Commentary

Population change and mortality in men and women

The association between population change and mortality has been investigated for over a century. In the *Supplement to the 35th Annual Report of the Registrar-General (1861–1870)* it was evident that rapidly urbanising areas, with increasing populations, experienced relatively adverse mortality trends, while districts with declining populations did rather better.[1] In 1930 Lewis-Faning[1] showed that between 1860 and 1910 more rapid population growth was associated adversely with relative mortality, albeit weakly. These data were taken to suggest that rapid industrialisation and urbanisation had unfavourable health effects during a period when infectious diseases were the most important cause of morbidity and mortality. Conversely Hoffman[2] examined the trend in death rates in large US cities between 1871 and 1904 and demonstrated that the cities with the greater population growth had the lower mortality rate. Thus the influence of population change on mortality seems to be specific in time and place. Therefore we welcome the partial replication of our findings[3] by Molarius and Janson.[4] We demonstrated that population change between 1971 and 1991 was inversely correlated with mortality around the 1991 census across 292 county boroughs and urban and rural remainders of counties in Britain. The correlations between population change and all cause standardised mortality ratios (SMR) were −0.68 ($p<0.001$) for men and −0.50 ($p<0.001$) for women. Adjusting for the proportion of the population in semiskilled and unskilled manual jobs or with unclassified social class in 1991 attenuated the correlations, but they remained substantial. Furthermore the change in SMR between the early 1970s and the early 1990s correlated at −0.37 ($p<0.001$) with the change in population between these times, demonstrating that change in population size and change in mortality accompany each other.

Molarius and Janson studied 16 municipalities of the county of Värmland and found a similar correlation between population change and male all cause mortality, but no correlation with all cause mortality in women. This may reflect the very small sample size in this ecological study, with there being considerable sampling variation around the estimated correlation coefficients. They also report correlations with particular causes of death, but the problems here of sample size are even greater, and few of these correlations are robust. We have therefore repeated our analysis using population change between 1971 and 1991 and cause specific mortality between 1981 and 1998. As can be seen in table 1, the correlations with all cause and cause specific mortality are similar for the two time periods and show a clear pattern for all cause, lung cancer, coronary heart disease, stroke, respiratory disease and cirrhosis mortality—which show strong negative correlations only partly attenuated by adjustment for social class composition of areas. For breast cancer, we have failed to confirm the positive correlation of 0.39 (but $p=0.14$) found by Molarius and Janson, instead finding a negligible correlation for mortality between 1981 to 1989 and a weak positive correlation for mortality between 1990 and 1998. We hypothesised that mortality related to social fragmentation—in particular attributable to alcohol and drugs or suicide—would be strongly related to population change, but these correlations were, if anything, weaker than the correlations with the major causes of death such as cardiovascular disease and lung cancer.

Table 1 Correlations between population change 1971–1991 and standardised mortality ratios, weighted by population size

SMR	*1981–89*	*Adjusted†*	*1990–98*	*Adjusted†*
Men				
All cause	−0.70	−0.57	−0.72	−0.61
Stomach cancer	−0.50	−0.30	−0.46	−0.27
Lung cancer	−0.71	−0.59	−0.69	−0.56
Other cancer	−0.57	−0.39	−0.52	−0.30
Alcohol and drugs	−0.46	−0.38	−0.42	−0.29
CHD	−0.61	−0.41	−0.69	−0.55
Stroke	−0.62	−0.44	−0.67	−0.53
Other cardiovascular	−0.63	−0.48	−0.58	−0.51
Respiratory	−0.70	−0.58	−0.68	−0.60
Cirrhosis	−0.61	−0.51	−0.68	−0.57
Suicide and undetermined	−0.39	−0.23	−0.40	−0.16
Other accidents	0.10*	0.24	−0.07*	0.19
All others	−0.66	−0.52	−0.71	−0.59
Women				
All cause	−0.68	−0.64	−0.66	−0.62
Stomach cancer	−0.37	−0.28	−0.42	−0.34
Lung cancer	−0.63	−0.58	−0.63	−0.58
Breast cancer	0.01*	0.01*	0.20	0.21
Other cancer	−0.32	−0.19	−0.29	−0.16
Alcohol and drugs	−0.39	−0.40	−0.36	−0.33
CHD	−0.49	−0.39	−0.60	−0.54
Stroke	−0.52	−0.43	−0.53	−0.44
Other cardiovascular	−0.60	−0.54	−0.58	−0.53
Respiratory	−0.60	−0.54	−0.62	−0.56
Cirrhosis	−0.51	−0.48	−0.57	−0.52
Suicide and undetermined	−0.49	−0.50	−0.50	−0.44
Other accidents	−0.07*	−0.05*	−0.09*	−0.00*
All others	−0.60	−0.53	−0.61	−0.55

†Partial correlations controlling for per cent of the population in social classes 4, 5 or of unclassified social class. All $p<0.01$ except those marked*.

We think that the conclusion of our original study—that the broad range of factors that underlie differences in health status between areas, such as cost of living, the image and ambience of the place, available amenities and services, notions of community, pace of life, degree of pollution, healthcare provision, type of jobs available, quality of housing and safety of traffic—are ones that people clearly recognise as noxious, but that are not automatically incorporated into conventional measures of deprivation. People leave areas with a high prevalence of these factors when they can, so that relative population shrinkage occurs, while at the same time the areas have high mortality rates. The need for resources to be allocated to the most disadvantaged areas both in terms of conventional deprivation measures and the wider aspects of the local environment should be considered.

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3 Davey Smith G, Shaw M, Dorling D. Shrinking areas and mortality. *Lancet* 1998;**352**:1439–40.
4 Molarius A, Janson S. Population change and mortality in men and women. [Letter]. *J Epidemiol Community Health* 2000;**54**:772.