American Journal of Epidemiology
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Vol. 159, No. 5
Printed in U.S.A.
DOI: 10.1093/aje/kwh057

Childhood and Adult Socioeconomic Conditions and 31-Year Mortality Risk in Women

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Received for publication March 10, 2003; accepted for publication September 3, 2003.

Links between low socioeconomic position and poor health are well established. Most previous research, however, has focused on middle-aged males and has relied on limited socioeconomic data, usually measured at one point over the life course. This paper examines all-cause, cardiovascular, and noncardiovascular mortality in women in relation to socioeconomic position at different stages of the life course. Information was collected in 1965, 1974, 1983, and 1994 and included recalled father's occupation and education as a measure of childhood socioeconomic position and the respondent's household income, education and occupation, and spouse's occupation from a sample of 3,087 women participating in the Alameda County Study. Cox regression models were used to estimate hazard ratios for risk of death. Lower childhood socioeconomic position was associated with an increased mortality due to cardiovascular disease (hazard ratio (HR) = 1.29, 95% confidence interval (CI): 1.09, 1.54) but was unrelated to death due to other causes (HR = 0.97, 95% CI: 0.82, 1.15). Overall mortality was higher among women reporting the lowest level of education (HR = 1.17, 95% CI: 0.99, 1.39), but education was most strongly related to noncardiovascular disease-related deaths (HR = 1.41, 95% CI: 1.10, 1.81). Low household income was also associated with higher mortality, for both cardiovascular disease-related (HR = 1.47, 95% CI: 1.14, 1.91) and noncardiovascular disease-related (HR = 1.30, 95% CI: 1.03, 1.63) deaths. Both early and later life indicators of socioeconomic position contribute to increased mortality risk among socioeconomically disadvantaged women, but these effects appear stronger for cardiovascular mortality.

adult; cardiovascular diseases; child; mortality; risk; social class; socioeconomic factors; women

Abbreviations: CI, confidence interval; HR, hazard ratio; ICD-9, *International Classification of Diseases*, Ninth Revision.

There is growing evidence that economic and social circumstances early in life may influence health later in life (1–5). Increased morbidity and mortality in adulthood are the result of complex interacting processes potentially involving the interplay of biologic (6–9), behavioral (10), and psychosocial processes along the pathway between infancy and adulthood (6, 8, 11–13). An important step in explicating these complex life course processes is to establish the relative importance of different socioeconomic indicators from different stages of life to various dimensions of health and functioning in adulthood.

Although the inverse relation between adult socioeconomic position and health has been observed in both men and women, most of the evidence linking low socioeconomic position to poorer health outcomes is derived from middle-aged male populations (14, 15). Evidence is accumulating, however, that the complex interplay of biologic, social, economic, behavioral, and psychological life course processes may operate differently for men and women for some health outcomes, and so it may be worthwhile to consider men and women separately (16). Of the 24 studies that have examined life course socioeconomic position in relation to cardiovascular disease, less than half have even

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included women and then usually in relatively small numbers (8). Furthermore, the assessment of women's socioeconomic position has often been based on the socioeconomic characteristics of her household and/or partner, so it is important to include indicators of her own position (17).

In addition, there may also be other aspects of the socially defined structural roles of women that may be associated with poorer health outcomes, such as the demands of child or elder care. To examine questions about the contribution of life course socioeconomic processes to women's mortality, we took advantage of data collected in the Alameda County Study between 1965 and 1996, which included information on a woman's own childhood socioeconomic conditions, education, and occupation. In addition, we used information on her household income and the occupation of her husband/partner in relation to her risk of all-cause, cardiovascular disease, and noncardiovascular disease mortality.

MATERIALS AND METHODS

Study population

In 1959, the Human Population Laboratory was established to assess the levels of physical, mental, and social health of persons living in Alameda County, California. In 1965, questionnaires were mailed to 8,083 prospective subjects, based on an area probability sample of the county, and 6,928 (86 percent) were returned. In 1974, surveys were sent to 5,722 surviving participants and 4,864 (85 percent) responded. In 1983, surveys were sent to a 50 percent random sample of cohort members known to be alive and participants in the studies of 1965 and 1974 ($n = 1,799$). In 1994, all surviving subjects ($n = 3,005$) were recontacted, and 2,730 (91 percent) completed questionnaires. The present investigation is limited to female cohort members for whom complete baseline information on the socioeconomic indicators of interest was available ($n = 3,087$) and uses data from the 1965, 1974, 1983, and 1994 surveys.

Cause-specific mortality was ascertained primarily through computer linkage with the California Master Death Index, supplemented with searches of the National Death Index. Follow-up for mortality was completed through December 1996 with a total of 1,163 deaths documented among females in this study. Earlier investigations estimated that this accounted for approximately 96 percent of the deaths occurring within the study population (18). *International Classification of Diseases*, Ninth Revision (ICD-9), codes 390–459 listed as the primary cause of death were considered cardiovascular disease outcomes ($n = 580$). Separate analyses were performed within this group for deaths due to ischemic heart disease (ICD-9 codes 410–414) and cerebrovascular disease (ICD-9 codes 430–438), but as the findings were similar we present results for the combined category of cardiovascular disease only. An analysis of premature mortality was restricted to subjects aged 45 years or younger at baseline ($n = 1,753$), with a total of 247 deaths recorded (cardiovascular disease-related deaths = 72).

Assessment of life course socioeconomic indicators

The questionnaires sent at each wave of data collection were similar in content and collected information on socioeconomic and demographic factors, physical and psychological health, medical conditions, personal habits, activities, and home life.

Childhood. Socioeconomic position in childhood was assessed at baseline by asking subjects to indicate their father's education and occupation. Detailed occupational codes corresponding to the US Census were derived from the questionnaires and later collapsed by the authors into two broad categories—nonmanual (high socioeconomic position) and manual (low socioeconomic position). When information on the father's occupation was missing ($n = 247$), we categorized respondents according to their father's education, where low childhood socioeconomic position was defined as the father's having 8 years of education or less.

Education. Women in this study ranged in age from 17 to 94 years. As average levels of education have increased in a cohort-specific fashion and the socioeconomic implications of attaining a certain level of education have changed over time, we attempted to account for cohort effects by ranking women's education relative to their broad birth cohort as being younger or older than 55 years at baseline. Sensitivity analyses showed that using narrower age bands did not substantively alter the conclusions of the study. Younger women who reported not completing at least 12 years of schooling and older women who did not finish at least 8 years were categorized in the lowest education group, while any subject who reported completing more than 12 years was classified as having the highest education.

Occupation. An occupation was recorded for all subjects who reported employment outside the home. At baseline, all retirees were asked to report their occupation when they were last employed, and this continued over the course of follow-up. Additionally, all married women were asked to report their husband's occupation. The job titles were then coded according to the relevant census year classifications and collapsed into broader occupational categories by the authors (J. B. D., J. W. L.): professionals (doctors, lawyers, professors, scientists, engineers, architects, etc.); other nonmanual positions (secretaries, stenographers, bookkeepers, typists, office workers, cashiers, tellers, collectors, messengers, and salespersons); skilled manual positions (foremen, machinists, electricians, carpenters, mechanics, craftsman, military enlisted men, and protective service workers); and unskilled manual positions (truck and bus drivers, operatives and apprentices in industry, bartenders, waiters, cooks, other service workers, gardeners, longshoremen, laborers, sharecroppers, and private household workers).

The job classifications for women were further collapsed to nonmanual versus manual positions because of the relatively small number of women employed in skilled manual positions. Housewives were considered a separate occupational category. These categories were updated at each wave of data collection and used in the time-dependent covariate analyses to account for women who may have changed occupational status, such as when they reentered the labor force after working in the home providing child care.

Income. Subjects were asked to report the gross household income from all sources for the year prior to the survey. Income categories were created on the basis of approximate tertiles in the distribution of income among study respondents. At baseline, subjects reporting an annual income of less than $5,000 before taxes were categorized as living in low-income households, those who reported incomes from $5,000 to $10,000 were considered as living in medium-income households, while earnings of greater than $10,000 were categorized as high income. Reported incomes during subsequent waves of data collection were adjusted to constant dollars using the consumer price index.

Covariates. At baseline and at each subsequent wave of data collection, subjects were classified as current, former, or never smokers. A measure of physical activity was also created according to the intensity, frequency, and duration of reported participation in different types of leisure time activity, such as swimming, walking, active sports, or gardening. Weight (in pounds) and height (in feet and inches) were self-reported by subjects and then converted to their metric equivalent for the calculation of body mass index. Women with a body mass index of greater than 30 kg/m^2 were categorized as obese. Previous research using the Alameda County data has shown that these covariates are related to both socioeconomic position and mortality.

Statistical analysis

All statistical procedures were performed using SAS version 6.12 software (SAS Institute, Inc., Cary, North Carolina). Cox proportional regression analyses were used to estimate relative mortality hazards and 95 percent confidence intervals for all exposures of interest. Additionally, a time-dependent hazard regression analysis was performed to account for changes in selected exposures over time, such as income and health behaviors. Survival time was calculated as the number of years between baseline survey completion and date of death.

RESULTS

Table 1 shows demographic, behavioral, and health characteristics among study participants in 1965. The age range of subjects at the baseline examination was from 17 to 94 years, with a mean age of approximately 44 years. The majority of participants were White (84.3 percent), with the remaining subjects of African, Asian, and Hispanic descent. The resulting racial composition of the study subjects was similar to the population of Alameda County as a whole at that time. Most participants reported being married at the time of examination, never smoking cigarettes, and being moderately to highly physically active; they were not considered obese. An earlier published report has characterized the Alameda County Study participants in greater detail (19).

Table 2 describes the distribution among subjects of several different indicators of socioeconomic position, and 48.8 percent of the subjects reported that their father was employed in a nonmanual occupation or had attended high school. The remainder indicated that their father worked predominately as a manual laborer or did not attend high school. Most respondents had themselves completed high school, and approximately 30 percent reported attending college. In 1965, almost half (46.7 percent) of the participants reported working primarily within the home, 37.7 percent reported working in nonmanual positions, and the rest were employed in manual positions (15.6 percent). Over the follow-up period, 263 (16.1 percent) housewives joined or rejoined the workforce in nonmanual jobs, and 118 (7.2 percent) former housewives were subsequently employed in manual positions outside the home. Alternatively, 24.5 percent of the women who reported working outside the home in nonmanual positions and 21.8 percent of the women employed in manual positions at baseline ultimately ended up working primarily within the home over the same period of follow-up. Among subjects who were ever married, 36.4 percent had husbands employed in professional positions, 12.7 percent had husbands employed in nonprofessional but nonmanual occupations, and 50.8 percent reported husbands employed in either skilled or unskilled manual jobs.

Table 3 shows associations between life course socioeconomic factors and all-cause mortality. All socioeconomic indicators except occupation were associated with mortality

TABLE 1. Baseline characteristics of women participating in the Alameda County Health Study, Alameda County, California, 1965

Characteristic	No.	%
Age (years)		
<25	319	10.3
25–44	1,355	43.9
45–64	1,002	32.5
≥65	411	13.3
Race		
White	2,599	84.3
Black	363	11.8
Other	120	3.9
Marital status		
Single	246	8.0
Married	2,221	71.9
Separated or divorced	317	10.3
Widowed	303	9.8
Smoking		
Current smoker	1,230	40.3
Former smoker	355	11.6
Never smoker	1,469	48.1
Body mass index		
Obese (>30 kg/m^2)	234	7.7
Nonobese	2,818	92.3
Physical activity level		
Low	986	32.0
Medium/high	2,098	68.0

TABLE 2. Baseline socioeconomic profiles among female participants of the Alameda County Health Study, Alameda County, California, 1965

Characteristic	No.	%
Childhood socioeconomic position*		
High	1,505	48.8
Low	1,582	51.2
Education†		
High	1,057	34.2
Medium	1,220	39.5
Low	810	26.2
Occupation		
Nonmanual	1,163	37.7
Manual	482	15.6
Housewife	1,442	46.7
Husband's occupation		
Professional	992	36.4
Other nonmanual	347	12.7
Skilled manual	703	25.8
Unskilled manual	680	25.0
Annual household income‡		
High	1,009	32.7
Medium	1,114	36.1
Low	964	31.2

* Childhood socioeconomic position based on father's occupation (high socioeconomic position = nonmanual; low socioeconomic position = manual); when information on father's occupation was missing, then childhood socioeconomic position was estimated from the father's education (high socioeconomic position = >8 years' schooling; low socioeconomic position = ≤8 years' schooling).

† Education is age adjusted: high = college/finished high school; medium = finished high school/some high school; low = some high school/no grammar school.

‡ Income in 1965: high (>$10,000); medium ($5,000–$10,000); low (<$5,000).

when mutually adjusted and when adjusted by income and occupation as time-varying covariates. In the fully adjusted model, the hazard ratio for childhood disadvantage was 1.12 (95 percent confidence interval (CI): 0.99, 1.27). Table 4 shows that low childhood socioeconomic position was associated with cardiovascular disease mortality (hazard ratio (HR) = 1.29, 95 percent CI: 1.09, 1.54) after time-varying adjustment for other socioeconomic indicators and health behaviors, in addition to adult income (HR = 1.47, 95 percent CI: 1.14, 1.91). Education was not associated with cardiovascular disease mortality. Table 5 shows results for noncardiovascular disease mortality. Childhood socioeconomic position was unrelated to mortality from noncardiovascular disease causes (HR = 0.97, 95 percent CI: 0.82, 1.15), while both education and income showed significant inverse associations. Tables 3, 4, and 5 show that there was no association between a woman's own occupation and mortality, with similar estimates calculated between models that measured baseline occupation versus results from time-varying covariate models.

Table 6 shows that, among women who were married, there was no association between husband's occupation and cardiovascular disease mortality, although there was some elevation of mortality risk for noncardiovascular disease mortality among women whose husbands were manual workers (HR = 1.18, 95 percent CI: 0.93, 1.50).

An identical analysis of premature mortality was also performed in a sample of women aged 45 years or younger at baseline, indicating mortality in this group would have been before age 76 (table 7). The relative effects of both early and later-life socioeconomic indicators were uniformly stronger. Low childhood socioeconomic position was more strongly associated with premature cardiovascular disease mortality (HR = 1.41, 95 percent CI: 0.83, 2.39), as were education with noncardiovascular disease-related mortality (HR = 2.01, 95 percent CI: 1.28, 3.17) and income with all causes (HR = 1.63, 95 percent CI: 1.16, 2.29). Women employed in manual occupations were at an increased risk of premature death (HR = 1.61, 95 percent CI: 1.02, 2.52), and housewives appeared to be at increased risk for premature death due to cardiovascular disease (HR = 1.56, 95 percent CI: 0.83, 2.95), although this effect was imprecisely estimated because of small numbers.

DISCUSSION

Our results provide evidence that both early and later life markers of socioeconomic position were related to an increased risk of death in this sample of women from Alameda County, California. There is also evidence that the relative contribution of early life socioeconomic position is stronger for cardiovascular mortality than for death from other causes. This is consistent with findings from a number of studies that have examined this in predominately male European populations (1, 2, 20–30). Most studies (1, 2, 20, 22, 23, 27–33), but not all (34, 35), have observed inverse associations between childhood socioeconomic position and cardiovascular disease incidence and mortality. Several large studies have shown that men whose fathers were employed in manual occupations tended to display adverse cardiovascular disease risk factor profiles (increased body mass, high blood pressure, low high density lipoprotein cholesterol, physical inactivity, heavy drinking, smoking) and also to be at an increased risk of death primarily from cardiovascular disease and cancer, compared with men whose fathers were employed in professional or nonmanual jobs (20, 24, 36). Most associations persisted even after adjustment for adult socioeconomic position. Unfortunately, few investigations of the relation between childhood socioeconomic position and adult health have been able to include large numbers of women in their analyses (32, 37–39). However, the results here suggest that at least for cardiovascular disease mortality the contribution of early life socioeconomic disadvantage is similar among the women in this study to that found for men in other studies.

TABLE 3. Socioeconomic predictors of all-cause mortality, Alameda County Health Study, Alameda County, California, 1965–1996

Variable	Age-adjusted hazard ratio	95% confidence interval	Multivariable-adjusted hazard ratio*	95% confidence interval	Multivariable-adjusted hazard ratio†	95% confidence interval	Multivariable-adjusted hazard ratio‡	95% confidence interval
Childhood socioeconomic position								
High	1.00		1.00		1.00		1.00	
Low	1.20	1.07, 1.35	1.13	1.00, 1.28	1.12	1.00, 1.27	1.12	0.99, 1.27
Education								
High	1.00		1.00		1.00		1.00	
Medium	1.22	1.06, 1.40	1.16	1.01, 1.34	1.14	0.98, 1.31	1.13	0.97, 1.31
Low	1.38	1.18, 1.61	1.29	1.09, 1.53	1.23	1.04, 1.46	1.17	0.99, 1.39
Occupation								
Nonmanual	1.00		1.00		1.00		1.00	
Manual	1.13	0.95, 1.33	0.96	0.80, 1.15	1.08	0.88, 1.31	1.06	0.87, 1.30
Housewife	1.08	0.95, 1.23	1.03	0.90, 1.17	0.97	0.84, 1.12	0.98	0.85, 1.13
Annual household income								
High	1.00		1.00		1.00		1.00	
Medium	1.18	1.01, 1.38	1.14	0.98, 1.33	1.15	0.96, 1.37	1.15	0.96, 1.38
Low	1.35	1.16, 1.57	1.29	1.11, 1.51	1.34	1.13, 1.59	1.35	1.14, 1.60

* Multivariable model simultaneously adjusts for age (as a continuous variable), baseline household income, childhood socioeconomic position, education, and baseline occupation.

† Multivariable model with income and occupation as time-varying covariates.

‡ Multivariable model also includes smoking status, body mass index, and physical activity as time-varying covariates.

TABLE 4. Socioeconomic predictors of cardiovascular disease mortality, Alameda County Health Study, Alameda County, California, 1965–1996

Variable	Age-adjusted hazard ratio	95% confidence interval	Multivariable-adjusted hazard ratio*	95% confidence interval	Multivariable-adjusted hazard ratio†	95% confidence interval	Multivariable-adjusted hazard ratio‡	95% confidence interval
Childhood socioeconomic position								
High	1.00		1.00		1.00		1.00	
Low	1.34	1.13, 1.58	1.31	1.11, 1.56	1.30	1.09, 1.54	1.29	1.09, 1.54
Education								
High	1.00		1.00		1.00		1.00	
Medium	1.09	0.90, 1.32	1.00	0.82, 1.23	0.99	0.81, 1.22	0.99	0.80, 1.21
Low	1.21	0.98, 1.51	1.07	0.85, 1.36	1.06	0.84, 1.34	1.00	0.79, 1.28
Occupation								
Nonmanual	1.00		1.00		1.00		1.00	
Manual	1.08	0.85, 1.39	0.94	0.73, 1.23	1.00	0.75, 1.34	0.96	0.78, 1.29
Housewife	1.11	0.92, 1.34	1.06	0.88, 1.28	0.98	0.80, 1.19	0.99	0.80, 1.21
Annual household income								
High	1.00		1.00		1.00		1.00	
Medium	1.51	1.20, 1.90	1.49	1.18, 1.88	1.41	1.08, 1.84	1.42	1.08, 1.86
Low	1.44	1.15, 1.82	1.40	1.11, 1.77	1.44	1.11, 1.86	1.47	1.14, 1.91

* Multivariable model simultaneously adjusts for age (as a continuous variable), baseline household income, childhood socioeconomic position, education, and baseline occupation.

† Multivariable model with income and occupation as time-varying covariates.

‡ Multivariable model also includes smoking status, body mass index, and physical activity as time-varying covariates.

TABLE 5. Socioeconomic predictors of mortality due to other causes, Alameda County Health Study, Alameda County, California, 1965–1996

Variable	Age-adjusted hazard ratio	95% confidence interval	Multivariable-adjusted hazard ratio*	95% confidence interval	Multivariable-adjusted hazard ratio†	95% confidence interval	Multivariable-adjusted hazard ratio‡	95% confidence interval
Childhood socioeconomic position								
High	1.00		1.00		1.00		1.00	
Low	1.09	0.92, 1.28	0.98	0.83, 1.16	0.97	0.82, 1.15	0.97	0.82, 1.15
Education								
High	1.00		1.00		1.00		1.00	
Medium	1.39	1.13, 1.70	1.38	1.12, 1.70	1.33	1.08, 1.64	1.32	1.07, 1.63
Low	1.59	1.28, 1.98	1.60	1.26, 2.04	1.46	1.15, 1.86	1.41	1.10, 1.81
Occupation								
Nonmanual	1.00		1.00		1.00		1.00	
Manual	1.19	0.94, 1.50	0.97	0.76, 1.26	1.15	0.88, 1.52	1.16	0.88, 1.54
Housewife	1.02	0.85, 1.23	0.96	0.80, 1.16	0.96	0.79, 1.16	0.97	0.80, 1.18
Annual household income								
High	1.00		1.00		1.00		1.00	
Medium	0.94	0.76, 1.16	0.90	0.72, 1.11	0.98	0.77, 1.25	1.00	0.79, 1.26
Low	1.27	1.04, 1.56	1.20	0.97, 1.47	1.31	1.04, 1.65	1.30	1.03, 1.63

* Multivariable model simultaneously adjusts for age (as a continuous variable), baseline household income, childhood socioeconomic position, education, and baseline occupation.

† Multivariable model with income and occupation as time-varying covariates.

‡ Multivariable model also includes smoking status, body mass index, and physical activity as time-varying covariates.

There are several potential limitations that should be considered in the interpretation of the results of this study. First, there are a number of issues to bear in mind in regard to the measurement of socioeconomic position over the life course. Our measure of childhood socioeconomic position was based on recall at the baseline examination that likely would have resulted in nondifferential exposure misclassification, which may underestimate the effects of childhood disadvantage. A recent review of studies of childhood socioeconomic position and adult cardiovascular disease has shown that studies measuring socioeconomic position in childhood showed stronger associations between childhood socioeconomic position and outcomes than studies relying on adult recall of childhood socioeconomic position (8). Furthermore, we were forced to create fairly crude categorizations of childhood socioeconomic position into a simple high/low dichotomy because of the particular occupational distribution of the fathers in this sample.

It is also possible that the educational and occupational classification of women in this study was imprecise. There were enormous secular changes in education over the life course of these cohorts of women. At baseline, women were aged 17–94 years and thus were born between 1871 and 1948. Achieving a high school education for a woman born in the 1900s had a very different social meaning than the same objective level of education for a woman born in the 1930s. We attempted to deal with this issue by assigning each woman an educational rank relative to her birth cohort. Nevertheless, this is a fairly crude attempt to adjust for such massive secular changes in education.

In regard to measuring a woman's occupation, there are two potential sources of imprecision. First, the occupational classification schemes available for the 1960, 1970, and 1980 censuses may be more sensitive for male than female jobs, so that our collapsed occupational categories were not as accurate a representation of women's work as they might have been. Evidence for this is found in the fact that occupation was unrelated to mortality in unadjusted models, although the estimates did strengthen when premature mortality was examined, suggesting that the occupational classification may have been more sensitive for younger than older women, many of whom were already retired at baseline. A second source of imprecision may have arisen from missing data on occupational changes among women over the life course. Most occupational change occurred in the women who were classified as working in the home at baseline (46.7 percent). Some of these women were of retirement age (16.9 percent) and so would not have changed occupational classifications. Of the remainder, some rejoined the workforce over the 31 years of the study (23.3 percent), but 15.1 percent had missing data on their subsequent occupations. This may have meant that we underestimated the effects of occupation on women's mortality experience. Finally, occupational classification of women may have

TABLE 6. Hazard ratios and 95% confidence intervals associated with socioeconomic indicators among 2,737 married* participants, Alameda County Health Study, Alameda County, California, 1965–1996

Variable	All-cause mortality hazard ratio†	95% confidence interval	Cardiovascular disease mortality hazard ratio	95% confidence interval	Other mortality hazard ratio	95% confidence interval
Childhood socioeconomic position						
High	1.00		1.00		1.00	
Low	1.10	0.97, 1.25	1.26	1.05, 1.51	0.96	0.80, 1.15
Education						
High	1.00		1.00		1.00	
Medium	1.11	0.95, 1.30	0.98	0.79, 1.22	1.27	1.01, 1.60
Low	1.13	0.94, 1.36	0.95	0.73, 1.23	1.36	1.04, 1.78
Occupation						
Nonmanual	1.00		1.00		1.00	
Manual	1.02	0.82, 1.27	0.94	0.69, 1.28	1.10	0.82, 1.49
Housewife	0.95	0.82, 1.11	0.92	0.74, 1.15	0.97	0.79, 1.20
Annual household income						
High	1.00		1.00		1.00	
Medium	1.14	0.95, 1.38	1.40	1.06, 1.87	0.98	0.77, 1.26
Low	1.30	1.08, 1.56	1.41	1.08, 1.86	1.25	0.98, 1.60
Husband's occupation						
Professional	1.00		1.00		1.00	
Other nonmanual	0.94	0.76, 1.17	0.91	0.67, 1.24	0.96	0.71, 1.30
Skilled manual	1.05	0.89, 1.24	1.04	0.83, 1.32	1.06	0.83, 1.34
Unskilled manual	1.13	0.96, 1.34	1.08	0.85, 1.37	1.18	0.93, 1.50

* Married or formerly married respondents who provided information on husband's occupation in the 1965 survey.

† Multivariable models adjusted simultaneously for age, childhood socioeconomic position, education, and husband's occupation, with household income, occupation, smoking status, body mass index, and physical activity as time-varying covariates.

been more imprecise for older than younger cohorts, because cohorts of older women had more constrained access to different types of work. The final issue in regard to measuring socioeconomic position is that, because household income may have been relatively accurately reported, the smaller measurement error in that indicator of adult socioeconomic position may have made it appear to be a stronger predictor of mortality than other life course socioeconomic position indicators, potentially measured with greater error. Nevertheless, these potential measurement issues cannot explain why childhood socioeconomic position was associated with cardiovascular disease but not with noncardiovascular disease mortality, when examining this association was one of the primary objectives of this study. It also cannot explain why education was strongly linked to noncardiovascular disease mortality but not to cardiovascular disease mortality.

Other measurement limitations include the inability to accurately capture smoking, body mass index, and levels of physical activity. Although assessment of these behavioral pathways was not the primary goal of the study, it is likely that these effects were underestimated because of self-report and measurement error. In addition, the period under study was one where epidemic levels of coronary heart disease in the United States declined sharply. The period was also characterized by major shifts in the socioeconomic patterning of major cardiovascular disease risk factors such as smoking (40, 41), so that both secular and socioeconomic shifts in risk factors between 1965 and the 1990s complicate the understanding of the behavioral pathways that may help mediate the effects of early life socioeconomic position on cardiovascular disease mortality. Finally, the sample used here is unlikely to be representative of the United States as a whole, but it is an unselected population and may be more socioeconomically diverse than the only previous US study of mortality conducted among nurses (32).

Our findings are consistent with those from other studies on women. An inverse association between childhood socioeconomic position and cardiovascular disease was reported among 117,006 subjects participating in the US Nurses' Heath Study (32). Kuh et al. (39) also observed a strong inverse association between the father's social class and

TABLE 7. Socioeconomic predictors of premature mortality, Alameda County Health Study, Alameda County, California, 1965–1996*

Variable	All-cause mortality hazard ratio†,‡	95% confidence interval	Cardiovascular disease mortality hazard ratio§	95% confidence interval	Other mortality hazard ratio	95% confidence interval
Childhood socioeconomic position						
High	1.00		1.00		1.00	
Low	0.99	0.76, 1.29	1.41	0.83, 2.39	0.86	0.63, 1.17
Education						
High	1.00		1.00		1.00	
Medium	1.36	0.97, 1.91	1.03	0.54, 1.95	1.51	1.01, 2.20
Low	1.96	1.34, 2.85	1.80	0.92, 3.55	2.01	1.28, 3.17
Occupation						
Nonmanual	1.00		1.00		1.00	
Manual	1.61	1.02, 2.52	1.69	0.70, 4.09	1.58	0.94, 2.68
Housewife	1.21	0.88, 1.67	1.56	0.83, 2.95	1.10	0.76, 1.60
Annual household income						
High	1.00		1.00		1.00	
Medium	1.20	0.88, 1.64	1.17	0.65, 2.09	1.22	0.85, 1.76
Low	1.63	1.16, 2.29	1.55	0.82, 2.91	1.67	1.12, 2.49

* The analysis includes 1,753 women aged 45 years or younger at the baseline examination.

† Model includes age, childhood socioeconomic position, and education, with income, occupation, smoking status, body mass index, and physical activity as time-varying covariates.

‡ No. of deaths = 247.

§ No. of deaths = 72.

premature mortality (26–54 years) in a large post-World War II birth cohort in the United Kingdom.

A number of hypotheses have been generated to explain the effect of early life socioeconomic position on adult disease risk. In 1977 and 1978, Forsdahl (42, 43) first speculated that persons growing up in a deprived environment, followed by later affluence, were at an increased risk for developing coronary heart disease and that the relation was mediated primarily through serum cholesterol concentrations, although studies of upward mobility in affluent countries have tended to show reduced rather than elevated risk (35). Others have highlighted the role of early life conditions on the development of insulin resistance (44–46) or of hemostatic factors, such as increased levels of plasma fibrinogen (47, 48), as a potential explanation for the findings linking lower childhood socioeconomic position to adult health.

In addition to childhood social class, certain markers of low socioeconomic position later in life were also associated with increased mortality in our study. Women who reported completing the lowest number of years of schooling had a greater risk of noncardiovascular disease-related death compared with women who reported achieving the highest level of education. Annual household income was inversely associated with both cardiovascular disease-related and noncardiovascular disease-related mortality in all analyses, but it was stronger for cardiovascular disease-related deaths. The subject's occupation was unrelated to mortality in this study. However, among married women, there was some suggestion of an increased risk of death depending upon the husband's occupation. The lowest risk was observed among women married to professionals, and the highest risk was observed among women with husbands who worked in unskilled manual positions, even after adjustment for other individual and household measures of socioeconomic position.

Our findings are generally consistent with the literature, linking low socioeconomic position in adulthood to poorer general health and adverse health outcomes in women (29, 36–39, 49). Previous research in the area, however, has tended to rely primarily on the husband's or household measures of socioeconomic position rather than on the woman's own measures, and this is especially true for women working within the home. Our results indicate an independent contribution of both individual and household measures of adult socioeconomic position to risk of death in women, which suggests that the results of previous studies that cannot account for multiple measures of socioeconomic position should be interpreted with caution because of the possibility of residual confounding by other socioeconomic predictors.

Additionally, a small number of studies of women have attempted to evaluate the independent effect of both childhood and adult measures of socioeconomic position on adult health (37–39). In a previously mentioned study of employed women in the United Kingdom, the authors of the paper created a measure of lifetime social class by summing the number of times a woman's class location was considered manual or nonmanual (37). Unfortunately, as the study population consisted of employed women, housewives were not included. Our study is the first to examine women working within the home in the analyses of socioeconomic differences in mortality.

The results of the current investigation suggest that both individual and household markers of adult socioeconomic position are consequential considerations in studies of women's health, and the results demonstrate the utility of multiple measures of socioeconomic position from across different life course stages. In our analyses, the associations among most measures of socioeconomic position held, although somewhat attenuated, after controlling for the other socioeconomic measures. This suggests that studies that are dependent on a single measure of socioeconomic position are missing potentially valuable aspects of the relation between socioeconomic position and adult health outcomes as they play out over the life course. Moreover, as most studies rely on largely self-reported information, those that use multiple predictors of socioeconomic position may be less prone to measurement error resulting in nondifferential misclassification bias. Problems of measurement error may be exacerbated in studies focusing specifically on women, as a majority of studies use household measures of social position rather than individual measures. It has been suggested that the measures commonly used to characterize an individual's social position better predict the adult health outcomes and mortality for men than those for women (14).

An additional strength of our study is the ability to update information on the markers of socioeconomic position over an extended period of follow-up. The estimates derived from the time-dependent covariate analyses were similar to those generated from baseline data; however, allowance was made for changes in risk factors over time.

Our results generally indicate modest relative associations between the measures of socioeconomic position and mortality. This is to be somewhat expected in a study with a protracted period of follow-up, where death eventually occurs in approximately 45 percent of the total population. The subanalyses of those women aged 45 years or younger highlight the importance of the socioeconomic position on premature mortality. The results from this analysis suggest that early life markers of social class may play a greater role in predicting premature mortality. However, we cannot know if this is truly the case or an artifact of measurement closer to the time of death. It is also possible that the results may be subject to survivor bias, so that any effects of life course socioeconomic conditions were expressed in premature mortality, before older women could be recruited into the cohort in 1965. Nearly 8 percent of the study population was 70 years or older in 1965.

In summary, our results indicate that both childhood and adult markers of socioeconomic position are important factors in cardiovascular disease mortality, but it appears that lower socioeconomic position later in life has a larger impact on overall mortality. This suggests the potential for different socioeconomic markers from different life course stages to be linked through different mechanisms that may ultimately affect mortality risk. These findings highlight the need to incorporate multiple markers of socioeconomic position over the life course, to more adequately characterize the links between different dimensions of life course socioeconomic position and subsequent mortality.

ACKNOWLEDGMENTS

This research was supported by grant HD-35120-01A2 from the National Institutes of Health.

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