occupational status may adversely affect health, and conversely, ill health may lead to reduced income or occupational status (7). However, the fact that education, which is usually obtained prior to major changes in health, was as predictive of mortality as income and occupational prestige (at least for men) suggests that reverse causation does not entirely account for observed gradients. Education may be associated with lower mortality because it promotes access to and ability to use health-relevant information, including adoption of a healthy lifestyle and preventive health care, as well as higher income potential and occupational achievement (44, 61).

Men with Duncan Socioeconomic Index scores in the lowest quartile were 25 percent more likely to die than the highest-scoring men, after adjustment for demographic factors. This finding is unique in that occupational prestige has been neglected in epidemiologic investigations of SES and mortality in this country. European researchers report strong links between occupational status, as measured by the British Registrar General's Scale, and mortality (23–29). However, because the Registrar General's Scale was designed to provide decreasing mortality rates with increasing social class, there are built-in associations between this scale and health (44). Use of Duncan Socioeconomic Index scores to measure occupational prestige in the EPESE cohorts avoided this tautology and was appropriate, since this classification system was developed in 1970, when the respondents were in the middle of their working years. The Duncan Socioeconomic Index may not measure prestige accurately in younger birth cohorts, since rankings change over time. Researchers wishing to examine relations between occupation and health in younger generations should use an updated version of the Duncan Socioeconomic Index (44). Occupational prestige may protect against mortality because it is a source of self-esteem and other psychological rewards as well as a source of financial gain (61).

Unexpectedly, in East Boston and Iowa, women in the lowest quartile of occupational prestige experienced lower mortality than did women in the highest quartile, although the association in Iowa was statistically significant only after adjustment for health status. The reason for this anomalous finding is unclear. Perhaps having a high-prestige job in a community where many of one's peers do not entails some level of psychosocial stress that adversely affects health, especially if that job is combined with child-rearing responsibilities, which fell mainly on women in the EPESE generation.

In summary, this study examined the relation between SES and mortality in four community-dwelling elderly populations. Higher SES, whether measured by education, by income, or by occupational prestige, was generally associated with reduced mortality over a 9-year period. Findings varied by gender and by community. SES-mortality gradients were more similar in men and women when household income rather than individual educational or occupational attainment was considered. Future research should continue to investigate the relative validity of traditional SES measures for men and women and develop more balanced assessment tools, including indicators of wealth among the elderly. Researchers should focus not only on delineating individual characteristics but also on community attributes that mediate or modify pathways through which socioeconomic conditions are associated with disease and death.

ACKNOWLEDGMENTS

This work was supported by grants R01-AG011042, R01-AG010127, and R01-AG12765 and contracts N01-AG-0-2105, N01-AG-0-2106, N01-AG-0-2107, and N01-AG-1-2102 from the National Institute on Aging.

The authors thank Dr. Paul R. Markowitz for helpful comments on earlier versions of the manuscript.

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APPENDIX 1

Assessment of Physical Activity Level

East Boston, Massachusetts

How often do you:

1) Take walks in good weather?
2) Work in the garden in the spring or summer?

3) At least once a week, do you engage in any regular activity akin to brisk walking, jogging, bicycling, etc., long enough to work up a sweat?

Response choices: *For items 1 and 2*: 1 = frequently; 2 = sometimes; 3 = rarely; 4 = never. *For item 3*: 1 = yes; 2 = no.
Physical activity level = number of items with the response choice "1."

Iowa

How often do you:

1) Take walks?
2) Garden or do yard work in season?
3) Jog, bike ride, swim, or do some other vigorous exercise?

Response choices: 0 = do not do; 1 = every day; 2 = several times a week; 3 = once a week; 4 = several times a month; 5 = once a month or less.
Physical activity level = number of items with response choices of "1" or "2" (for items 1 and 2) or of "1," "2," or "3" (for item 3).

New Haven, Connecticut

In the last month, how often have you done:

1) Take walks?
2) Work in the garden or yard?
3) Active sports or swimming?

Response choices: 1 = often; 2 = sometimes; 3 = never.
Physical activity level = number of items with the response choice "1."

North Carolina

Questions on physical activity were not asked.

APPENDIX 2

Assessment of Depressive Symptomatology

Center for Epidemiologic Studies Depression Scale

Now I have some questions about your feelings during the past week. For each of the following statements, please tell me if you felt that way (response choices listed below):

1. I was bothered by things that usually don't bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues, even with help from my family and friends.
4. I felt that I was just as good as other people.*
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.*
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.*
13. It seemed that I talked less than usual.
14. I felt lonely.
15. People were unfriendly.
16. I enjoyed life.*
17. I had crying spells.
18. I felt sad.
19. I felt that people disliked me.
20. I could not get going.

(*Reverse-scored.)

At some study sites, abbreviated versions of the scale were used. Scores were obtained by summing response choices across the items indicated below.
East Boston: items 6, 7, 11, 12, 14, 15, 16, 18, 19, and 20. Response choices: 1 = yes; 0 = no.
Iowa: items 2, 6, 7, 11, 12, 14, 15, 16, 18, 19, and 20. Response choices: 0 = hardly ever; 1 = some of the time; 2 = most of the time.
New Haven: items 1–20. Response choices: 0 = rarely or none of the time; 1 = some of the time; 2 = much of the time; 3 = most or all of the time. (This is the full-length scale.)
North Carolina: items 1–20. Response choices: 1 = yes; 0 = no.