5 Lifecourse influences on health in early old age

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Introduction

Our understanding of health inequalities is most advanced in relation to childhood and the years of adult working life. Yet it is among the post-retirement population that we see the highest levels of morbidity, mortality and health service utilization. Health at older ages has been relatively neglected by inequalities research. The study reported here redresses some of this imbalance.

The study draws on the increasing body of research which suggests that health in adult life is the outcome of experiences and exposures across the lifecourse (see Chapter 1). The 'lifecourse perspective' holds that inequalities in the structure of society shape life chances so that advantages and disadvantages cluster cross-sectionally and accumulate longitudinally (DoH 1995; Davey Smith *et al.* 1997; Kuh and Ben Shlomo 1997; Power and Matthews 1997). As a consequence of this, observed social class differences in health in early old age can be seen as the biological correlates of socially structured, differential exposure to health hazards.

Numerous studies have shown that childhood circumstances have long-term sequelae for both adult health and socio-economic circumstances (e.g. Montgomery *et al.* 1996; Strachan 1997). And just as childhood conditions can be seen to influence adult health, living and working conditions in adult life can be seen to influence health after retirement. Among the post-retirement population, most of the prevalent chronic illnesses have developed slowly over several decades. While cross-sectional studies can explain some of the variations in the observed distribution of these illnesses, a method of examining the whole lifespan is needed to investigate the ways in

which pre-retirement living and working conditions affect health after retirement.

Probably the most powerful research method for this purpose is the birth cohort study, a longitudinal study which tracks its subjects from birth through life. The earliest birth cohort study members in Britain were born in 1946 and are currently in their early fifties. At this age, most of the common illnesses of old age are not yet manifest. There remains, therefore, a need to extend the reach of cohort studies to include older age groups from whom retrospective lifecourse data can be collected.

Between 1937 and 1939, the Rowett Research Institute, headed by Sir John Boyd Orr, conducted a nationwide survey of diet and health. Families from 16 centres in Scotland and England took part in a detailed inquiry into their diet and health (Gunnell *et al.* 1996). This survey, one of the most valuable sources of information on diet and health in pre-war Britain, was recently 'rediscovered' by the Department of Social Medicine at Bristol University. Much of the original data has now been computerized and surviving members of the survey have been traced and flagged for death registration by the Office for National Statistics. In terms of investigating precursors of health in early old age, the Boyd Orr subjects provided an ideal opportunity to collect retrospective data which could be supplemented by the archive data on childhood diet, health and living conditions.

In 1997–8, we carried out a follow-up study of the Boyd Orr cohort. This chapter describes findings from the study which shed light on the lifecourse influences on health in early old age. Following an overview of the research design, the central three sections highlight how disadvantage accumulates across the lifecourse and how earlier exposure to disadvantage is related to current health. The sections look in turn at how childhood disadvantage is linked to subsequent disadvantage in adult life, at how disadvantage after retirement is associated with earlier disadvantage and how past and current disadvantage are related to health in early old age. The chapter concludes by drawing out some policy messages about the importance of interventions targeted at all stages of the lifecourse.

Research design and methods

Study sample

A stratified random sample of traced surviving members of the Boyd Orr cohort was taken. Our sample comprised children who were medically examined and aged between 5–14 years at the time of the original survey. Our sample was stratified on the basis of per capita childhood household food expenditure (the amount of money spent by each family on food per child per week) which was calculated by the original survey and which was available for all sample members. These data were used as a measure of

childhood socio-economic circumstances in preference to using father's social class which, in a number of cases, was not recorded by the original survey. Equal numbers of subjects were chosen within each food expenditure category. From an original classification of six groups, three strata representing highest, medium and lowest food expenditure were created. Power calculations showed that 100 interviews from each of these strata would be required to detect any statistically significant differences between groups. Letters inviting subjects to give an interview were sent via local health authorities and general practitioners (Blane *et al.* 1999).

Methods

Each subject, with only three exceptions, was interviewed in their own home. The interview was conducted using a modified lifegrid (see Table 5.1) (Blane 1996; Berney and Blane 1997). Lifegrid interviews use a series of timelines to collect landmark events from different areas of a subject's life and as aids to recall when collecting additional retrospective lifecourse information. Prior to the interview, major public events such as wars and coronations were noted on the 'External' line. This provided 'benchmark' dates with which to cross-reference the dates of life events which the subject reported during the interview.

The interviews began with the completion of the 'Personal' timeline. Subjects provided a range of information on their parents and siblings, such as

Table 5.1 Section of a completed lifegrid for a woman born in 1935

	External	*Personal*	*Residential*	*Occupational*
1935			High St. Fulham	
		Sister born		
	World War II		Evacuation	
1945	War Ends		West Rd. Bolton	
				Bank clerk
	Coronation			
		Marries	May St. Dover	Housewife
1955		John born		
		Alice born		
1965		Husband promoted	Acacia Rd. Dover	

dates of birth (and death, if applicable), occupations, dates of leaving school and so on. The years of the subjects' marriage(s) and birth of children were also noted. The 'Residential' timeline noted the years when subjects changed address. The 'Occupational' timeline noted years when the subjects changed job. Having completed this part of the interview, the subjects were then asked to talk in more detail about their residences, specifically about the hazard exposures in which we were interested. Having covered all residences, the interview then went on to examine the subjects' occupations, again probing for information on hazard exposure.

Hazard exposures and health measures

Hazard exposure scores, based on years of exposure, were calculated for seven types of hazard. These were air pollution; residential damp; occupational fumes and dusts; physically arduous labour; lack of job autonomy; inadequate nutrition in childhood and adulthood; and cigarette smoking.[1] The hazards were selected on the basis that their exposure patterns may be related to the social structure (Blane *et al.* 1997; Blane *et al.* 1998). The one possible exception to this is cigarette smoking which, while undoubtedly socially structured, can be described as largely behavioural. The individual hazards also offer a biologically plausible link between exposure and morbidity/mortality. Air pollution, damp, fumes and dusts and cigarette smoking are all contributory factors for respiratory disease (Calman 1995). Lack of job autonomy has been associated with an increased risk of coronary heart disease (CHD) (Siegrist *et al.* 1990; Bosma *et al.* 1997).

To calculate the total hazard load to which each individual was exposed, the individual values for each hazard were aggregated to create a combined lifetime hazard exposure score. This provided a measure of the combined 'insults' with which the body's regenerative mechanism had to cope. It was also the case that the numbers for each individual exposure were often too small to make statistical inferences.

Once all the residential and occupational data had been collected, a range of additional information on the current socio-economic position of each subject was obtained. Subjects were asked about their housing tenure, car ownership, receipt of works or private pensions and receipt of state benefits. The interviews ended with questions on the subject's current health, freedom from serious disease, limiting long-standing illness and prescribed medication. The subject's height, weight, leg length, blood pressure and lung function were then measured.

Assigning social class

Occupational social class was assigned according to the registrar general's 1991 classification of occupations and its associated coding rules. Male

subjects were assigned a class based on their last significant period of employment, with 'significant' being defined as any period greater than two years part-time. Two systems of coding were used for female subjects. The first was the conventional scheme by which married women are allocated to a social class on the basis of their husband's occupation and single women are allocated on their own occupation. The second classified women who had been in paid employment during the final ten years before the statutory retirement age, being classified on the basis of their own last significant period of employment, whether they were, or had been, married or not. Women who had not worked in this period were classified according to their husband's occupation.

Individual classes were aggregated for the analyses so that classes I, II and IIINM became the 'non-manual' category and classes IIIM, IV and V became the 'manual' category.

Childhood circumstances

Childhood height and the presence of signs of chronic disease were chosen as measures of childhood health status. Each subject's childhood stature was converted to a *z-score*: the number of standard deviations above or below the expected values for an individual's age and sex that their measurement lay. As no reference standard for the stature of pre-war children is available, internally-derived reference values were calculated (Gunnell *et al.* 1998). Subjects were then ranked into thirds according to height z-score. A symptom score was constructed to indicate the number of chronic diseases present at the childhood clinical examination. Only those signs of chronic disease which were measured in all the survey sites were included in the symptom score, namely angular stomatitis (a deficiency disease indicating a lack of riboflavin in the diet), bronchitis, knock knees and otitis media. Subjects were then classed as either 'symptom free' as children (that is, displaying none of these conditions at clinical examination) or 'symptomatic' (that is, displaying one or more of these conditions).

Childhood social class was assigned according to father's main occupation during the subject's childhood, on the basis of information given at lifegrid interview. Father's social class was coded to the registrar general's 1991 classification, rather than that in use at the time of the original survey, to allow for aggregation of classes into manual and non-manual categories.

Representativeness of the sample

In total, 294 subjects (155 women and 139 men) aged between 63 and 78 years old were interviewed. The overall response rate for the study was 43 per cent. Given that the original Boyd Orr survey was not a random sample of the British population and that families were selected from the poorer

areas of the survey centres, the question of representativeness arises when placing our results in the context of the general population.

The social class distribution of the interviewees' fathers is broadly equivalent to that of the social class distribution of young adult males at the 1931 census: 66 per cent were in social classes I-III compared to 64 per cent of the male population aged 20–44 years. The interviewees, in terms of their socio-demographic characteristics in early old age, broadly resemble those aged 65–74 years in the British population at the 1991 census. The proportion in the sample who were male was 47 per cent, compared to 45 per cent in the general population. The proportion in the sample in the non-manual social classes was 50 per cent, compared to 49 per cent in the general population. In terms of current health profile, such as mean systolic blood pressure and forced vital capacity (FVC), our subjects were broadly similar to their age-group peers in the 1995 Health Survey for England (HSFE). Any bias in the results is likely to be conservative as the most disadvantaged subjects were disproportionately affected by loss to follow-up through death. Additionally, non-responders were more disadvantaged as children than the interviewees (Blane *et al.* 1999).

Childhood conditions and subsequent hazard exposure

It is well established that conditions in utero and low birth weight have long-term impacts on health in childhood and later life (Barker 1992; Power *et al.* 1996). Chronic illness and slow growth in childhood can both be described as forms of early disadvantage. They have been linked both to poor health (Strachan 1997) and to socio-economic disadvantage (Wadsworth 1986) in later life. The present study found that males and females with short stature (slow growth) in childhood accumulated greater hazard exposure than their taller peers (see Figure 5.1). There is a graded association between childhood height and mean lifetime exposure to the combined hazards: as childhood height decreases, lifetime exposure increases. There were significant linear trends for both men ($p = 0.002$) and women ($p = 0.001$) after adjusting for age at examination and age at interview (Holland *et al.* 2000).

The association between childhood symptom status and lifetime hazard exposure was less clear. Males who showed signs of chronic disease at the clinical examination carried out in the original survey accumulated greater hazard exposure than their symptom-free peers, but not significantly so. The relationship for females was reversed, with those who were symptom-free accumulating greater hazard exposure, but again this was not statistically significant. The reasons for this become clearer when we examine the association between childhood symptoms of chronic illness, lifetime hazard exposure and father's social class.

As Figure 5.2 shows, the pattern of hazard exposure for manual men is,

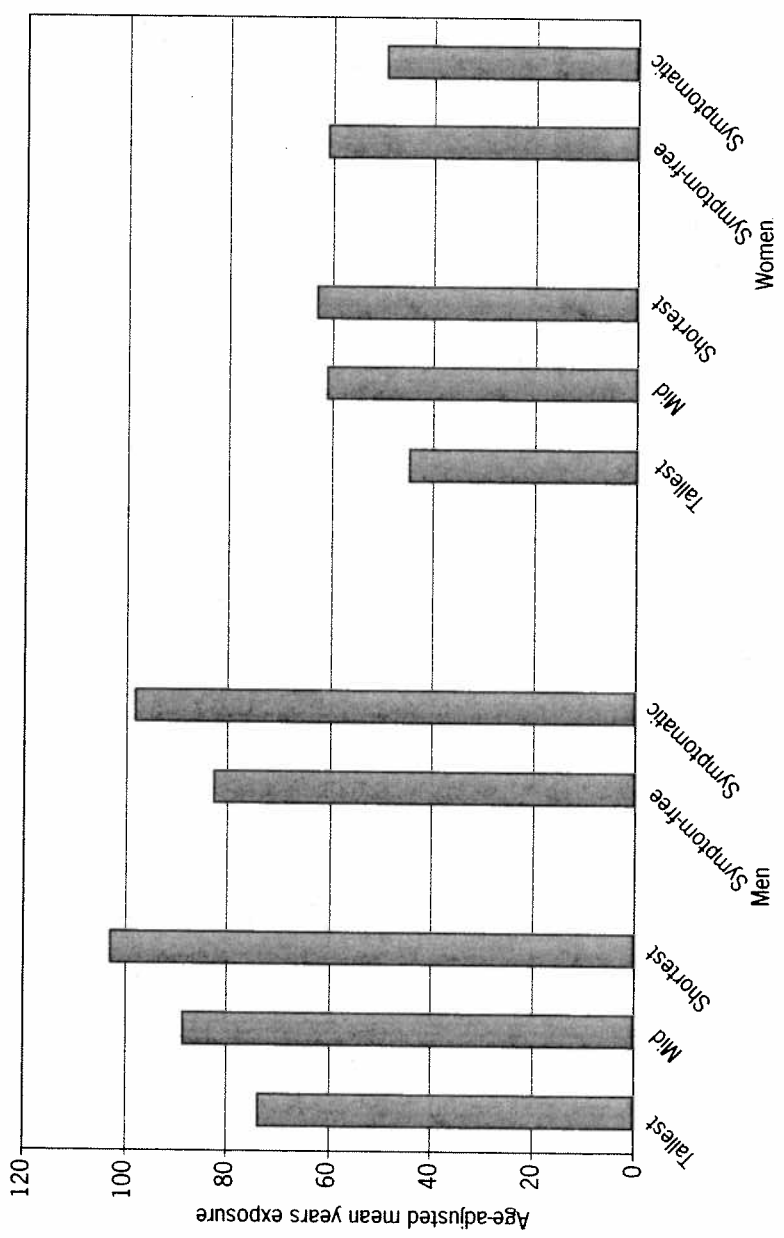

Figure 5.1 Lifetime exposure to combined hazards: childhood height and symptoms by gender

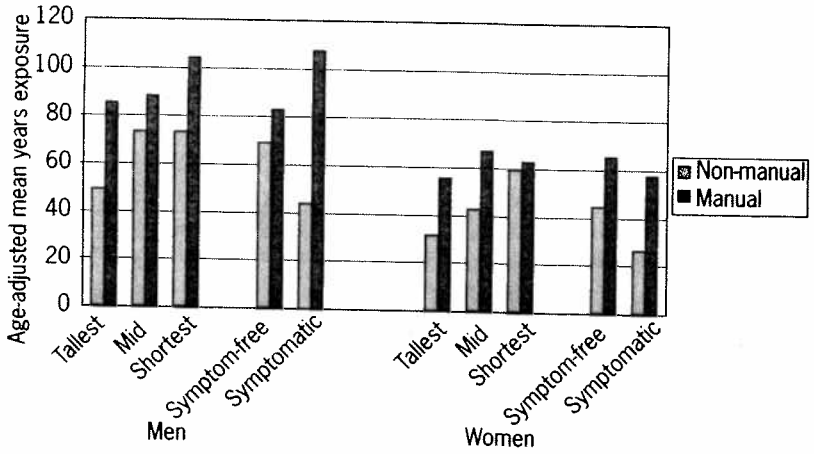

Figure 5.2 Lifetime exposure to combined hazards: childhood height and symptoms by father's social class

as we might expect, with the shortest and the symptomatic showing higher levels of exposure than the tallest and the symptom-free. The tallest children from both manual and non-manual backgrounds subsequently accumulated less exposure than their shorter peers, and there were statistically significant linear trends for men from manual backgrounds ($p = 0.044$) and women from non-manual backgrounds ($p = 0.035$). However, the pattern with respect to symptoms is more complex: among non-manual men and among non-manual and manual women, symptomatic subjects accumulated less lifetime exposure than their symptom-free peers.

One possible explanation for this is that the presence of these symptoms in childhood, more so than short stature, is likely to be recognized as a sign of physical frailty. It may well be the case that, where possible, parents set such children on a 'protective' life trajectory, thus avoiding further rapid hazard accumulation (by, for example, entering non-manual occupations). A greater accumulation of hazard exposure may be experienced by those who are not afforded such protection. Those least likely to receive such protection, for whom alternatives to paid (or, at the very least, less hazardous) employment were most restricted, were men from manual-class homes.

Health inequalities in adulthood may partly reflect a lifetime's differential accumulation of exposure to health-damaging and health-promoting environments. These results show childhood disadvantage is associated with the accumulation of further disadvantage in terms of exposure to health-damaging hazards throughout the lifecourse. This supports other evidence that individuals experiencing disadvantage as children are more likely to accumulate further disadvantages (Wadsworth 1991). The social patterning

of hazard exposure is further illustrated when we look at the current socio-economic status of our subjects.

Current socio-economic status and previous lifetime hazard exposure

Measuring socio-economic status after retirement raises a number of important methodological issues. For example, how valid is it to use an occupationally-based schema when it may have been many years since the subject was employed? Similarly, there exists the widely recognized problem of assigning married women to a social class on the basis of their husband's occupation. In order to address some of these issues, the present study used a range of additional socio-economic measures. Having obtained full occupational histories for each subject, we were also able to assign women to a class based on their own last main occupation rather than their husband's (Berney *et al.* 2000).

Looking at Figure 5.3, one can see a clear trend of increasing hazard score. The main anomaly to the trend is the lower levels of hazard exposure for men in social class IIINM than in social class II. The most likely explanation for this is the social mobility of men who had spent the bulk of their working lives in the relatively high hazard exposure social class IIIM. Many of these men established their own businesses later in life and moved into social class II. In contrast to such men, it would be expected that subjects who remained in social class IIINM for the bulk of their working life would amass less hazard exposure.

When the individual classes were recoded into manual and non-manual categories, highly significant differences for both men and women ($p < 0.001$) were found between the two groups. Of the hazards examined, cigarette smoking is probably the most widely recognized and is the one most likely to be considered behavioural rather than material. The above analyses were repeated but with cigarette smoking excluded from the combined lifetime exposure score. This reduced the absolute levels of the combined hazard score but the distribution of lifetime exposure scores across classes did not change and remained statistically significant.

For women, social class differences in exposure to the combined residential hazards (air pollution, damp, inadequate nutrition) were found to be better indexed according to the social class of the head of household, while social class differences in exposure to the combined occupational hazards (fumes and dusts, lack of job autonomy, physically arduous labour) were found to be better indexed according to the social class of the women's own last main occupation. Thus, the choice of classification system used to assign social class will depend on the particular area of women's lives in which one is interested.

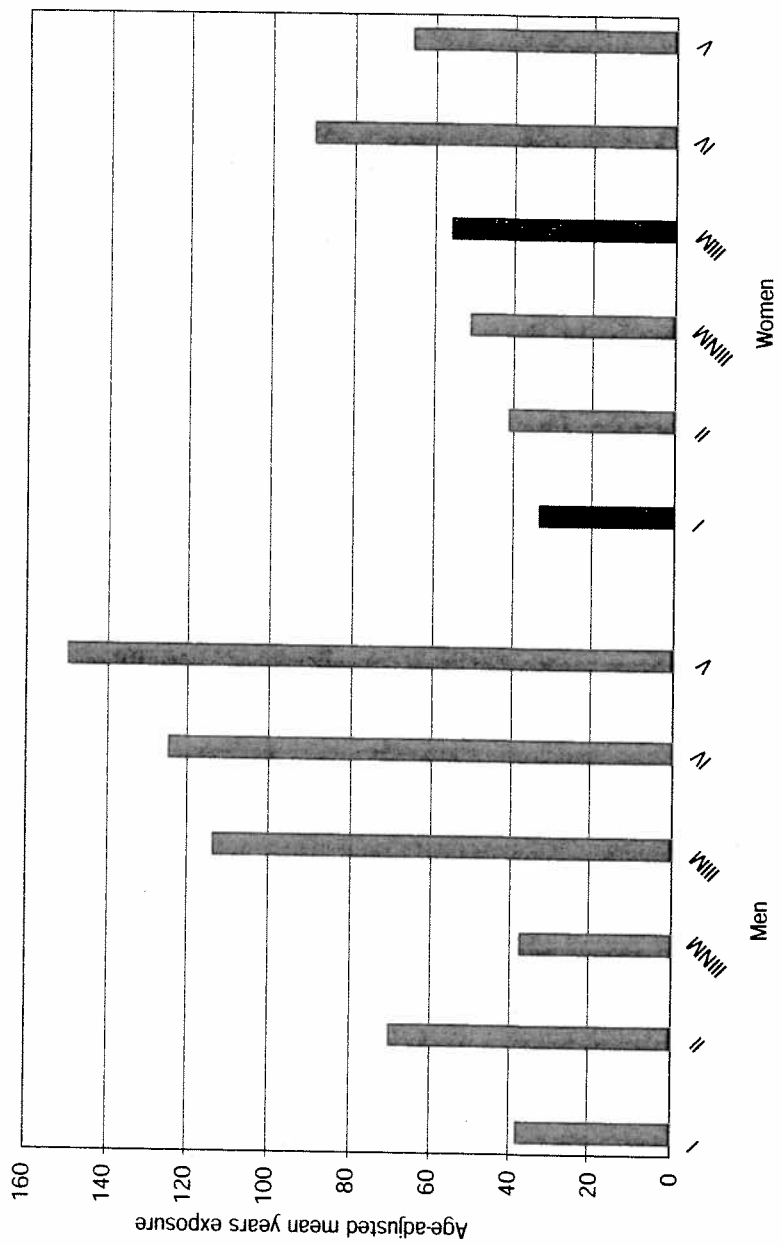

Figure 5.3 Lifetime exposure to combined hazards by subject's own current social class

In addition to information on occupation, data on a range of additional socio-economic indicators were also collected. These were housing tenure, car ownership, possession of a works or private pension, and receipt of state benefits.

Figure 5.4 shows the differences in levels of age-adjusted exposure scores which were found using the different indicators of socio-economic status position. On each measure, those who are disadvantaged after retirement have previously accumulated longer lengths of exposure to the hazards than those who are advantaged after retirement.

Linear regression modelling was used to ascertain which of the available socio-economic indicators had the strongest relationship with previous lifetime hazard exposure. For both men and women, social class of last main occupation was most strongly associated with previous lifetime hazard exposure and the largest differences in exposure score were found between the manual and non-manual groups of this indicator. Of the non-occupational indicators, housing tenure status had the strongest association for men. For women, benefit status was most strongly associated with previous hazard exposure.

Comparing the effect of social class and additional measures of socio-economic position on health in later life, Arber and Ginn (1993) found that social class was a more important determinant of disability among older people than current material resources. However, they also found that material resources had an additional effect on subjective health and sense of well-being. In the next section, we assess the relationships between socio-economic measures and objective health measures as well as self-reported health.

Social class and health outcomes in later life

When we examined health outcomes in later life, we found that the social class differences in the various measures of self-reported health (limiting long-standing illness, freedom from serious disease, regular prescribed medication) were mostly confined to men. None of the self-reported measures were related to socio-economic position during childhood. Some associations were found between the length of some individual hazard exposures during adulthood and self-reported health in early old age. The number of years exposed to low levels of job autonomy, for example, was related to both long-standing illness ($p = 0.029$) and lack of freedom from serious disease ($p = 0.004$).

Looking at each of the individual physiological measures taken at the end of the interview, it was found that lung function in women was related to factors across the whole lifecourse. Current social class, combined lifetime hazard exposure (independent of cigarette smoking status), years of

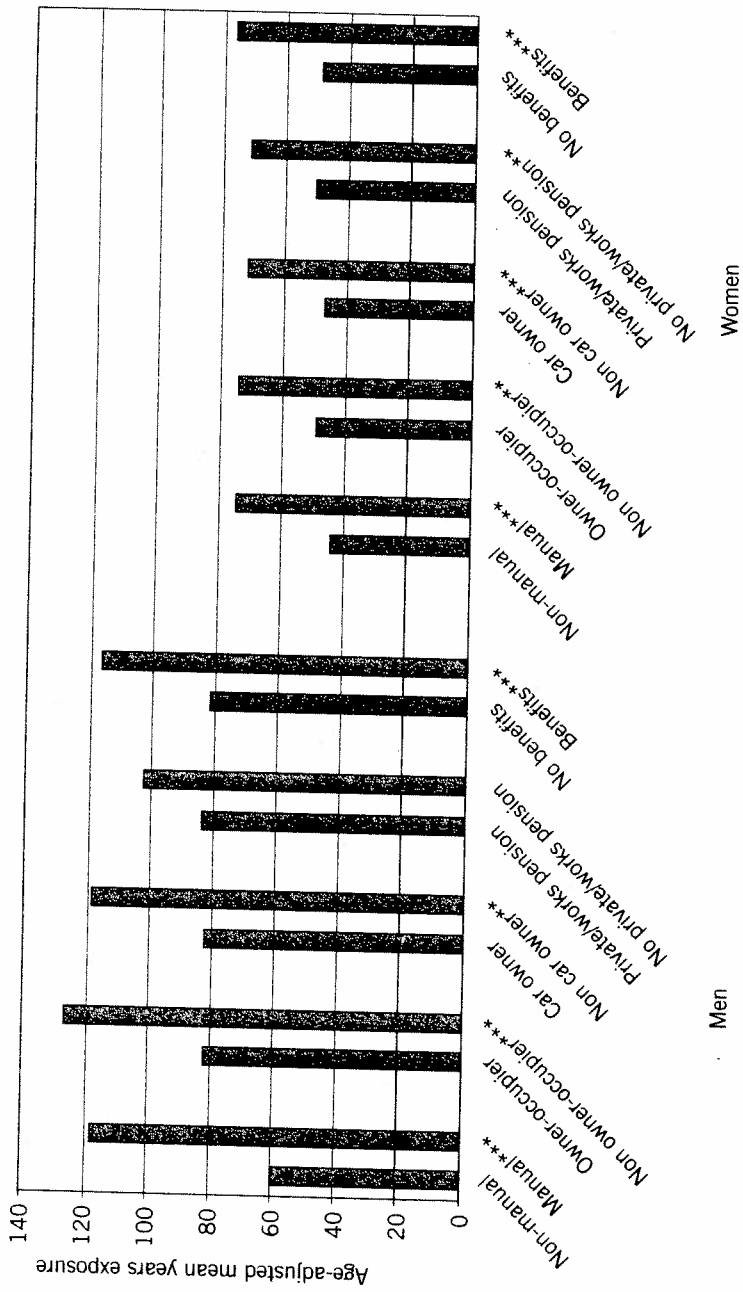

Figure 5.4 Lifetime exposure to combined hazards by measures of current socio-economic status (SES)
Note: Difference between groups: **p = < 0.01; ***p = < 0.001.

cigarette smoking and childhood socio-economic position all were related to measured lung function. Among men, lung function in early old age was found to be related to current social class and to combined lifetime hazard exposure (independent of cigarette smoking status).

Figure 5.5 shows the social class differences in lung function for both men and women. Both manual-class men and manual-class women had significantly lower levels of forced expiratory volume in one second (FEV1) than their non-manual counterparts. Similar, but slightly less significant, social class differences can be seen for levels of forced vital capacity (FVC).

Blood pressure in early old age was found to be unrelated to current social class. While non-manual men and women did have lower systolic blood pressure than their manual counterparts, the difference was not significant. However, it was found, at the individual level, that diastolic blood pressure was related to a combination of (i) shorter than average height during childhood and (ii) having a more obese than average body mass index in early old age (p = 0.002). Diastolic blood pressure was not related to either of these factors on their own; the lifecourse effect appeared only when the childhood and adult factors were placed in a sequential or conditional relationship.

Associations were also found between adult leg length, adult height and inadequate nutrition in childhood. Adult leg length, which is a sensitive indicator of growth during childhood, was associated both for men (p = 0.002)

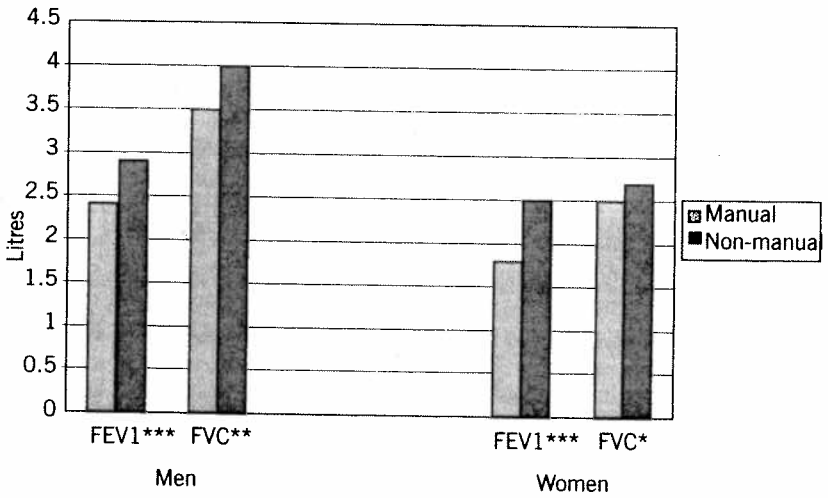

Figure 5.5 Social class differences in lung function in early old age
Note: Difference between manual and non-manual: *p = < 0.05; **p = < 0.01; ***p = < 0.001.

and women (p = 0.001) with inadequate childhood nutrition. That is to say, high inadequate nutrition scores in childhood were linked to shorter leg length in adulthood. It was also found that higher childhood inadequate nutrition scores (men p = 0.004; women p = 0.001) were associated with shorter adult height.

Conclusions

The study found evidence to support the theory that material and environmental disadvantage accumulates over the lifecourse and is linked to social class. Disadvantage after retirement from paid employment is associated with the level of disadvantage which has previously accumulated across life. Disadvantage in childhood, in terms of illness and social position, is associated with levels of disadvantage which accumulate subsequently. Such findings support conclusions from earlier studies and government committees of inquiry such as the Metter's Committee (DoH 1995) and the Independent Inquiry into Inequalities in Health (1998). Both reports state that the determinants of health inequalities are linked to the social structure and to the way that structure influences the lifestyle and quality of life of individuals. Of key importance to this process is the effect these influences exert over time.

The various dimensions of health examined by the present study related to the lifecourse in different ways. The effects of lifecourse influences are more apparent on objective than on self-reported measures of health. It may be the case that the self-reported measures are more a register of current social circumstances and psychological well-being, while objective measures register the impact of the combined lifecourse exposures on an individual's physiological state. It appears that there are at least three models of the ways in which the lifecourse influences health in early old age. In some cases, such as lung function, the influences may accumulate across the whole lifecourse, involving factors in childhood, adulthood and early old age. Alternatively, the later life relationship may have been determined largely, as in the case of adult height, at a much earlier stage of life. Finally, as in the case of blood pressure, the relationship may be conditional, with factors from different stages in the lifecourse having to occur sequentially before the later life effect is produced.

The study examined hazards which were socially and biologically plausible: socially, in that the exposure patterns were determined by the social structure; and biologically in the sense that the selected hazards were widely documented as having negative impacts on health. Differential exposure to these hazards may go some way to explaining observed social class differences in morbidity and mortality.

The last two major government investigations into health inequalities in the UK, the Black Report (DHSS 1980) and the Acheson Report (Independent Inquiry into Inequalities in Health 1998), both identified policies to improve the circumstances of children as an essential prerequisite for the reduction of health inequalities. It is undoubtedly the case that deprivation and ill-health in childhood negatively impact on adult health. We found that disadvantage and ill-health in childhood predicted disadvantage and ill-health in adulthood.

However, in addition to this, our study suggests that no stage of the lifecourse is particularly privileged. Those of our subjects who were currently in the most disadvantaged circumstances in retirement were more likely to be in poor health and more likely to have had the highest levels of hazard exposure. Such a combination of events does not occur randomly: it is socially structured. Interventions which improve living and working conditions, such as reducing exposure to the hazards we have looked at, will help no matter what stage of the lifecourse they target. In the same way as disadvantage has a knock-on effect in terms of future ill-health and further disadvantage, assistance, be it in terms of better housing, improved working conditions, cleaner air or better nutrition, will have knock-on benefits.

The Acheson Report (Independent Inquiry into Inequalities in Health 1998) emphasized that intersectorality is the key to tackling health inequalities. At home, at school, in the workplace, there are hazards to health that can be identified and acted upon. Inequalities in health in early old age may be greatly reduced by an approach that seeks to address these lifecourse influences.

Note

1 Air pollution measures were based on the level of urbanization in the area of residence and proximity to industry or main roads. Residential damp was based on subjects' recall of the presence of black mould or other signs of damp. Occupational fumes and dust scores were based upon the type and level of exposure that a subject described as being commonplace in each of their particular jobs. Physically arduous labour scores were based upon a subject's description of any occupation which involved heavy lifting, heavy sweating and where back injuries were commonplace. The job autonomy score was based upon three questions which ascertained the level of authority, variety and autonomy the subject had in each job. The three questions asked were: was the subject involved in the decision-making process; did the subject perceive the work to be repetitive; and could breaks be taken when the subject chose? Inadequate nutrition in childhood and adulthood was an indirect measure based on the number of dependent household members and the number and social class of incomes available to support them. Years of cigarette smoking were directly reported by each subject.

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References

Arber, S. and Ginn, J. (1993) Gender and inequalities in health in later life, *Social Science and Medicine*, 36: 33–46.

Barker, D.J.P. (1992) *Fetal and Infant Origins of Adult Disease*. London: British Medical Journal Publishing Group.

Berney, L.R. and Blane, D.B. (1997) Collecting retrospective data: accuracy of recall after 50 years judged against historical records, *Social Science & Medicine*, 45: 1519–25.

Berney, L.R., Blane, D. and Davey Smith, G. *et al.* (2000) Socioeconomic measures in early old age as indicators of previous lifetime exposure to environmental hazards to health, *Sociology of Health and Illness*, 22: 415–30.

Blane, D. (1996) Collecting retrospective data: development of a reliable method and a pilot study of its use, *Social Science and Medicine*, 42: 751–7.

Blane, D., Bartley, M. and Davey Smith, G. (1997) Disease aetiology and materialist explanations of socio-economic mortality differentials, *European Journal of Public Health*, 7: 385–91.

Blane, D.B., Montgomery, S.M. and Berney, L.R. (1998) Social class differences in exposure to environmental health hazards, *Sociology of Health and Illness*, 20: 532–6.

Blane, D., Berney, L., Davey Smith, G., Gunnell, D.J. and Holland, P. (1999) Reconstructing the lifecourse: health during early old age in a follow-up study based on the Boyd Orr cohort, *Public Health*, 113: 117–24.

Bosma, H., Marmot, M. and Hemingway, H. *et al.* (1997) Low job control and risk of coronary heart disease, in Whitehall II (prospective cohort) study, *British Medical Journal*, 314: 558–65.

Calman, K. (1995) On the state of the public health, *Health Trends*, 27: 71–5.

Davey Smith, G., Hart, C., Blane, D., Gillis, C. and Hawthorne, V. (1997) Lifetime socio-economic position and mortality: prospective observational study, *British Medical Journal*, 314: 547–52.

DHSS (Department of Health and Social Security) (1980) *Inequalities in Health: Report of a Working Group* (the Black Report). London: HMSO.

DoH (Department of Health) (1995) *Variations in health: What Can the Department of Health and the NHS do?* (The Metter's Committee). London: DoH.

Gunnell, D.J., Frankel, S., Nanchahal, K., Braddon, F. and Davey Smith, G. (1996) Life-course exposure and later disease: a follow-up study based on a survey of family diet and health in pre-war Britain (1937–1939), *Public Health*, 110: 85–94.

Gunnell, D.J., Davey Smith, G. and Frankel, S. *et al.* (1998) Childhood leg-length and adult mortality: follow-up of the Carnegie (Boyd Orr) survey of diet and health in pre-war Britain, *Journal of Epidemiology and Community Health*, 52: 142–52.

Holland, P., Berney, L.R. and Blane, D.B. *et al.* (2000) Life course accumulation of disadvantage: childhood health and hazard exposure during adulthood, *Social Science and Medicine*, 50: 1285–95.

Independent Inquiry into Inequalities in Health (1998) *Independent Inquiry into Inequalities in Health Report* (The Acheson Report). London: The Stationery Office.

Kuh, D. and Ben Shlomo, Y. (eds) (1997) *A Lifecourse Approach to Chronic Disease Epidemiology*. Oxford: Oxford University Press.

Montgomery, S.M., Bartley, M.J., Cook, D.G. and Wadsworth, M.E.J. (1996) Health and social precursors of unemployment of young men in Great Britain, *Journal of Epidemiology and Community Health*, 50: 415–22.

Power, C. and Matthews, S. (1997) Origins of health inequalities in a national population sample, *Lancet*, 350: 1584–9.

Power, C., Bartley, M., Davey Smith, G. and Blane, D. (1996) Transmission of social and biological risk across the lifecourse, in D. Blane, E. Brunner and R. Wilkinson (eds) *Health and Social Organization*. London: Routledge.

Siegrist, J., Peter, R., Junge, A., Cremer, P. and Seidel, D. (1990) Low status control, high effort at work and ischemic heart disease: prospective evidence from blue-collar men, *Social Science and Medicine*, 31: 1127–34.

Strachan, D.P. (1997) Respiratory and allergic diseases, in D. Kuh and Y. Ben Shlomo (eds) *A Lifecourse Approach to Chronic Disease Epidemiology*. Oxford: Oxford University Press.

Wadsworth, M.E.J. (1986) Serious illness in childhood and its association with later-life achievement, in R.G. Wilkinson (ed.) *Class and Health: Research and Longitudinal Data*. London: Tavistock.

Wadsworth, M.E.J. (1991) *The Imprint of Time: Childhood, History, and Adult Life*. Oxford: Clarendon Press.