Inequalities in Mortality by Social Class Measured at 3 Stages of the Lifecourse

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ABSTRACT

Objectives. This study examined how social class, measured at 3 stages of life, contributes to mortality risk.

Methods. A cohort of employed Scottish men (n = 5567) provided their fathers' occupation and their own first and current occupations, from which social class in childhood, at labor-market entry, and at screening (1970 to 1973) was determined. Relative rates of mortality and relative indices of inequality were calculated from 21 years of follow-up.

Results. Mortality risk was similar at each stage of life, with men in the higher social classes having the lowest risk. Social class at screening produced the greatest relative indices of inequality.

Conclusions. The widening of inequalities in mortality in adulthood suggests the importance of the accumulation of poor socioeconomic circumstances throughout life. (*Am J Public Health* 1998;88:471–474)

Introduction

Mortality differentials by social class have been the subject of much discussion, particularly since the publication of the Black Report in 1980.[1] Recent research relating to birthweight and weight in early infancy has suggested links between poor early life experience and future cardiovascular disease risk.[2,3] Other studies have investigated the influence of socioeconomic conditions in childhood on morbidity[4–8] and mortality,[5,8–11] generally finding that poorer socioeconomic conditions in childhood are associated with increased morbidity and mortality risk.

It is possible, however, that people born into poor socioeconomic circumstances and those most likely to have low birthweights are also likely to experience poor circumstances throughout later life. It is thus difficult to separate the particular contributions of socioeconomic factors acting at different times of life.[11–13] Studies with information on social circumstances throughout the life course are required to clarify this situation.

We had an opportunity to investigate this issue, using data from a cohort study that recorded social class at 3 stages of life and now has 21 years of mortality follow-up.

Methods

This analysis was based on a cohort of employed men from 27 workplaces in Glasgow, Clydebank, and Grangemouth, Scotland, screened between 1970 and 1973. Participants completed a questionnaire and attended a physical examination. Full details have been given elsewhere.[14,15] The 5567 men aged between 35 and 64 years (average 48.2 years) who supplied complete information on their occupation at the time of screening, their own first regular occupation, and their father's main occupation were included in this analysis. Social class was coded according to the Registrar General's classification[16] from the occupations given at the 3 life stages, where social class I represents professional occupations, social class II represents intermediate occupations, social class III represents skilled nonmanual and skilled manual occupations, social class IV represents partly skilled occupations, and social class V represents unskilled occupations. Each life stage was analyzed in 4 groupings: classes I and II; class III nonmanual; class III manual; and classes IV and V.

Participants were flagged at the National Health Service Central Registry in Edinburgh and deaths occurring in the 21-year follow-up period were reported, together with their cause, coded according to the *International Classification of Diseases*, ninth revision (ICD-9)[17] (follow-up is continuing). Causes of death were grouped in 4 ways: all causes, cardiovascular disease (ICD-9 codes 390–459), cancer (ICD-9 codes 140–208), and other causes. Relative risks of mortality were calculated with Cox's proportional hazards models[18] at each of the 3 life stages; the computer package SPSS was used.[19] The baseline category was taken as social class III manual, the largest group.

Confidence intervals for the relative risks were estimated by treating the relative risks as floating absolute risks.[20] This method attributes some estimate of variability to the baseline category and reduces the variance associated with the other relative risks. The values of the relative risks, now called floating absolute risks, remain unchanged.

To avoid problems of comparing measures across groups of differing size, the relative index of inequality[21,22] was calculated at each life stage. This index requires that the socioeconomic position of each social class group be defined hierarchically and given a value between 0 and 1, based on the proportion of men with a higher position than the midpoint of each group in the hierarchy. This is done for each 5-year age group. The newly formed socioeconomic measure (SEM) is used as

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TABLE 1—Mortality during 21 Years of Follow-Up, by Social Class at Screening: 5567 Employed Men in a Scottish Workplace Study

	Social Class[a] at Screening					
	I and II (n = 1785)	III Nonmanual (n = 1005)	III Manual (n = 1613)	IV and V (n = 1164)	Trend	Relative Index of Inequality[b]
All causes						
No. deaths	374	284	517	405		
Age-adjusted floating absolute risk	0.62*	0.88	1	0.99	$P < .0001$	1.87
95% CI	(0.56, 0.68)	(0.79, 0.99)	(0.92, 1.09)	(0.90, 1.10)		(1.56, 2.23)
Cardiovascular disease						
No. deaths	192	149	269	204		
Age-adjusted floating absolute risk	0.61*	0.89	1	0.96	$P < .0001$	1.79
95% CI	(0.53, 0.71)	(0.76, 1.04)	(0.89, 1.13)	(0.83, 1.10)		(1.40, 2.29)
Cancer						
No. deaths	123	91	160	127		
Age-adjusted floating absolute risk	0.65*	0.91	1	1.01	$P = .0002$	1.78
95% CI	(0.55, 0.78)	(0.74, 1.12)	(0.86, 1.17)	(0.85, 1.21)		(1.30, 2.44)
Other						
No. deaths	59	44	88	74		
Age-adjusted floating absolute risk	0.57*	0.80	1	1.08	$P = .0001$	2.33
95% CI	(0.44, 0.74)	(0.60, 1.08)	(0.81, 1.23)	(0.86, 1.35)		(1.50, 3.60)

Note. CI = confidence interval.
[a]Social class was coded from I (high) to V (low) according to the Registrar General's classification.[16]
[b]See Pamuk[21] and Kunst and Mackenbach.[22]
*$P < .001$

the independent variable in a Poisson regression analysis,[23] with number of deaths as the dependent variable:

$$\log(D_{ij}) = \log(P_{ij}) + a_i + (\beta \times \mathrm{SEM}_j),$$

where D is the number of deaths, P is the number of person-years at risk in the i^{th} 5-year age group and j^{th} socioeconomic group, and α and β are the regression coefficients. The relative index of inequality is defined as the exponential of β and is the relative risk of mortality comparing a socioeconomic position indicator of 1 to 0—that is, the bottom to the top of the socioeconomic hierarchy. A relative index of inequality of 2 means that the mortality risk of the hypothetical poorest individual at the bottom of the hierarchy is twice the mortality risk of the hypothetical richest individual at the top, taking into consideration the intermediate points. The larger the relative index of inequality, the greater the degree of inequality. The computer package EGRET was used.[23] Standardized normal deviate tests were used to perform tests of differences between the relative indices of inequality.[24]

Results

Mortality analyses based on social class at screening found that men in social classes I and II had significantly lower risks—a third lower than the risks of other social classes—for each broad grouping of cause of death (Table 1). Men in other social classes had similar risks. Similar associations were seen for social class at entry into the labor market (Table 2). When mortality was analyzed by childhood social class, the risks for all-cause and cardiovascular disease mortality were significantly lower for men whose fathers were not manual laborers (social classes I, II, and III nonmanual) than for men whose fathers were manual laborers (Table 3). For cancer mortality, men in social classes I and II had lower risks than those in the other social classes, but there was no consistent trend.

For each cause of death, the relative index of inequality was largest, denoting greatest inequality, for social class at screening. For all-cause and cardiovascular disease mortality, the relative index of inequality for social class at entry into the labor market and in childhood were similar. For cancer mortality, the relative index of inequality was smaller for social class in childhood (1.22) than for social class at entry into the labor market (1.44). Tests between the relative indices of inequality showed that they were not statistically significantly different from each other for any cause of death (e.g., in tests between social class at screening and in childhood, $P = .16$ for all-cause mortality and $P = .10$ for cancer mortality.

Discussion

In this cohort, mortality experience by social class was similar when measured at each life stage. Men in the highest social classes had significantly lower mortality risks than men in the other social classes, and there were significant trends across the social classes. Only small mortality differentials were seen within the manual-labor social classes. These findings are unlike those from general population samples, in which there is generally a stepwise gradient of mortality risk across all socioeconomic groups.[25–27] This cohort included only men in stable employment, which would underrepresent chronically ill men and those in casual work and thus would not include a group of men in manual jobs who were at high risk for mortality. The exclusion of such men would distort the underlying mortality pattern. Additionally, those failing to survive childhood would not be included because of the retrospective collection of social class during childhood and at entry into the labor market. However, the men in the cohort were not selected on health grounds at the time of screening.

Previous studies have analyzed mortality risk indexed by social class in adulthood, this being the time when risk factors may be considered to influence mortality.[28,29] More recently the influence on mortality of early life conditions, both in utero[2,3] and in childhood,[5,8–11] has been examined. Increased risk

TABLE 2—Mortality during 21 Years of Follow-Up, by Social Class at Entry into Labor Market: 5567 Employed Men in a Scottish Workplace Study

	Social Class[a] at Entry into Labor Market					
	I and II (n = 790)	III Nonmanual (n = 1370)	III Manual (n = 2225)	IV and V (n = 1182)	Trend	Relative Index of Inequality[b]
All causes						
No. deaths	145	373	662	400		
Age-adjusted floating absolute risk	0.58*	0.92	1	1.04	$P < .0001$	1.56
95% CI	(0.50, 0.69)	(0.83, 1.01)	(0.93, 1.08)	(0.95, 1.15)		(1.31, 1.87)
Cardiovascular disease						
No. deaths	66	192	353	203		
Age-adjusted floating absolute risk	0.50*	0.88	1	0.99	$P < .0001$	1.62
95% CI	(0.39, 0.64)	(0.77, 1.02)	(0.90, 1.11)	(0.86, 1.13)		(1.26, 2.09)
Cancer						
No. deaths	53	115	210	123		
Age-adjusted floating absolute risk	0.67**	0.89	1	1.02	$P = .010$	1.44
95% CI	(0.51, 0.88)	(0.74, 1.07)	(0.87, 1.15)	(0.85, 1.21)		(1.05, 1.98)
Other						
No. deaths	26	66	99	74		
Age-adjusted floating absolute risk	0.70	1.08	1	1.30	$P = .018$	1.63
95% CI	(0.48, 1.03)	(0.85, 1.38)	(0.82, 1.22)	(1.03, 1.63)		(1.05, 2.53)

Note. CI = confidence interval.
[a]Social class was coded from I (high) to V (low) according to the Registrar General's classification.[16]
[b]See Pamuk[21] and Kunst and Mackenbach.[22]
*$P < .001$; **$P < .01$.

TABLE 3—Mortality during 21 Years of Follow-Up, by Social Class in Childhood: 5567 Employed Men in a Scottish Workplace Study

	Social Class[a] in Childhood					
	I and II (n = 758)	III Nonmanual (n = 574)	III Manual (n = 2435)	IV and V (n = 1800)	Trend	Relative Index of Inequality[b]
All causes						
No. deaths	163	130	739	548		
Age-adjusted floating absolute risk	0.68*	0.74**	1	1.05	$P < .0001$	1.56
95% CI	(0.58, 0.79)	(0.63, 0.89)	(0.93, 1.08)	(0.96, 1.14)		(1.30, 1.87)
Cardiovascular disease						
No. deaths	83	57	387	287		
Age-adjusted floating absolute risk	0.66*	0.63*	1	1.05	$P < .0001$	1.68
95% CI	(0.53, 0.82)	(0.48, 0.81)	(0.91, 1.11)	(0.94, 1.18)		(1.30, 2.17)
Cancer						
No. deaths	52	52	239	158		
Age-adjusted floating absolute risk	0.67**	0.92	1	0.93	$P = .06$	1.22
95% CI	(0.51, 0.87)	(0.70, 1.20)	(0.88, 1.14)	(0.80, 1.09)		(0.88, 1.69)
Other						
No. deaths	28	21	113	103		
Age-adjusted floating absolute risk	0.76	0.78	1	1.28	$P = .004$	1.96
95% CI	(0.53, 1.10)	(0.51, 1.20)	(0.83, 1.20)	(1.06, 1.56)		(1.25, 3.08)

Note. CI = confidence interval.
[a]Social class was coded from I (high) to V (low) according to the Registrar General's classification.[16]
[b]See Pamuk[21] and Kunst and Mackenbach.[22]
*$P < .001$; **$P < .01$.

of cardiovascular disease in particular has been linked to poorer socioeconomic circumstances in early life.[5–9] A difficulty with such studies is that people born into poor socioeconomic circumstances are likely to spend their adult lives in similar circumstances, and it is unclear at what point in the life course influences are acting. It may be that risk factors are influenced differentially by exposures acting at different stages of the life course.[15] In the present cohort, we have shown that cardiovascular disease mortality risk is particularly dependent on early-life social conditions, even when later socioeconomic position is taken into account.[14]

The relative rates of mortality were similar whichever of the 3 social class locations were used, the main difference being in cardiovascular disease and all-cause mortality by social class in childhood. Here it was men who had grown up in non–manual-labor households who had a lower mortality risk, compared with the other life stages, where it was only men in social classes I and II who had a lower risk.

The results showed that social class at screening produced the largest inequalities

for each cause of death, although they were not significantly different from the inequalities calculated for time of entry into the labor market and for childhood. The relative index of inequality for social class in childhood and at entry into the labor market were similar. For cancer mortality, the relative index of inequality was smaller for childhood social class than for social class at labor market entry. This finding, together with the nonsignificant trends for cancer mortality by childhood social class, suggests no strong childhood social class effect for cancer mortality.[14]

The recent United Kingdom Department of Health *Variations in Health* report recognizes the importance of the accumulation of risks throughout the life course and the influences of this accumulation on inequalities in health.[30] In our study, although the differences in magnitude of the relative indices of inequality were not statistically significant, the trend was in the direction of widening of inequalities later in life, suggestive of the role of accumulation of socially patterned risk factors across the life course.[14] Future investigations of this cohort will look at cause-specific mortality and the role of social mobility on mortality. □

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