Deprivation and mortality in non-metropolitan areas of England and Wales

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Abstract
Objective – To test the hypothesis that the relationship between deprivation and mortality is weaker among residents of non-metropolitan areas of England and Wales than among residents of metropolitan areas.
Design – This study compared mortality, expressed as standardised mortality ratios (SMRs), in residents of metropolitan and non-metropolitan districts at three levels of deprivation classified by an electoral ward deprivation score and by home and car ownership. SMRs were computed for all causes of death, for bronchitis and asthma (ICD9 codes 490–493), and for accidental, violence, and poisoning (ICD9 codes 800–999).
Setting – England and Wales.
Participants – Members of the longitudinal study of the Office of Population Censuses and Surveys, a quasi-random 1% sample of the population of England and Wales.
Main results – There was an association between deprivation and mortality which was clear for all cause mortality, more noticeable for respiratory disease, and less clear for deaths from accident, violence, and poison. In general, the results showed a remarkable similarity between metropolitan and non-metropolitan areas.
Conclusions – This study does not support the hypothesis that the relationship between mortality and deprivation differs between residents of metropolitan and non-metropolitan areas of England and Wales.

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The association between deprivation and ill health is beyond dispute, but there is some evidence that the relationship between deprivation (judged by measures such as Jarman or Townsend scores) and health (as judged by mortality or morbidity) differs between metropolitan and non-metropolitan areas of England. None of this evidence taken in isolation is compelling, but collectively it seems to add up. For example inner London districts stand out from the rest of the country as having low mortality rates relative to their deprivation scores. The metropolitan wards of Tyneside have a higher correlation coefficient than the non-metropolitan wards of Northumberland and Cumbria between deprivation and a composite health score of mortality, low birth weight and permanent sickness. A morbidity study in London found a relationship between Nottingham health profile scores and deprivation assigned by enumeration district, but no such relationship was evident in a similar study in north east Essex. An ecological study of hospital use in the Wessex region of England, which consists entirely of non-metropolitan districts, found that deprivation was not a predictor of hospital use. Watt et al have provided a general review of health in rural populations compared to town dwellers in the UK.

Although these studies provide some evidence, for both mortality and morbidity, of differences between metropolitan and non-metropolitan areas, they all have a number of limitations, chief among them being ecological design or limitation to small parts of the country (dictated by the researcher’s place of work rather than the hypothesis being tested).

The longitudinal study (LS) of the Office of Population Censuses and Surveys (OPCS) affords an opportunity to explore further the relationship between deprivation and mortality in metropolitan and non-metropolitan areas while avoiding the limitations of ecological design and geographical specificity. This study links census and vital event data for individuals, from 1971 onwards, on a 1% sample of the population of England and Wales and is of proven value for documenting social class variation in health. I thought it would be interesting to use this data set to test the hypothesis that the relationship between deprivation and mortality differs between metropolitan and non-metropolitan areas of England and Wales.

Method
The basic method was to classify members of the LS into three levels of deprivation and then tabulate mortality, expressed as a standardised mortality ratio (SMR), separately for residents of metropolitan and non-metropolitan districts or boroughs. Deprivation was classified by tertile of Carstairs’ deprivation score, assigned to individuals by the score of their electoral ward of residence. This score is based on electoral ward statistics for unemployment, car ownership, household overcrowding, and social class (proportion in social class IV or V). It has the advantage of providing large categories with a continuous distribution of deprivation score but is an ecological classification, so individuals were also classified by three categories of home and car ownership used by Goldblatt. These categories, which were mutually exclusive but not exhaustive, were as follows: owner-occupiers with 2 or more cars (low deprivation),
Deprivation in areas

Results

Results for all age SMRs and SMRs for death at age 16 through 74 years were closely similar: only the results for all age SMRs are presented here. The results for classification by ward deprivation score are shown in table 1 and for classification by home and car ownership in table 2.

There was a clear gradient of all cause SMR from low to high deprivation for both males and females in both metropolitan and non-metropolitan areas. The SMRs for metropolitan and non-metropolitan areas are similar at each level of deprivation with overlapping 95% confidence intervals, though there is a suggestion of greater separation in the category of medium deprivation.

For bronchitis, asthma, and emphysema there is again a clear gradient, for both metropolitan and non-metropolitan areas, of SMR with deprivation classified by Carstairs score. This gradient is more marked than for all cause mortality. Classification by home and car ownership accentuates the SMR difference between the low and high categories of deprivation for both males and females, but produces some anomalies in the medium category: the highest point estimates of SMR for bronchitis, asthma, and emphysema are the medium deprivation category (in metropolitan areas for males and in non-metropolitan areas for females).

If we examine the absolute level of SMR rather the difference between deprivation cat-
categories, and use the ward deprivation classification, it seems that males in metropolitan and non-metropolitan areas have almost the same SMR for this group of causes at low deprivation levels, while at medium and high levels of deprivation the point estimates for SMR are higher in the metropolitan dwellers. Among females it is the high deprivation group which has similar SMRs; at low and medium levels of deprivation the point estimates for SMR are higher in metropolitan areas. None of the differences in SMR between metropolitan and non-metropolitan dwellers, using either classification, is statistically significant at the 5% level since the confidence intervals overlap (albeit only just in one instance).

The pattern of results for death from accidents, violence, and poisoning is complex; such gradients of mortality as exist are less clear than for the other two groups of causes. The number of deaths in each category is small, resulting in wide confidence intervals for the SMR estimates. For males in both metropolitan and non-metropolitan areas, there is a gradient of SMRs with deprivation using either classification of deprivation, with one exception: the low point estimate of SMR for non-metropolitan males classified by ward deprivation. For females in both metropolitan and non-metropolitan areas, those in the low and high deprivation categories (using either classification) have low and high SMRs, but as with bronchitis it is the medium deprivation category which produces some anomalies. This category has intermediate SMRs on the ward classification of deprivation but the lowest SMRs when classified by home and car ownership. However, the confidence intervals on all these estimates of SMRs for death by accidents, violence and poisoning are wide.

Discussion
This study adds to the substantial literature which demonstrates an association between deprivation and mortality. With one exception, for males and females in both metropolitan and non-metropolitan areas, using two methods of classifying deprivation, and three groups of cause of death, those with low deprivation have low SMRs and those with high deprivation have high SMRs. In general, the results show a remarkable similarity between metropolitan and non-metropolitan areas, and contradict, at least for mortality, the evidence outlined in the introduction which suggested a difference between metropolitan and non-metropolitan areas. Of 24 comparisons made between metropolitan and non-metropolitan areas, only that for accidents, violence, and poisoning among males living in non-metropolitan areas classified by Carstairs score showed a higher SMR for low deprivation than for high deprivation, but even this conclusion is rendered less secure by wide confidence intervals on the SMR estimates.

Although the differences between the high and low deprivation categories are clear and consistent, the results for the medium deprivation category contain a couple of anomalies, particularly if the person – rather than electoral ward – based classification of deprivation is used. The statistical and practical significance of these anomalies results is doubtful given the wide confidence intervals of the SMRs.

The confirmation of the association between deprivation and mortality is in some ways surprising: two of the most striking features of metropolitan areas are the cost of housing and availability of public transport, so that classifications of deprivation scores based on car ownership should be measuring different social phenomena in metropolitan and non-metropolitan areas.

How might the present study be extended? The results for death from accident, violence, and poisoning are particularly intriguing, and might be clearer if suicide and traffic accidents were tabulated separately. The category “non-metropolitan” includes a variety of areas from urban to rural, and a finer classification might have produced different results. Any finer classification of cause or geography would, however, be at the expense (at least in this data set) of precision. Furthermore, the LS offers almost countless possibilities for analysis and there is a clear risk of dredging the data to find results which accord with preconceived notions. My view is that deeper understanding will come, not from yet more refinement in statistical studies, but rather from descriptive case studies like those of Phillimore and Morris and Barker and Osmond.

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