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Short Report

Shrinking areas and mortality: An artefact of deprivation effects in the West of Scotland?

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ABSTRACT

A number of studies have shown that mortality rates are highest in areas that are experiencing population decline. A recent study suggests that this relationship disappears when area deprivation is accounted for. We extend this research to consider the relationship between population change and mortality in five Health Boards in the West of Scotland—a region with some of the worst mortality rates in Europe. For the area as a whole and all five Health Boards separately, we find a significant negative association between population change and mortality, but in each case this relationship disappears when small area deprivation is accounted for. This confirms our previous conclusion that it is more important to account for deprivation than population decline in health resource allocation.

Introduction

A number of studies have considered the ecological relationship between mortality and population change. Early studies found that places experiencing population growth during the rapid urbanisation of the 18th century tended to have higher mortality (Farr, 1875; Lewis-Faning, 1930) while more recent studies demonstrate a reversal of this relationship, such that declining areas tend to have higher mortality rates (Davey Smith et al., 1998, 2001; Molarius and Janson, 2000; Regidor et al., 2002). It has been suggested that this relationship should be taken into account when allocating health-related financial resources as declining areas have experienced relative budgetary declines which do not reflect the higher mortality experienced there (Davey Smith et al., 1998, p. 1440). However, while recent Scottish studies which analysed mortality data for small areas throughout the whole of Scotland also found a negative relationship between population change and mortality, this disappeared once deprivation circumstances were accounted for (Boyle et al., 2004; Exeter et al., 2005a).

This study extends our previous Scottish analysis (Exeter et al., 2005a) by conducting five separate analyses for each of the Health Boards in the West of Scotland. These Health Boards include some of the most deprived parts of Europe, with some of the highest mortality rates (Leyland et al., 2007). Parts of Glasgow, for example, consistently top the mortality rankings in the UK. However, the five Health Boards also include some relatively wealthy areas which have much lower mortality rates. This analysis allows us to test whether our previous results for the whole of Scotland are consistent at smaller scales of analysis (Health Boards) and when we focus on particularly deprived settings.

First, we tested whether there was a negative relationship between population change and mortality in the entire study area and each of these Health Boards separately. Second, we examined whether this relationship held once deprivation circumstances were accounted for.

Data and methods

We used mortality data for 1999–2001 obtained from the General Register Office for Scotland (GROS) with the European Standard population used as a weight to create age-standardised mortality rates. Table 1 provides the deaths and populations for each of the Health Boards, as well as the number of 'Consistent Areas Through Time' (CATTs) for which the data were aggregated

Abbreviations: GROS: General Register Office for Scotland, CATT: Consistent Areas Through Time.

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Table 1
Descriptive statistics

	Deaths	Population	Number of CATTs	Minimum CATT population	Maximum CATT population
West of Scotland	89,228	2,487,697	4974	50	18,299
Ayrshire and Arran	13,807	368,851	815	50	11,274
Argyll and Clyde	15,736	424,110	826	52	12,620
Forth Valley	9113	279,776	448	53	11,282
Greater Glasgow	32,654	862,873	1863	50	8341
Lanarkshire	17,918	552,087	1022	54	18,299

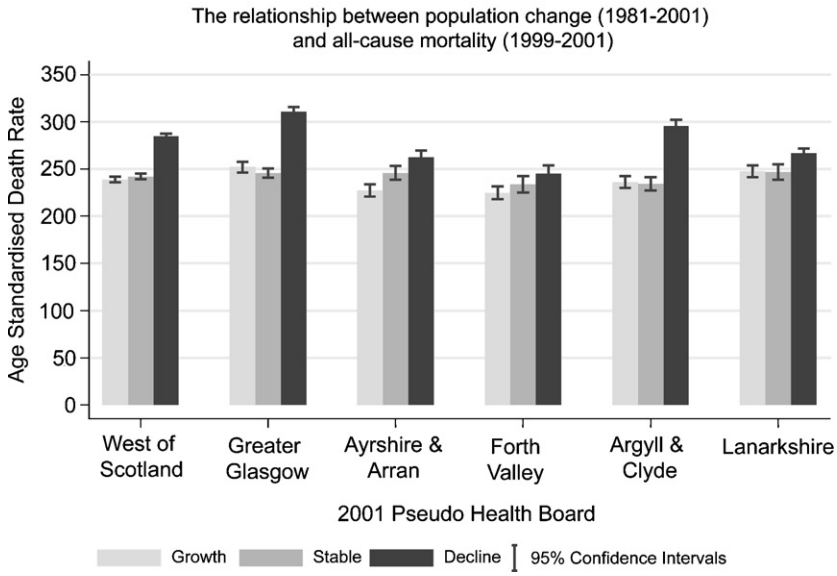

Fig. 1. The relationship between population change (1981–2001) and all-cause mortality (1999–2001).

(Exeter et al., 2005b).[1] The minimum population in a single CATT was 50 and the maximum was 18,299. Census data can be reliably aggregated for the CATTs from the 1981, 1991 and 2001 censuses and we calculated population change between 1981 and 2001; there is evidence that the population denominators from the 1981 and 2001 censuses are more reliable than for 1991 (Simpson and Dorling, 1994). We also calculated Carstairs deprivation scores (Carstairs and Morris, 1991) for the CATTs, using 2001 census data.

The CATTs were then aggregated into population-weighted quintiles, based on the Carstairs deprivation score, for the West of Scotland as a whole and for each Health Board separately. Within each quintile, three categories of CATT were distinguished, based on the population change between 1981 and 2001: 'declining areas' experiencing at least 10% population decline between 1981 and 2001; 'growing areas' experiencing at least 10% population increase between 1981 and 2001; and 'stable areas', which fell in between. Finally, we calculated all-cause mortality rates using the direct method for these various categories.

Results and discussion

Similar to most recent studies, we find a negative relationship between population change and mortality for the West of Scotland as a whole and for each Health Board separately (Fig. 1). The differences between the declining and growing areas were significant in each case. Most notably, the rates were much higher in the areas experiencing decline over the 20-year period.

However, the population gradient effectively disappears when we divide the West of Scotland and each Health Board into deprivation quintiles and in nearly all cases, and the mortality rates for the declining areas were not significantly different to the mortality rates for the growing areas (Fig. 2a–f). The finding is highly consistent even though the deprivation circumstances and mortality rates vary across the five Health Boards. Fig. 2a–f also shows that in a few cases where there were significant differences between the mortality rates in growing and declining areas, the mortality rates were actually higher in the areas of population growth.

These results suggest that the negative relationship between population change and mortality in the West of Scotland and its five constituent Health Boards is an artefact of the relationship between area deprivation and mortality. Declining areas tend to be more deprived. This confirms our previous conclusion (Exeter et al., 2005a) that while resource allocation clearly needs to include the population base as a key element of the calculation, it is not necessary to allocate additional resources to those areas experiencing population decline. Instead, the formula used to distribute health resources should continue to be related to deprivation circumstances, which is correlated with population decline. This reflects the current strategy in Scotland. Since 2000, approximately 70% of the health resource expenditure at the NHS Health Board level in Scotland has been apportioned according to the 'Arbuthnott' formula, which comprises four measures of health, including the population distribution living in a health board, the age/gender mix of the population, level of deprivation, and adjustments for the level of rural and remote areas within a health board (The Scottish Executive, 2000). While the precise details of this formula may be debated, the focus on deprivation in

[1] There are 10,058 CATTs in Scotland.

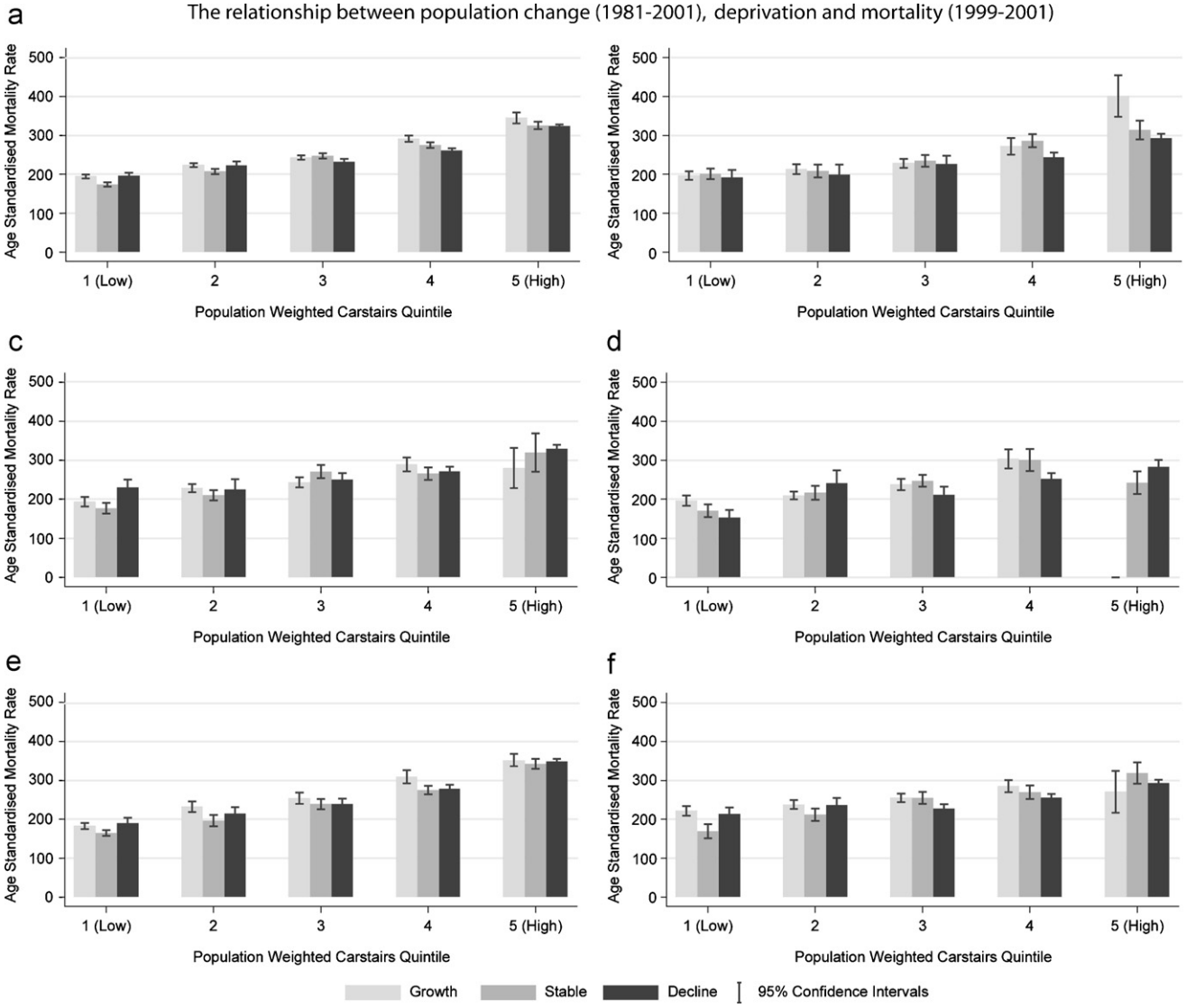

Fig. 2. The relationship between population change (1981–2001), deprivation and mortality (1999–2001) for the West of Scotland and each of the five Health Boards. (a) West of Scotland; (b) Ayrshire and Arran health board; (c) Argyll and Clyde health board; (d) Forth valley health board; (e) Greater Glasgow health board and (f) Lanarkshire health board.

addition to absolute population distribution seems sensible, although we would acknowledge that there may be unique health care circumstances in areas where population decline is occurring, particularly as unmet need is likely to be higher in these deprived places.

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