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Migration and geographical inequalities in health in Britain

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Abstract

This paper explores the role of migration in creating geographical inequalities in mortality at the district level in Britain for the British Household Panel Study sample — a representative sample of 10264 British residents born after 1890 and enumerated in 1991. Analysis of the mortality rates of migrants showed that male migration accounts for nearly all the differences in mortality rates between districts. The BHPS was then utilised to look at the lifetime socio-economic characteristics of these migrants and to compare men and women. It was found that the health of both men and women moving from high mortality districts to low mortality districts could be explained by advantage over their lifetimes. The small proportion of men and women moving from low mortality districts to high mortality districts represent a very mixed group and their contribution, whilst small, is intriguing, as is the very different mortality rates of men and women in this group.

Keywords: Health; Migration; BHPS; Area effects; Lifetime disadvantage; Gender differences

Introduction

This paper takes as its starting point the previously reported finding by the authors that migration between districts in the British Household Panel Survey (BHPS) accounted for all of the observed inequalities in mortality between districts in Britain found in that sample (Brimblecombe et al., 1999). The analysis of the BHPS presented here enables us to build up a profile of those groups of migrants who were found to be having such an effect on the geographical pattern of mortality in Britain and thus helps explain how and to what extent this migration contributed to district level geographical inequalities in health. It also allows us to look at both early life factors (such as education and parental social class) and later life factors (such as class and income) and hence to explore the role of lifetime disadvantage in creating inequalities in health.

Migration and health

Although there is a substantial body of research on the health of migrants between countries, including migrants into Britain (for example Harding and Maxwell, 1998), there is rather less on the health of migrants within Britain. Much of the research concentrates on the role that health plays in determining whether people move and where they move to. When a difference in the health of migrants is found, studies have attempted to answer the question of whether health-selective migration accounts for those differ-

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ences. In this paper we present evidence to suggest that migration may account for a large proportion of health differences between areas, but not through health selection.

In 1864, Farr concluded that migrants from urban to rural areas differed in their health from migrants from rural to urban areas as, later, did Welton (1872), Hill (1925) and Bentham (1986). That some migration is necessitated by poor health, whereas some is facilitated by good health, has also been put forward by Hull (1979) and Dorling and Atkins (1995), among others. Fox and Goldblatt (1982) have shown that there are differences between types of migrants such that migrants who have moved only a short distance have higher mortality rates than longer distance migrants, perhaps, they suggest, reflecting the ill health of the short-distance migrants prompting a move to be nearer family or to enter an institution. Similarly, Britton et al. (1990) also found that longer distance migrants had lower mortality rates, whereas shorter distance migrants (within county) had higher rates.

One theory is that this health-related differential migration contributed to the widening of regional differences between the North West and South East of England, as those moving out of high mortality areas had lower mortality than those moving in and those moving between 'healthy' regions had even lower mortality rates (e.g. Fox and Goldblatt 1982). Britton et al. (1990) found that migrants tended to have slightly higher mortality rates than non-migrants. However, this trend was not uniform. For example, mortality rates for movers into areas of high status were similar to, or below, the average rates of the areas into which they moved. Osmond et al. (1990), using proportional mortality rates, found that place of birth had a significant effect on deaths from ischaemic heart disease (IHD) and stroke. Migrants from Scotland to the rest of Britain have higher mortality rates than those of the population of the rest of England and Wales (Harding and Maxwell, 1998) although we have no comparison with those remaining in Scotland nor those migrating into Scotland.

In contrast to the above studies, Elford et al. (1989) found that place of residence in middle age was more influential on male deaths from IHD than was place of birth. According to Leon and Strachan (1993), although migrants tend to have higher mortality rates than non-migrants, this explains only a little of the geographical variation in mortality rates at the broad regional level. Looking at the South East to North West gradient in mortality from IHD and stroke, Strachan et al. (1995) found that rates of mortality for the former were about 10% lower for migrants than non-migrants even after adjusting for age, sex, calendar period of death, housing tenure, car ownership and area of origin and destination. They found that the geographical patterns in mortality for cardiovascular disease (CVD) could not be explained by migration between areas and that the low risk of death from stroke in London was acquired by those who lived there, regardless of place of residence forty years previously. However, a previous paper by the authors (Brimblecombe et al., 1999) found that, using the BHPS, whilst migration made little difference to geographical patterns in mortality at the regional level, at the district level it accounted for all of the observed differences in mortality found in that sample. There is thus conflicting evidence as to the role of migration in producing geographical inequalities in health.

Here and throughout this paper, 'region' refers to the ten standard regions of Britain (the South East, South West, etc.) which, having average populations of five million people, are of a similar size to the smaller States in the United States of America. 'District' refers to local authority districts, or amalgamations of these, to have minimum populations of 120,000 people.

Health selection

The theory that health selection plays a part in the geographical movement of people is paralleled by research suggesting that the observed class gradient in health, whereby those in the higher social classes have the best health and those in the lower classes have the worst health, is due to health selection (e.g. Goldberg and Morrison, 1963; Illsley, 1986; West et al., 1990). They suggest that those with poor health in childhood are likely to miss parts of their education, are limited to the type of work that they can do and/or may lose their job through ill health. They are therefore likely to either begin and remain in the lower social classes or to move into those classes through ill health. Thus it is health which affects their class position rather than class affecting their health.

However, Blane et al. (1999) found that health related mobility did not contribute to differentials in mortality. Bartley and Plewis (1997) and Blane et al. (1999) have found that the socially mobile have illness levels or mortality rates somewhere between those of the class they left and those of the class they moved into. As Bartley and Plewis say "in order for mobility to be a significant cause of social gradients in health, upward movers into any class must be healthier, not only than those left behind in their class of origin but also in comparison to those already present in their class of destination" (p. 384). Such research undermines the health selection theory of social class inequalities in health.

Recent research suggests that socio-economic characteristics throughout the lifetime influence health rather than the other way round. Research on disadvantage at different points in the lifecourse lends sup-

port to this suggestion. Davey Smith et al. (1998) found that education was strongly associated with mortality in middle aged men, as was their social class. Morris et al. (1994) showed that education was correlated with mortality at the area level, although again like Davey Smith et al. (1998), social deprivation was a more important determinant. Several studies have described the link between poor conditions in childhood and ill health (e.g. Barker and Osmond, 1986; Barker et al., 1989; Peck, 1994). Research has shown the importance, in later life, of factors such as social class (Townsend and Davidson, 1982; Goldblatt, 1990; Blane et al., 1993; Harding et al., 1997) and household income (Davey Smith, 1996). Recent studies suggest that it is lifecourse disadvantage — the cumulative effect of disadvantage in childhood and throughout later life, the two being interrelated — that has the most significant impact on health. For example, Davey Smith et al. (1997) concluded that father's social class and own social class had a compound effect on premature mortality rates.

Thus it might be the case that the health differences seen between migrants and between geographical areas, might also be attributable to lifecourse disadvantage. Research by Champion and Ford (1998) on the social selectivity of migrants in Britain between 1981 and 1991 found that there was substantial outmigration of those who have been successful in professional, technical and managerial positions from the conurbations into other areas. Likewise, Dorling and Woodward (1996) found that migration out of cities tends to be by the economically active and in particular by those in professional social classes. There are also differences in socio-economic circumstances (such as housing tenure, social class and educational level) between migrants and non-migrants and between migrants moving long or short distances (OPCS, 1980; Fox and Goldblatt, 1982; Hoinville, 1983; Britton, 1990; Boyle et al., 1998). However, little research has examined the socio-economic characteristics in early life of migrants within Britain.

The relationship between socio-economic factors and health is more complex for women than for men. For example, whereas for men being in employment is associated with better health than not being in paid employment, for women with children this is only the case for those women with middle class husbands (Elliott and Huppert, 1991); lone mothers in paid employment having particularly poor health (Blaxter, 1990; Popay and Jones, 1990; Macran et al., 1996). The social class gradient in health (particularly mortality) is more consistent and more marked for men than for women (Hattersley, 1998; Harding et al., 1997). Similarly, Raleigh and Kiri (1997) found that geographical patterns of health in England were different for men and women and that the gender differentials in life expectancy were widest in the most deprived areas. This paper looks at gender differences and focuses on factors such as education, social class and housing tenure. The sample size was too small to consider ethnicity. It may be that with a larger sample, or in a different context such as the US, race, ethnicity and immigration status prove to be important factors.

Method

The data set used for this analysis is the British Household Panel Study which at its first wave of data collection in 1991 included 10264 people aged 16 and over. The sample, which is representative of the population of Britain, has been followed up wherever possible in all subsequent years to date; the analysis here uses the data from the first six waves (1991 to 1996).

While the BHPS is not the only large-scale cohort study available to social scientists interested in spatial dimensions of health in Britain, it has a number of advantages over other studies (Ekinsymth, 1996). The largest study, the ONS Longitudinal Study (LS), links census data from 1971, 1981 and 1991 to vital statistics for a 1% sample of the population of England and Wales. However, unlike the BHPS, the LS only has place of residence in 1939 (and only then for a minority of study members), 1971, 1981 and 1991 reducing the scope for spatial analyses, particularly those concerned with migration. In addition, the only information available on morbidity in the LS is the 1991 census question on limiting long-term illness.

The National Study of Health and Development, the National Child Development Study and the 1970 British Birth Cohort are invaluable resources — they all follow thousands of British people who were born in the same week. However, they are by definition restricted to certain age cohorts and thus do not allow for the consideration of variations by age. In addition, the geographical data do not allow for analyses at the local level. Other cohort studies are limited spatially, in that they are focused on geographically defined areas (for example, the West of Scotland Twenty-07 study, the Whitehall studies, or The Avon Longitudinal Study of Pregnancy and Childbirth, therefore ruling out many geographical analyses. The BHPS on the other hand allows researchers to look at issues of health and mortality (though cause of death is not yet available) in relation to a myriad of social variables including district of birth and death.

Between 1991 and 1996, 527 BHPS members died and it is on these deaths that the age-sex standardised mortality rates (SMRs) are based. The following age groups were used for the standardisation: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84 and 85 and over. In all other measures, the analysis looks

Table 1
British Household Panel Survey Standardised Mortality Ratios (SMRs) of Sample of Anonymised Records districts adjusting for the effect of lifetime migration between districts ($N = 10264$, a representative sample of the population of Britain in 1991, all ages over 15, men and women). SMRs calculated with 10-yr age groups and two sexes

	High mortality districts	Low mortality districts	Total
Observed deaths with all migration	271	256	527
Expected deaths with all migration	256	271	527
SMR with all migration (95% confidence interval)	*106* (94–119)	*95* (83–107)	*100* (92–109)
Observed deaths without all migration	335	192	527
Expected deaths without all migration	335	192	527
SMR without all migration (95% confidence interval)	*100* (90–111)	*100* (86–115)	*100* (92–109)

at the population of migrants as a whole, not just those who died. Other measures of health include whether a person's health limits their daily activities or the type or amount of work that they can do and a self-rated health measure where the respondent ranks their health from excellent to very poor. A 12-point version of the General Health Questionnaire is used to measure mental health (Goldberg and Williams, 1988).

In looking at migrants' early life circumstances we have used parental social class when respondent was aged 14, type of school attended and highest qualification gained. In later life we have looked at own social class, housing tenure, household income and access to a car — all measures of socio-economic circumstances. The data on later life factors reflect the person's circumstances at interview in 1991. We cannot therefore identify the extent to which these factors affected migration, nor health, as, for example, a person could have moved into owner occupation at any point. The same is also true of migration in this paper. This analysis compares Sample of Anonymised Records (SAR) district of birth with SAR district of residence in 1991. Sample of Anonymised Records districts are individual 1991 Local Authority districts or amalgamations of districts so that no area has a population of less than 120,000 (Marsh and Teague, 1992). Migrants are identified as those whose district of birth differed from their district of residence in 1991. These people could have migrated at any point after birth and could also have made multiple moves. Non-migrants are defined here, by necessity, as those whose place of residence in 1991 (district or region, depending on the analysis) was the same as their place of birth. This group will therefore include some migrants who moved back to their place of birth and migrants who moved shorter distances (for example, between wards). The SAR districts were categorised according to their area mortality rate (see list of districts). Migrants were grouped as those who moved from high to low mortality districts, those who moved from low to high, those who remained in low mortality districts either through non-migration or from moving from one low mortality district to another and, similarly, those remaining in high mortality districts.

When comparing differences between the migrant groups a standard significance test for comparison of proportions was used (Upton and Cook, 1996). In this paper * denotes significant difference at the 95% level, ** a significant difference at the 99% level.

Results

Table 1 'puts migrants back' into their district of birth in order to look at the effect of migration on the mortality rates of the population of districts at time of

Table 2
British Household Panel Survey Standardised Mortality Ratios (SMRs) of Sample of Anonymised Records districts adjusting for the effect of lifetime migration between districts, comparison of men and women ($N = 10264$, a representative sample of the population of Britain in 1991, all ages over 15)

	High mortality districts	Low mortality districts	Total
Observed deaths without migration of men	291	236	527
Expected deaths without migration of men	295	232	527
SMR without migration of men (95% confidence interval)	*99* (88–111)	*102* (89–116)	*100* (92–109)
Observed deaths without migration of women	315	212	527
Expected deaths without migration of women	295	232	527
SMR without migration of women (95% confidence interval)	*107* (95–119)	*91* (79–105)	*100* (92–109)

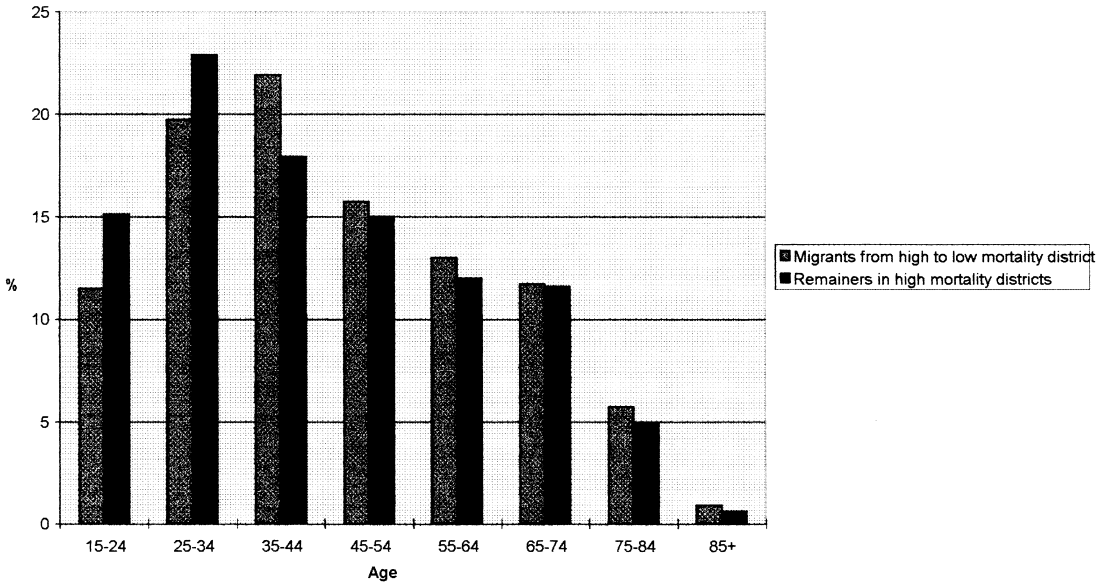

Fig. 1. Age profile, men in Britain, born in high mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991).

interview. The table shows that migration between districts in the BHPS accounts for all of the differences in mortality rates between districts in Britain seen in 1991 in the BHPS. It is important to note that the confidence limits to these SMRs overlap (and all include 100). This indicates that the BHPS does not contain a large enough sample of deaths for us to be confident that the BHPS is truly representative of the situation for the whole population of Britain as concerns lifetime migration and mortality. However, as we showed in a previous paper (Brimblecombe et al., 1999), the BHPS sample does have the same characteristics as the

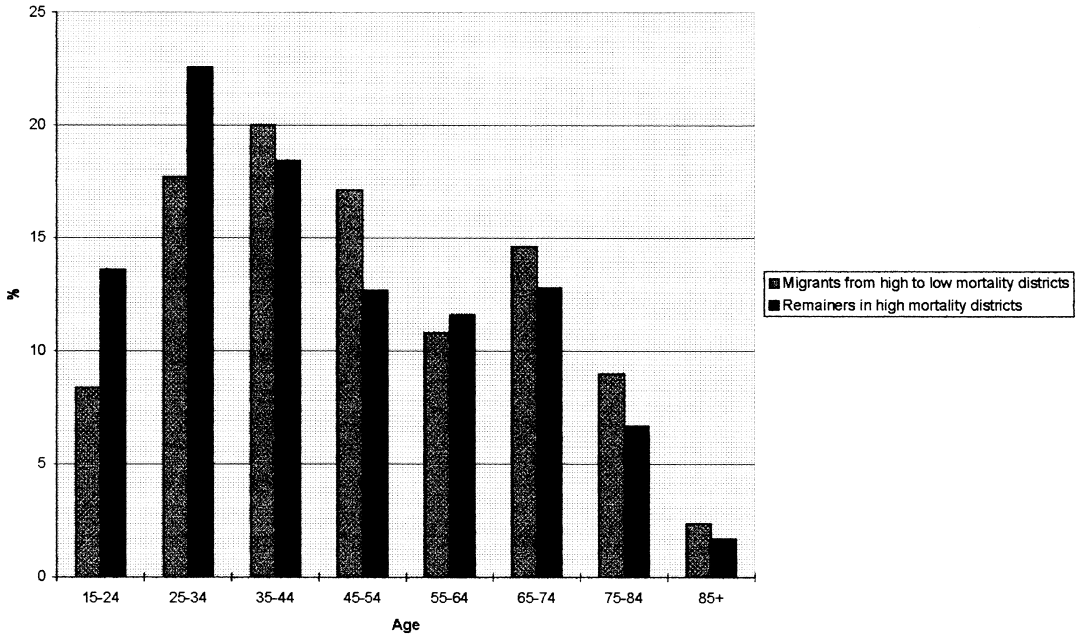

Fig. 2. Age profile, women in Britiain, born in high mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991).

Table 3
Mortality and morbidity men and women in Britain, born in high mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men		Women	
	migrants from high to low mortality districts	remainers in high mortality districts	migrants from high to low mortality districts	remainers in high mortality districts
n	814	1799	870	2104
Health limits activities	10.6**	14.3**	13.0**	18.2**
Health limits work	14.0	16.8	18.7	20.7
GHQ ≥ 3[a]	21.0	21.8	25.1**	29.6**
Health fair, poor, very poor	20.8**	26.7**	25.3**	32.8**
SMR	73	99	98	116
95% confidence limit	(52–100)	(81–120)	(72–130)	(96–139)

[a] General Health Questionnaire (GHQ) is a measure of mental health derived from, in the BHPS, a series of twelve questions about mental health. It is scored according to symptom (caseness) with a score of three symptoms or more found to correspond with poor mental health (Goldberg and Williams, 1988).

much larger Longitudinal Study at regional level and the two mortality distributions are different for migrants and non-migrants. Nevertheless at this stage, with a cohort who have only been followed up since 1991, our findings must be considered preliminary, although we hope the reader agrees that they are intriguing.

When comparing the effect of migration of men and women on the mortality rate of districts in 1991, Table 2 shows that the migration of men is contributing most to the pattern of mortality seen between districts in the BHPS. In essence, if all men had returned to their district of birth, before death, in the BHPS sample, then the mortality rate in high mortality districts would have actually been lower than average (SMR = 99) than in the traditionally low mortality districts (SMR = 102 when men returned to their birthplace). Because of this difference between the sexes all further tables are now subdivided by men and women. The next section of results and discussion will explore the characteristics of the people who constitute the different groups of migrants.

Figure 1 shows how similar are the age profiles of the men when comparing the group who have remained in high mortality districts with those who migrated from them to low mortality districts. The latter groups have slightly (and statistically significantly) more members in the age ranges 15–24 and 35–44, but despite this the two groups are broadly comparable in age structure. Similarly, Fig. 2 shows that proportionally more of those women moving from high to low mortality districts are in the 45–54 age group, proportionally less are in the 15–24 age group (statistically significant), but that overall the two groups are of very similar age profiles. Furthermore, we found that removal of these age groups did not alter the significance of the differences between the social groups reported below. Because of this and because of the small numbers involved we do not subdivide by age in the following analysis.

Table 3 shows that those men moving from high to low mortality districts have a lower SMR and better self-rated health than those remaining in high mortality districts. This is what we would expect and helps to explain why male lifetime migration appears to be potentially so important in determining the geography of inequalities in mortality. The last two columns of Table 3 shows that women migrating out of areas of high mortality had significantly better self-rated health on all measures (other than health limiting amount or type of work that can be done) than those remaining in high mortality areas. The SMR for those migrating out of these areas was also lower although the confidence intervals show a large extent of overlap.

Table 4 shows that, for those men born in a high mortality district, those who had migrated to a low mortality district by the time of interview were less likely to have had a father or mother in a manual occupation when the respondent was aged 14 compared to those who remained in a high mortality district. Those who moved to a low mortality district were also more likely to have attended a grammar or private school and were more likely to have gained a qualification higher than A level. For women, Table 4 shows that those who migrated out of high mortality areas had more advantageous early lives than those who did

Table 4
Early life factors, men and women in Britain, born in high mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men		Women	
	migrants from high to low mortality districts	remainers in high mortality districts	migrants from high to low mortality districts	remainers in high mortality districts
n	814	1799	870	2104
Mother's social class manual when respondent aged 14[a]	49.1*	55.6*	48.3**	57.6**
Father's social class manual when respondent aged 14[a]	61.9**	73.5**	60.5**	72.6**
School type[b]				
Comprehensive	55.1**	68.2**	51.3**	64.4**
Grammar (non-fee paying)	17.5**	9.5**	15.6**	10.8**
Private	7.9**	3.5**	10.7**	4.5**
Highest qualification				
Higher or equal to A Level	50.3**	35.2**	31.4**	25.4**
Lower than A Level	25.3**	31.5**	35.3	32.8
No qualification	24.4**	33.3**	33.3**	41.7**

[a] Mother's and father's social class derived from Standard Occupational Classification codes.
[b] School types do not add up to 100% as 'other' school type is omitted from the analysis.

not, factors which could explain their ability to migrate out of such areas and/or their better health at time of interview.

Table 5 shows that those men born in a high mortality district who migrated to a low mortality district were less likely to have a household income below the median for the BHPS sample compared to those remaining in high mortality districts. They were also more likely to be in a non-manual social class. They were more likely to have access to a car and more likely to be in owner occupation and less likely to be in social rented housing. This latter finding is not surprising given the concentration of social rented dwellings in high mortality areas (Dorling, 1995). Table 5 also shows that female migrants out of high mortality districts also had more advantageous later lives in terms of social class, household income and housing tenure.

Table 5
Later life factors, men and women in Britain, born in high mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men		Women	
	migrants from high to low mortality districts	remainers in high mortality districts	migrants from high to low mortality districts	remainers in high mortality districts
n	814	1799	870	2104
Present social class manual[a]	39.4**	59.5**	24.4**	34.7**
Household income below median[b]	36.6**	51.9**	45.2**	60.5**
Housing				
Owner occupation	80.2**	68.9**	77.4**	62.6**
Private renting	10.2**	6.3**	8.4	6.7
Social housing	9.6**	24.7**	14.2**	30.7**
No access to car	6.6**	11.7**	6.5*	9.6*

[a] Present social class is based on Registrar General's Social Class classification.
[b] Household income is compared to the median household income for the BHPS.

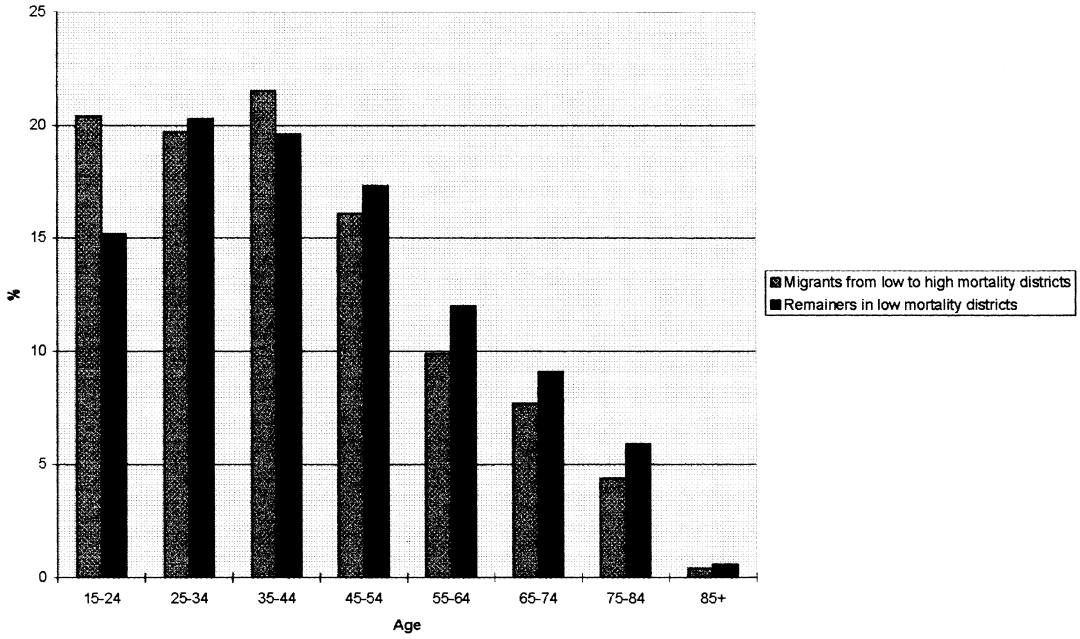

Fig. 3. Age profile, men in Britain, born in low mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991).

Figure 3 shows that, other than for the youngest age group (there being significant differences for the 15–24 age group) the age profiles of these two groups of men are very similar. This is also true for women although, as can be seen from Fig. 4, the main (significant) difference in age groups is for women aged 75–84. Although again, these differences in age profile were found not to alter the significance of the relationships described below.

Table 6 shows that those men moving from low

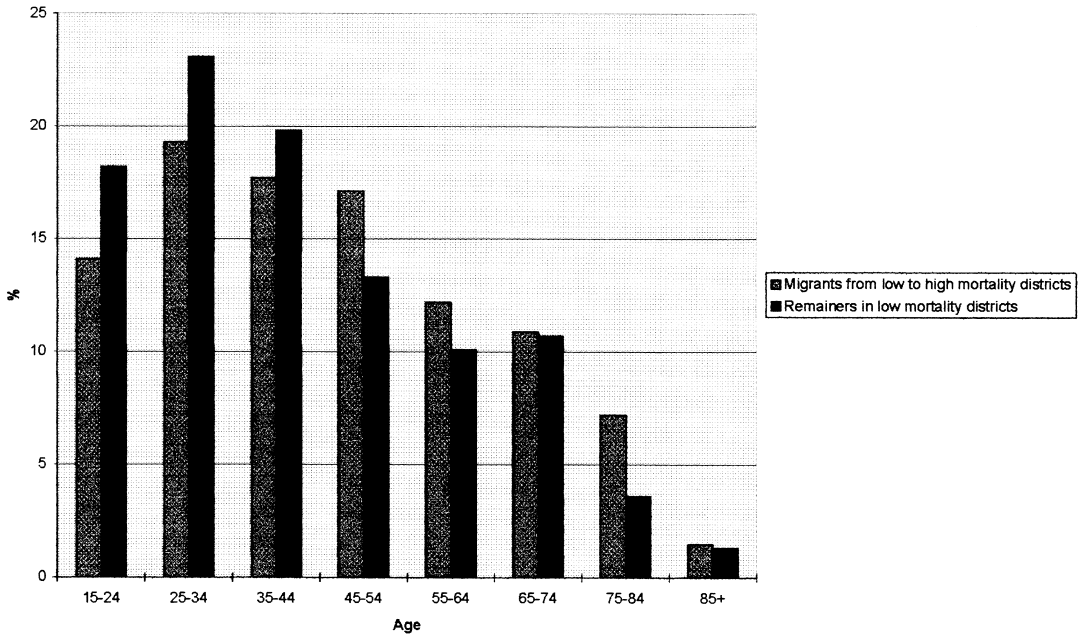

Fig. 4. Age profile, women in Britain, born in low mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991).

Table 6
Mortality and morbidity, men and women in Britain, born in low mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men		Women	
	migrants from low to high mortality districts	remainers in low mortality districts	migrants from low to high mortality districts	remainers in low mortality districts
n	274	1280	308	1443
Health limits activities	10.6	10.7	12.6	11.0
Health limits work	10.6*	15.9*	15.4	13.7
GHQ ≥ 3[a]	24.1*	20.5*	25.6	30.7
Health fair, poor, very poor	20.8	21.7	26.1	23.3
SMR (95% confidence interval)	138 (82–219)	109 (87–136)	45 (15–106)	94 (72–120)

[a] General Health Questionnaire (GHQ) is a measure of mental health derived from, in the BHPS, a series of twelve questions about mental health. It is scored according to symptom (caseness) with a score of three symptoms or more found to correspond with poor mental health (Goldberg and Williams, 1988).

mortality districts to high mortality districts have a higher SMR, less limiting illness but worse mental health than those remaining in low mortality districts. For women, the table shows that there are no significant differences in self-rated health between those migrating out of low mortality districts and those remaining in them. However, the SMR for women moving from low to high mortality districts is lower than those remaining in low mortality districts (although there is overlap in the confidence limits). It is also much lower than the SMR for men moving from low to high mortality districts (45 for women compared to 138 for men).

Table 7 shows that proportionally less of those men

Table 7
Early factors, men and women in Britain, born in low mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men migrants from low to high mortality districts	remainers in low mortality districts	Women migrants from low to high mortality districts	remainers in low mortality districts
n	274	1280	308	1443
Mother's social class manual when respondent aged 14[a]	34.8*	47.2*	41.1	49.3
Father's social class manual when respondent aged 14[a]	51.6**	62.4**	52.9**	64.2**
School type[b]				
Comprehensive	59.0	58.9	58.0	56.7
Grammar (non-fee paying)	18.1	13.6	14.8	13.8
Private	11.1	9.0	8.5	8.4
Highest qualification				
Higher or equal to A Level	52.3**	38.5**	41.7**	25.2**
Lower than A Level	24.8**	32.6**	29.3**	36.9**
No qualification	22.9	28.8	29.0**	37.9**

[a] Mother's and father's social class derived from Standard Occupational Classification codes.
[b] School types do not add up to 100% as 'other' school type is omitted from the analysis.

Table 8
Later factors, men and women in Britain, born in low mortality areas (sub-sample of the BHPS population, all ages over 15 in 1991). * denotes significant difference at the 95% level, ** a significant difference at the 99% level

	Men		Women	
	migrants from low to high mortality districts	remainers in low mortality districts	migrants from low to high mortality districts	remainers in low mortality districts
n	274	1280	308	1443
Present social class manual[a]	43.1	49.3	26.0*	33.6*
Household income below median[b]	50.4*	42.2*	52.9	51.2
Housing				
Owner occupation	62.4**	75.6**	65.5*	72.2*
Private renting	19.3**	8.6**	14.0**	8.4**
Social housing	18.2	15.8	20.5	19.4
No access to car	10.2*	6.1*	7.4	8.4

[a] Present social class is based on Registrar General's Social Class classification.
[b] Household income is compared to the median household income for the BHPS.

moving from low to high mortality areas had a mother or father in a manual occupation compared to those remaining in low mortality areas. The migrant men were also more highly qualified. For women the Table shows that, in early life, those who migrated out of low mortality areas were also less likely to have a manual father and were also more highly qualified than those who remained in such areas. We suspect that the migration of students and young professionals to study or work in cities may be important here although the sample is too small to be able to subdivide these groups of migrants satisfactorily.

Table 8 shows that more of those men moving from low to high mortality districts had a lower than BHPS median household income, fewer were in owner occupation and more were in privately rented accommodation than those remaining in low mortality districts. The movers from low to high were less likely to have access to a car. The table shows that women migrating out of low mortality areas were less likely to be in manual occupations in later life, less likely to be owner occupiers and more likely to be privately renting.

Discussion: men

The tables above shed some light on the characteristics of district-level migrants — bearing in mind that districts will differ in much more than their mortality rates and moves represent much more than just geographical ones. First we consider the situation for men.

As can be seen from Table 3, the health of the upwardly mobile men is significantly better than the geographically stable on two measures of self-rated health. Applying the health selection hypothesis (West et al., 1990) to geographical differences in health, this finding could suggest that healthier people living in high mortality areas were more able to get better jobs, higher incomes and so move into better off areas. The collective mortality of the areas they move into would thus be lower because more advantaged (and therefore on average healthier) people live there and because the characteristics of the area itself contribute to better health (Wiggins et al., 1998). These people moving into the area not only represent the healthiest of their population of origin but they subsequently live in 'healthier' areas. The opposite would be the case for the downwardly mobile.

An alternative explanation is that it was the most socio-economically advantaged men who were able to move out of these areas. Early advantage is linked to better health and is linked to later advantage which is in turn linked to better health (Davey Smith et al., 1997). That lifetime advantage or disadvantage is the explanation for differences in health between these groups is supported by the finding that the upwardly mobile show significant differences in advantage to the geographically stable in high mortality areas throughout the lifecourse.

Compared to those men remaining in a district of high mortality either through non-migration as defined in this analysis or through migration to another high mortality district, those men who moved into low mor-

Table 9

High mortality districts	Low mortality districts
Aberconwy; Arfon; Dwyfor; Meirionnydd; Ynys Mon-Isle of Anglesey	Adur; Worthing
Aberdeen City	Alnwick; Berwick-upon-Tweed; Castle Morpeth; Tynedale
Afan; Lliw Valley; Neath	Amber Valley; North East Derbyshire
Allerdale; Carlisle	Angus; Perth and Kinross
Alyn and Deeside; Delyn; Wrexham Maelor	Arun
Annandale and Eskdale; Nithsdale; Stewartry; Wigtown	Ashfield; Mansfield
Argyll and Bute; Dumbarton; Inverclyde	Ashford; Tunbridge Wells
Badenoch and Strathspey; Inverness; Lochaber; Nairn; Orkney Islands; Shetland Islands	Aylesbury Vale
Banff and Buchan; Moray	Babergh; Ipswich
Barking and Dagenham	Barnet
Barnsley	Basildon
Barrow-in-Furness; Copeland	Basingstoke and Deane
Bassetlaw; Newark	Bath; Kingswood; Wansdyke
Bearsden and Milngavie; Clydebank; Strathkelvin	Beverley; Boothferry
Berwickshire; Ettrick and Lauderdale; Roxburgh; Tweeddale; East Lothian; Midlothian	Bexley
Birmingham	Blaby; Oadby and Wigston
Blackburn	Boston; South Holland
Blackpool	Bournemouth
Blaenau Gwent; Islwyn	Bracknell; Slough
Blyth Valley; Wansbeck	Braintree; Uttlesford
Bolsover; Chesterfield	Breckland; South Norfolk
Bolton	Brecknock; Montgomery; Radnor
Bradford	Brentwood; Epping Forest; Harlow
Brent	Bridgnorth; Shrewsbury and Atcham
Brighton	Broadland; Norwich
Bristol	Bromley
Burnley; Pendle	Broury
Bury	Broxbourne; East Hertfordshire
Calderdale	Broxtowe; Gedling; Rushcliffe
Camden	Cambridge; South Cambridgeshire
Cardiff	Cannock Chase; South Staffordshire
City of London; Westminster, City of	Canterbury; Maidenhead
Clackmannan; Stirling	Caradon; North Cornwall
Cleethorpes; Great Grimsby	Carmarthen; Dinefwr; Llanelli
Colwyn; Glyndwr; Rhuddlan	Carrick; Restormel
Corby; Kettering	Castle Point; Maldon; Rochford
Coventry	Ceredigion; Preseli; South Pembrokeshire
Cumbernauld and Kilsyth; Monklands	Charnwood
Cumnock and Doon Valley; Lanark (now Clydesdale); Kyle and Carrick	Chelmsford
Cunninghame	Cheltenham; Cotswold
Cynon Valley; Rhondda	Cherwell
Darlington; Teesdale	Chester-le-Street; Durham
Derby	Chester; Ellesmere Port and Neston
Derwentside; Wear Valley	Chichester; Horsham
Doncaster	Chiltern; South Bucks
Dundee City	Chorley; West Lancashire
Dunfermline	Christchurch; North Dorset; Wimborne
Ealing	Colchester
Easington; Sedgefield	Congleton; Crewe and Nantwich; Vale Royal

(continued on next page)

Table 9 (*continued*)

High mortality districts	Low mortality districts
East Kilbride; Hamilton	Craven; Hambleton; Richmondshire
East Staffordshire; Staffordshire Moorlands	Crawley; Mid Sussex
Eastwood; Kilmarnock and Loudoun	Croydon
Edinburgh City	Dacorum
Falkirk	Dartford; Gravesham
Fylde; Wyre	Daventry; South Northamptonshire
Gateshead	Dover; Shepway
Glanford; Scunthorpe	Dudley
Glasgow City	East Cambridgeshire; Fenland
Greenwich	East Devon; Mid Devon
Hackney	East Hampshire; Havant
Halton	East Lindsey; West Lindsey; Lincoln
Hammersmith and Fulham	East Northamptonshire; Wellingborough
Haringey	East Yorkshire; Holderness
Hartlepool; Stockton-on-Tees	Eastbourne; Hove; Lewes
Hounslow	Eastleigh; Fareham; Gosport
Hyndburn; Rossendale	Eden; South Lakeland
Islington	Elmbridge; Epsom and Ewell
Kensington and Chelsea	Enfield
Kingston upon Hull	Erewash; South Derbyshire
Kirkcaldy; North East Fife	Exeter; Teignbridge
Kirklees	Forest Heath; Mid Suffolk; St Edmundsbury
Knowsley	Forest of Dean; Stroud
Lambeth	Gillingham; Swale
Lancaster	Gloucester; Tewkesbury
Langbaurgh	Gordon; Kincardine and Deeside
Leeds	Great Yarmouth; North Norfolk
Leicester	Guildford
Lewisham	Harborough; Melton; Rutland
Liverpool	Harrogate
Luton	Harrow
Manchester	Hart; Rushmoor
Merthyr Tydfil; Rhymney Valley; Taff-Ely	Hastings; Rother
Middlesbrough	Havering
Motherwell	Hereford; Leominster; South Herefordshire
Newcastle upon Tyne	Hertsmere; Welwyn Hatfield
Newcastle-under-Lyme; Stafford	High Peak; West Derbyshire
Newham	Hillingdon
Newport	Hinckley and Bosworth; North West Leicestershire
North Tyneside	Huntingdon
Northampton	Kennet; Salisbury
Nottingham	Kerrier; Penwith; Isles of Scilly
Ogwr	Kingston upon Thames
Oldham	Lichfield; Tamworth
Plymouth	Macclesfield
Portsmouth	Maidstone
Preston	Malvern Hills; Worcester
Renfrew	Medina; South Wight
Rochdale	Mendip; Sedgemoor
Rotherham	Merton
Salford	Mid Bedfordshire; South Bedfordshire

Table 9 (*continued*)

High mortality districts	Low mortality districts
Sandwell	Milton Keynes
Sefton	Mole Valley; Waverley
Sheffield	Monmouth; Torfaen
South Tyneside	New Forest
Southampton	Newbury
Southwark	North Bedfordshire
St Helens	North Devon; Torridge
Stockport	North Hertfordshire; Stevenage
Stoke-on-Trent	North Kesteven; South Kesteven
Sunderland	North Shropshire; South Shropshire; Oswestry
Sutherland; Caithness; Ross and Cromarty; Skye and Lochalsh; Western Isles Islands	North Warwickshire; Nuneaton and Bedworth; Rugby
Tameside	North Wiltshire; West Wiltshire
Thanet	Northavon
The Wrekin	Oxford; Vale of White Horse; West Oxfordshire
Thurrock	Peterborough
Tower Hamlets	Poole
Trafford	Purbeck; West Dorset; Weymouth and Portland
Wakefield	Reading
Walsall	Redbridge
Wandsworth	Redditch; Wychavon
Warrington	Reigate and Banstead; Tandridge
West Lothian	Ribble Valley; South Ribble
Wigan	Richmond upon Thames
Wirral	Rochester upon Medway
Wolverhampton	Runnymede; Spelthorne
	Ryedale; Scarborough
	Selby; York
	Sevenoaks; Tonbridge and Malling
	Solihull
	South Hams; West Devon
	South Oxfordshire
	Southend-on-Sea
	St Albans
	Stratford-on-Avon; Warwick
	Suffolk Coastal; Waveney
	Surrey Heath; Woking
	Sutton
	Swansea
	Taunton Deane; West Somerset
	Tendring
	Test Valley; Winchester
	Thamesdown
	Three Rivers; Watford
	Torbay
	Vale of Glamorgan
	Waltham Forest
	Wealden
	West Norfolk
	Windsor; Wyre Forest
	Wokingham
	Woodspring
	Wycombe
	Yeovil

tality districts had a higher proportion of mothers and fathers being non-manual when the respondent was aged 14, they themselves were more likely to have attended grammar or private school and they were more likely to have a qualification higher than A level (these three factors obviously being inter-linked). Hence these men not only had less of the childhood factors associated with poor health in both childhood and later life, they also had more opportunity to obtain the jobs and income that would enable them to move to lower mortality (and more healthy) areas. This is borne out by a comparison of the characteristics of this group in later life. Compared to those who didn't move to areas of low mortality, the movers had higher average household incomes, were more likely to gain jobs in non-manual social classes, had higher levels of owner occupation and greater average access to a car. All these factors are linked with better health (e.g. Fiscella and Franks, 1997; Davey Smith et al., 1998; Filakti and Fox, 1995).

Looking at the downwardly mobile men compared to the geographically stable in the low mortality districts (Table 6), the health of the downwardly mobile is better on one measure (health limiting work) and worse on another (mental health). In terms of life-course effects (Tables 7 and 8), the downwardly mobile have more advantaged early lives than the geographically stable whose areas they left but more disadvantaged later lives. As they were born in areas of low mortality and ended up in areas of high mortality, this group of men appears, on the surface, to represent evidence for downward mobility. However, the picture is not as simple as this. They may have moved to areas of high mortality for very differing reasons, partly linked to life-stage and this will impact on their overall health. For example, a middle class person may move from their parental home in a low mortality area to University where their accommodation is located in a high mortality area. Later in life, a person may move from their home in a low mortality area to retirement housing in a high mortality area, or to be nearer their children who may be living in a high mortality area. The circumstances of these people may be very different from those who move from a low mortality area to a high mortality area following divorce, job loss or repossession of their home. It must also be noted that migration from low to high mortality districts was the least usual in this survey (as might be expected).

Compared to those men also born in low mortality areas but remaining there either through non-migration or migration to other low mortality areas, those moving to high mortality areas were less likely to have a father or mother in a manual social class. They were also more likely to be qualified to a level higher than A level. The clues to their movement to a high mortality area are therefore not apparent in their early life unless they are the more advantaged moving to University or to first jobs in relatively high mortality city districts. A comparison of the ages of these two groups shows no significant difference in the mean age although this group does have the lowest average age of all the groups. Looking at age bands (Fig. 3), the only significant difference is in the 15–24 year age band; this age group accounts for 20% of movers from low to high mortality districts compared to 11.5% of those remaining in low mortality districts. This gives further credence to the idea that at least some of these movers are leaving the parental home and therefore likely to be moving to an area of high mortality. However, this age group has a negligible effect on the mortality rates as there were no deaths in this age group of men moving from districts of low to high mortality and only 2 deaths of men aged 15–24 remaining in districts of low mortality).

Looking at later life factors, those men who moved from a low to a high mortality district, compared to those who stayed in a low mortality district, have lower household incomes. They also have lower levels of owner occupation and higher levels of private renting and a lower level of car access. This would again support the idea that they were those leaving the parental home either to go to University or to move to their first job. However, almost one in five of this group are in social housing (this proportion is similar to those remaining in low mortality areas). This suggests, as outlined above, that this group is fairly mixed. Those living in privately rented accommodation and those without access to a car could likewise be a varied group.

Hence, lifecourse effects provide possible explanations not only for why people move to different areas but also for why the health of some groups of migrants might differ from others. In addition, the health effects of migration will differ. For example, the effects health-wise (mental and physical) on those with the background advantageous enough to allow them to move to an area of their preference with all its attendant advantages may be more positive than the effects health-wise on those for whom circumstances force them to move to an area they may be less inclined to live in.

Discussion: women

As can be seen from Table 3 above, those women who moved out of high mortality districts had significantly better health than those who remained. However, the differences in early disadvantage would suggest, similarly to the picture for men, that the migration into areas of lower mortality was not simply due to health selection. Women who migrated out of

high mortality areas also had more advantageous early lives than those who did not. Proportionally more of them had parents in non-manual occupations, went to grammar and private schools and were more highly educated — factors which enabled them to have more advantageous later lives, to move into lower mortality areas and which gave them a healthier start in life. As Table 5 shows, they did indeed have more advantageous later lives.

Comparing women moving from low mortality areas to high with those who stayed in low mortality areas, the picture is, as for men, more complex. There is no significant difference in self-rated health between the two groups. Additionally this group of migrants in higher mortality areas shows either no difference in early life factors or demonstrates more advantage. The same is true of later life factors such as class or income. Unlike men, this group of women is not significantly younger than those who remained in low mortality areas. This would seem to undermine the idea that it is a large group of students or those moving to first jobs from the parental home that is accounting for the differences seen for women. However, there are a number of factors to be considered. Firstly, in the case of geographical mobility, those who do not migrate tend to have worse health and less advantageous lives than those who do. The group of remainers in low mortality areas consists partly of non-migrants which may affect the figures presented. Secondly, it might be assumed that the majority of those who were born in low mortality areas had relatively advantaged backgrounds and this can be seen to be the case when you compare them to those born in high mortality areas in this study. Therefore, it may be that even those moving to high mortality areas are protected either directly or indirectly, both in financial and health terms, by their backgrounds. Thirdly, whilst the majority of people leaving the parental home are in the age group 15 to 24, it may not be until much later in life that they move back to low mortality districts. Therefore it may be that we are simply not seeing this movement at this stage. Fourthly, as previous research (Townsend et al., 1984, 1988; Congdon, 1995) has shown, within a district there is often great variation in health and in other characteristics of both the area and the people who live in it. Fifthly, many people leave home and move to large cities, especially London, where the mortality rate of a district is high but the lives they live are often good and may be better than those who were left in low mortality districts. It again seems likely that this is a mixed group of people — some on their way up the social scale, others on their way down — and that this also explains the complexity of the picture seen.

Discussion: a comparison of men and women

As was stated earlier, looking at the effect of migration on the mortality rates of districts, it was evident that it was the migration of men that was accounting for the differences seen between districts. The effect of female migration was in the opposite direction to male migration. Comparing those who remained in high mortality areas with those who moved into low mortality areas, the picture is very similar for men and women. Those moving out — both men and women — had better self-rated health and lower (although not significantly lower) SMRs. Both men and women had more advantageous early lives in terms of parental social class, school attended and highest qualification attained, although women overall were not as highly qualified. Similarly both men and women who migrated out had more advantageous later lives, although once again women overall had lower incomes, lower rates of owner occupation and higher rates of social rented housing (as is the case nationally, GHS, 1996).

Women who moved from low to high areas do not have significantly different self-rated health to those who remained in low areas; the same is true of men when looking at over 25s (there being significant differences in the size of the 15 to 24 age group for men but not for women). The SMRs are however very different. Both women and men had more advantageous early lives in terms of father's social class (although this advantage disappears for men over 25). There is no significant difference in school type between those who remained and those who left for either men or women and both male and female movers were better qualified than the corresponding group of remainers. In later life again the pattern was similar for men and women.

As the comparison of the groups of migrants is so similar for both men and women, it begs the question as to why their migration is having such different effects on the mortality patterns of districts. One reason may be that although the comparisons are similar, women moving from low to high mortality areas had lower qualifications, perhaps impacting on the type of job that came to work in and hence the circumstances they were living in. Women in this group had lower household incomes than men, reflecting in part the types of job they achieved (and could achieve) but also more importantly, the inequalities in pay between men and women (Robinson, 1998) and the greater reliance of women on part time and poorly paid work (Pullinger, 1998). The higher proportion of women than men in social housing and the lower proportion in owner occupation, which again echoes the national pattern of tenure for women and men, will determine the specific area within a district that women will live in. Similar, although smaller, differ-

ences occur for men and women looking at those moving from low to high mortality districts, especially when looking at the over 25s for men. Therefore, it may be that whilst living in a similarly categorised districts women's lives within that district are very different from men's, hence the differential effect on mortality patterns.

Conclusions

What this study has shown in essence can be summarised in the following 6 points:

1. Within the BHPS representative sample of the population of Britain the major inequalities in health between districts are largely accounted for by the lifetime migration patterns of men. That is, if men had returned to their district of birth before their deaths then areas of high average mortality would have their age-sex standardized mortality ratios reduced to the average for Britain and areas of relatively low mortality would have their SMRs raised to around the average. Inter-district geographical inequalities in mortality in Britain, in this sample, are thus a result of lifetime migration patterns. Women migrating in one direction (from high mortality areas to low mortality areas) reinforce this pattern, but the very small group of women migrating in the other direction weaken the overall process slightly.
2. Men who migrate over their lifetime from high mortality districts to low mortality districts are significantly less likely to report illness in later life and are less likely to die prematurely when compared to men who start and end their lives in high mortality districts. They are also significantly less likely to have had a mother or father working in a manual occupation when they were 14 and were much more likely to have attended selective grammar or fee paying private schools at that age (when compared to the men who remained in high mortality districts). They gained significantly higher qualifications in later life, were significantly less likely to be in manual occupations themselves, to have below average household income or to be living in social housing or have no access to a car. In essence, the men who left high mortality areas over the course of their lives were a very different social group, from age 14, to those who remained in these areas. Those who remained accounted for most of their areas' high mortality ratios.
3. For women who migrated from high mortality districts to low mortality districts they too reported significantly lower rates of illness than the women who remained in high mortality districts. These migrants also had a lower mortality rate. They were also significantly less likely to have a parent in a manual social class and more likely to have attended grammar or private school at age 14 and to have achieved higher qualifications subsequently. As with the men in the sample they were also less likely to have ended up in a manual job as compared to the women they 'left behind' in high mortality districts. They were also significantly more likely to own their home and have access to a car.
4. Men who were born in low mortality districts and migrated to high mortality districts reported significantly higher rates of poor mental health when compared to the men who remained in the low mortality areas and these migrant men had the highest premature mortality rates reported in this study. Their migration from low to high mortality areas was despite them having significant advantages over those men who remained. These advantages were in early life, such as being significantly more likely to have parents in non-manual social classes and being significantly more likely to have gained good qualifications at age 14. However, by adulthood these men were also significantly more likely to be in households earning less than median incomes and were significantly less likely to own their home or have access to a car. In essence, they were men born and brought up on 'the right side of the tracks' in both the social and spatial senses who subsequently did not live up to the early expectations of their life chances, did poorly in adulthood both socially in terms of work and spatially in migrating to high mortality areas and finally contributed to very high mortality rates (and raised mortality rates in high mortality areas through their migration).
5. Finally, the women born in low mortality districts who migrated over the course of their lifetime to high mortality districts are the only migration/sex grouping who do not contribute to the lifetime migration explanation of geographical inequalities in health suggested by this analysis. They are also the smallest of all the groups with only 308 members and so the fact that they do not behave as the model suggests does not have much effect on the overall model. However, it is interesting to consider why their life chances and behaviour does not fall in line with the pattern of the remaining 9956 study members. At age 14, just like the comparable group of male migrants from low to high mortality districts they were also more likely to have a father in a manual occupation and were more likely to achieve good educational qualifications later in life. In contrast to the men, however, they were significantly less likely to be in a manual occupation when compared to the women who remained in low mortality districts and were much more likely to rent

privately. The sample is too small to draw any firm conclusions about this group but it could be hypothesised that women, over this historical period, faired better in life in general if they moved into high mortality (generally urban) settings which were often more receptive, earlier, to women working in professional occupations (for example).

6. Overall what this study highlights is the need for further work on both the BHPS and other cohort studies to determine if the findings reported here are replicated elsewhere both in Britain and in other countries, both over the course of the whole twentieth century (as reported here) and for other more specific time periods and also to determine whether there is any support for the mechanisms hinted at here. Do people who begin life in poor areas but who do well, largely due to social advantages in childhood, tend to leave those areas over the course of their lives and so raise geographical inequalities in mortality as shown here? Do people who fail in life, despite starting off in affluent settings with social advantages, tend to migrate to poorer areas and raise the premature mortality rates in those areas further as a result, as shown here? In short, are lifetime migration and the factors that drive it as important a determinant of geographical inequalities in mortality as these findings would suggest? Spatial and social inequalities in health are not simply different aspects of the same general process. Life is more complex than that.

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