

Widening inequality of health in northern England, 1981-91

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Abstract

Objective—To identify relative and absolute changes in mortality in the Northern region of England between 1981 and 1991.

Design—1981 and 1991 census data were used to rank 678 wards on an index of material deprivation composed of four variables (unemployment, car ownership, housing tenure, household overcrowding). Standardised mortality ratios (all causes) were calculated for various periods between 1981 and 1991 and for different age categories.

Setting—Counties of Cleveland, Cumbria, Durham, Northumberland, and Tyne and Wear.

Results—During 1981-91 mortality differentials widened between the most affluent and deprived fifths of wards in all age categories under 75 years. The decline in the relative position of the poorest areas was particularly great, and there was no narrowing of inequalities across the remainder of the socioeconomic spectrum. In absolute terms, there were improvements in mortality in all age categories in the most affluent areas. In the poorest areas improvements in the 55-64 age group were balanced by increased mortality among men aged 15-44, a slight rise among women aged 65-74, and static rates among men aged 45-54.

Conclusions—These results re-emphasise the case for linking mortality patterns with material conditions rather than individual behaviour.

Introduction

Several studies have indicated widening social class differences in mortality in Britain in the 1970s¹⁻⁸; indeed, a widening gap can be traced back to the 1950s.⁹ Given this long trend towards widening inequality in health, it would be surprising if differences in mortality were found to narrow in the 1980s, and increasing disparities in mortality through the 1980s have already been reported for Glasgow.¹⁰ The decade has been one of profound social and economic change, with two major recessions, a widening of income differentials,¹¹ and a reduction of the real income of the poorest 10% of households in the population.¹² Nevertheless, changes in mortality among different sections of the population need careful identification. In this paper we examine relative and absolute changes in mortality (all causes) in people aged under 75 between 1981 and 1991 in the area administered by Northern Regional Health Authority (the five counties of Cleveland, Cumbria, Durham, Northumberland, and Tyne and Wear). This builds on our earlier study of inequalities in health in this region of three million people.¹²

Methods

Socioeconomic and population data were drawn from the 1981 and 1991 censuses and mortality data

(1981-91) were taken from death records of the Office of Population Censuses and Surveys for the 678 wards used in our earlier study.¹² The index of deprivation created previously was reconstructed with data from the 1991 census. This index was constructed by means of z scores, combining four variables selected to reflect distinctive aspects of material wellbeing—unemployment, car ownership, non-owner occupation, and household overcrowding. Any method of combining several variables with different distributions into a single index will have drawbacks,¹³ but the z score is widely used and at ward level gives similar results to other methods.¹⁴

The populations in the 1981 census provided denominators for deaths in 1981-4, as did the populations in the 1991 census for deaths in 1988-91. The mean of the 1981 and 1991 populations was used as a denominator for deaths occurring in 1985-7. This enabled us to review mortality throughout the decade. Standardised mortality ratios were calculated for each ward over 11 years, but deaths were usually grouped into successive periods of three years. Absolute changes were examined by recalculating mortality ratios for 1989-91, standardising to rates in England and Wales in 1981-3. The ratio of the standardised mortality ratios for 1989-91 and 1981-3 was then calculated.¹⁵ To identify whether inequalities in mortality had widened, wards were grouped into fifths according to the levels of deprivation reflected in the summary z score for 1981 or 1991 with additional information about the highest and lowest tenths.

Population denominators refer to residents in households. Accordingly, deaths of people living in institutions were removed from the analysis. With regard to the accuracy of 1991 census population counts, underenumeration appears to have been less in the Northern region than nationally: imputed residents (reflecting the gap between census counts and estimates of the real population) accounted for 0.89% of the population in households the Northern region, compared with 1.64% in England and Wales.¹⁶ Both nationally and in the Northern region underenumeration was most pronounced among young adults, particularly men in their twenties.¹⁷ Because underenumeration was understood to be largely a consequence of homelessness and avoidance of poll tax it might be expected to be more pronounced in deprived than affluent populations. To check the social distribution of this deficit, we examined population changes in each five year age band in the most deprived fifth of wards, comparing the ratio of men to women in each age band between 1981 and 1991 as a guide to anomalies in the 1991 population structure of these poor wards. This exercise confirmed an apparent deficit of men in the 20-34 age group, in which numbers of men should have been 15.3% higher if trends had mirrored the female population. However, because deaths are much more numerous in the 35-44 age group than in the younger age group, there is only a

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small effect on mortality in the 15-44 age range as a whole. Comparing changes in the proportions of expected deaths for men and women aged 15-44 for 1981-3 and for 1989-91 shows that expected deaths in men should be just 2.7% higher than the value calculated with published population data.

Results

Table I shows socioeconomic data for 1981 and 1991. The high levels of unemployment in the poorest wards at both censuses persisted throughout the decade and peaked in 1986. Of the four indicators composing the deprivation index, only overcrowding showed a general decline. Overall, there was little change in the relative position of wards between 1981 and 1991. A Spearman rank correlation coefficient of 0.96 between deprivation z scores for the two periods confirmed this similarity. Only 19 of the 136 wards making up the region's poorest fifth in 1981 were outside this fifth in 1991. Such stability was reflected across the socioeconomic spectrum.

Table II shows the mortality data for people aged under 65, which suggest that inequalities in mortality had widened over the decade. A clear worsening of mortality relative to the national level in the poorest fifth of wards was accompanied by little relative change in the second and middle fifths and an improvement in the most affluent 40% of wards. Table III shows the wards with highest and lowest mortality in the region, illustrating how pronounced localised disparities were during 1981-91. At this level of analysis, mortality in the most favoured areas was one quarter of the rate found in the worst affected localities.

Table IV summarises the mortality of specific age groups during 1981-91 in the most deprived fifth and most affluent fifth of wards. Ward groupings are based solely on the 1981 deprivation ranking so that the same localities were compared over time. Since the deprived wards were located predominantly in the major urban centres, where wards cover larger populations than in small towns and rural areas, there was a large difference in the sizes of the populations compared. In 1991 the poorest fifth of wards included 28% of the region's population, while the richest fifth included 15% of the total. In each age range the gap between the most deprived and the most affluent areas seemed to have widened. This was not invariably because of improvements in standardised mortality ratios in the most affluent wards: only in the 15-44 age range was a substantial improvement evident. In general the widening gap was mainly due to standardised mortality ratios rising in the poorest wards. The position of the populations of the poorest wards worsened over the decade in all age categories, but this was most pronounced in the 45-54 age range. A widening of the differential among those aged 65-74 also supports evidence of inequalities persisting beyond retirement.¹⁸

The possibility that the widening gap among younger adults might in part be attributable to underenumeration at the 1991 census disproportionately

TABLE II—Association between mortality ratios and deprivation in people aged under 65 in electoral wards in Northern region during 1981-3 and 1989-91

Grouping of wards by deprivation*	1981-3		1989-91	
	Mortality ratio†	No of deaths	Mortality ratio†	No of deaths
Most deprived tenth	145	5601	158	4356
Most deprived fifth	136	10081	150	7807
Second fifth	120	6642	121	5864
Third fifth	109	5063	111	4134
Fourth fifth	100	3610	92	3078
Least deprived fifth	87	2746	84	2346
Least deprived tenth	84	1490	81	1123
Ratio of most deprived tenth to least deprived	1.73		1.95	

*Groupings for 1981-3 based on 1981 deprivation rank and for 1989-91 on 1991 deprivation rank.

†1981-3 standardised to national (England and Wales) mortality in 1981-3; 1989-91 standardised to national mortality in 1989-91.

TABLE III—Level of deprivation in the six electoral wards in Northern region with highest mortality in 1981-91 and the six with lowest mortality

Ward and local authority	Mortality ratio (95% confidence interval)*	Deprivation rank†	
		1981	1991
<i>Highest mortality</i>			
St Hilda's (Middlesbrough)	217 (191 to 245)	10	17
West City (Newcastle)	203 (184 to 223)	3	1
Portrack and Tilery (Stockton)	194 (173 to 217)	48	29
Grangetown (Langbaugh)	187 (161 to 215)	14	6
Southfield (Middlesbrough)	186 (160 to 213)	44	34
Deneside (Easington)	183 (160 to 206)	28	12
<i>Lowest mortality</i>			
Gosforth (Copeland)	57 (36 to 82)	574	639
Redesdale (Tynedale)	55 (29 to 88)	499	519
Crosby Ravensworth (Eden)	52 (30 to 80)	625	535
Hummersknott (Darlington)	51 (39 to 65)	672	664
Wylam (Tynedale)	51 (34 to 71)	624	625
Whalton (Castle Morpeth)	46 (23 to 76)	520	522

*Standardised to national (England and Wales 1981-91) mortality of 100.

†Range from 1 (most deprived) to 678 (least deprived).

affecting the poorest wards can be discounted. When the standardised mortality ratio for the 15-44 age range in 1989-91 in the poorest wards shown in table IV was adjusted to take account of the deficit of young men it fell only from 128 to 127. Moreover, the actual number of deaths in men aged 15-44 in the poorest fifth of wards increased from 726 in 1981-3 to 772 in 1989-91. This increase in a population that, even after adjustment for underenumeration, had fallen emphasises that the evidence for some widening of inequality should be taken as seriously in this age category as in others.

Table V shows standardised mortality ratios for 1981-3 and 1989-91, both standardised to national data for 1981-3, to examine absolute changes in the most and least deprived fifths of wards. In the affluent areas all age categories exhibit a distinct improvement, with significant reductions ($P < 0.05$) in each category except for one (women aged 15-44). In the poor areas the picture is uneven. There were significant reductions ($P < 0.05$) among children and men aged 55-64 and 65-74, although improvements were less than in the

TABLE I—Distribution of indicators of deprivation in 678 electoral wards in Northern region in 1981 and 1991. Values are percentages unless stated otherwise

Grouping of wards by deprivation (No of wards)*	1981					1991				
	People unemployed	Households with no car	Households not owner occupied	Households overcrowded	Total population (No)	People unemployed	Households with no car	Households not owner occupied	Households overcrowded	Total population (No)
Most deprived tenth (68)	23.5	70.4	82.9	7.1	474 037	24.0	66.8	67.9	3.0	427 491
Most deprived fifth (136)	21.0	65.6	76.3	6.2	900 501	20.6	61.5	61.0	2.6	799 860
Second fifth (136)	14.1	52.8	59.6	4.0	683 348	12.7	47.6	43.8	1.6	727 398
Third fifth (134)	11.1	46.1	47.3	2.9	587 867	9.1	37.7	33.7	1.2	566 092
Fourth fifth (136)	8.1	33.8	34.0	2.0	447 234	6.6	27.7	23.0	0.8	487 678
Least deprived fifth (136)	6.0	21.4	18.8	1.2	415 024	4.6	16.0	13.3	0.5	405 328
Least deprived tenth (68)	5.4	19.4	14.8	0.9	232 894	4.1	13.0	11.0	0.4	195 933

*Wards ranked on basis of 1981 deprivation index for 1981 data and 1991 deprivation index for 1991 data.

TABLE IV—Trends in age specific mortality in most deprived and least deprived fifths of electoral wards in Northern region. Values are standardised mortality ratios* (numbers of people)

	Age group of most deprived fifth of wards					Age group of least deprived fifth of wards				
	0-14	15-44	45-54	55-64	65-74	0-14	15-44	45-54	55-64	65-74
1981-3	116 (620)	117 (1116)	130 (2041)	145 (6304)	123 (9562)	80 (195)	86 (428)	79 (574)	92 (1549)	94 (3178)
1983-5	117 (580)	119 (1085)	135 (1892)	149 (6206)	122 (9256)	77 (170)	84 (406)	81 (560)	96 (1626)	90 (3042)
1985-7	119 (588)	120 (1072)	145 (1778)	151 (5789)	127 (9441)	70 (145)	87 (427)	79 (546)	88 (1531)	87 (2962)
1987-9	114 (551)	128 (1141)	152 (1624)	153 (5302)	130 (9474)	71 (135)	79 (400)	78 (535)	85 (1460)	87 (2995)
1989-91	130 (566)	128 (1144)	162 (1575)	151 (4745)	133 (9397)	79 (131)	77 (390)	83 (549)	87 (1433)	88 (2981)

*Standardised to national (England and Wales) mortality of 100 in each three year period. Local population denominators: 1981 census for deaths in 1981-4; 1986 population (derived from 1981 and 1991 censuses) for deaths in 1985-7; and 1991 census for deaths in 1988-91. Deprivation defined on basis of 1981 census.

TABLE V—Absolute changes in mortality between 1981-3 and 1989-91 in most deprived and least deprived* fifths of electoral wards in Northern region

Age group	Mortality ratios† for most deprived wards			Mortality ratios† for least deprived wards		
	1981-3 (total population 900 501)	1989-91 (total population 829 453)	% change (95% confidence interval)	1981-3 (total population 415 024)	1989-92 (total population 433 517)	% change (95% confidence interval)
			<i>Males and female</i>			
0-64	136	124	-9 (-12 to -7)	87	70	-20 (-24 to -15)
0-14	116	99	-15 (-24 to -5)	80	60	-25 (-40 to -7)
			<i>Males</i>			
0-64	137	123	-10 (-13 to -7)	85	66	-22 (-27 to -17)
15-44	117	131	12 (1 to 24)	84	69	-18 (-31 to -2)
45-54	137	137	-1 (-8 to 8)	79	66	-16 (-28 to -2)
55-64	144	120	-17 (-21 to -13)	90	67	-25 (-31 to -17)
65-74	124	113	-9 (-13 to -6)	94	75	-20 (-25 to -15)
			<i>Females</i>			
0-64	136	125	-8 (-12 to -3)	91	76	-16 (-23 to -8)
15-44	117	106	-9 (-21 to 5)	90	76	-16 (-33 to 4)
45-54	127	119	-6 (-16 to 4)	84	67	-20 (-34 to -4)
55-64	146	138	-5 (-11 to 1)	95	81	-15 (-24 to -4)
65-74	123	127	3 (-1 to 8)	95	82	-14 (-20 to -7)

*Deprivation defined on basis of 1981 census.

†Standardised to national (England and Wales 1981-3) mortality of 100.

affluent wards. In other age categories improvements were small or non-existent. Among men aged 45-54 mortality was unchanged, while among women aged 65-74 mortality slightly increased. The possible importance of this deterioration should not be underestimated because a similar pattern also occurred in the second most deprived fifth of wards. Among men aged 15-44 there was a larger increase in mortality. When the male population was adjusted to match changes in the female population this increase reduced but only from 12% (95% confidence interval 1% to 24%) to 9% (-2% to 20%). These patterns in the more deprived areas were apparent in all parts of the Northern region, but the Teesside conurbation contributed disproportionately to the trend in mortality among men aged under 55.

These results underline how closely health and wealth are related. Moreover, the statistical association between deprivation and mortality at ward level is greatly strengthened by combining data for an extended period. A Spearman rank correlation coefficient, weighted by the inverse of the variance around the mortality estimates, for the association between standardised mortality ratio for people aged under 65 during 1981-91 and deprivation rank (in both 1981 and 1991) was 0.85. This contrasts with a similar coefficient of 0.69 for mortality in 1981-83 and deprivation in 1981,¹² when small numbers of deaths in rural wards with low populations weakened the underlying strength of the relationship over a short period.¹⁹

Discussion

In a region that includes some of the poorest areas in Britain mortality differentials have continued to widen through the 1980s. Not only has mortality worsened in relative terms at all ages up to 75 in the poorest fifth of wards, but mortality in absolute terms has scarcely changed for several age categories over the decade relative to 1981-3 and has worsened in two categories. This runs counter to the general secular

decline in death rates.²⁰ Most striking is evidence of the poorest areas increasingly coming adrift from the experience of the rest of the population. But even without the experience of the most deprived fifth of wards there has been no narrowing of inequality in mortality across the remainder of the population, countering suggestions that continuing health inequalities largely reflect the high mortality of a small and shrinking section of the population.²¹⁻²³ Mortality experience in poor areas continues to lag far behind average national experience, particularly in middle age. In the poorest 10% of wards mortality in 1989-91 among men aged 45-54 and women aged 55-64 was equivalent to national (England and Wales) levels of mortality last experienced in the late 1940s, while among women aged 45-54 and men aged 55-64 the equivalent national rates occurred in the early 1950s.²⁴

The data on mortality among men aged 15-44 contribute to the understanding of a national phenomenon. Since 1985 deaths rates among 15-44 year olds have risen nationally, especially in men.²⁵ Dunnell has shown that this rise may be explained by an increasing proportion of 40-44 year olds within this wide age range, but she also noted that after adjustment for the skewed distribution of this population death rates have remained level, whereas mortality at other ages has continued to fall.²⁶ She suggested that AIDS might be the main contributor to the remaining anomaly among 15-44 year old men. Although we have not analysed deaths by cause, our evidence casts doubt on this assumption. In the Northern region the pattern of change among 15-44 year olds was highly differentiated. While mortality rose in the poorest fifth of wards, it changed little in the next two fifths, fell modestly in the fourth (down 7%), and fell most in the richest fifth of wards. This suggests that structural factors such as deregulation at work and unemployment are probably at least as influential as the developing impact of HIV and AIDS on national changes in mortality among men aged 15-44.

The most widely distributed adverse pattern was the

Public health implications

- Several studies reported widening differences in mortality among social classes in Britain in the 1970s
- In this study the association between deprivation and mortality during the 1980s was studied in electoral wards in the Northern region of England
- During 1981-91 inequalities in mortality widened in men and women of all age categories under 75 years, primarily because of the situation in poorest areas worsening relative to the rest of the population
- In absolute terms mortality fell substantially in all age categories in the most affluent wards, while in some age categories in the poorest wards it actually increased, especially in men aged 15-44
- These results re-emphasise the link between public health and material conditions rather than individual behaviour

slight increase in mortality among women aged 65-74 in the poorest 40% of wards. It is not clear why mortality should have risen in this age group but fallen among 55-64 year olds. However, much of the fall in the overall number of deaths in those aged under 65 in the most deprived wards is attributable to absolute improvements in mortality in the 55-64 range, particularly among men, which tends to obscure more disturbing trends at other ages.

A recent review of literature on health inequalities since the Black report noted with dismay a current preoccupation with behavioural explanations for health differentials,³⁴ and our evidence supports those studies which challenge this preoccupation with behaviour.²⁷⁻³⁰ If health differentials reflected behavioural choices by individuals then worsening health would be an indication of increasingly unwise personal behaviour. Yet if historical improvements in health throughout the population are generally attributed to rising living standards and improving material conditions, so worsening health among some groups and widening differentials must be related primarily to changes in the same factors.

In this context the indicators in table I reveal an incomplete picture of social change and growing inequality. Thus, households with two cars (highly correlated with income) increased considerably over the decade in affluent groups, while long term unemployment featured disproportionately among those unemployed in the poorest areas. There are other limitations in relying exclusively on the census for the interpretation of trends in health. Its emphasis on individuals and households takes no account of differences between areas in the economic infrastructure of services and aspects of the physical environment such as air and water quality. National data on income distribution offer one compensating source, however, as Wilkinson has shown.^{4 31 32} Official statistics reveal widening income differentials in Britain during the 1980s, particularly since 1985, on a range of indicators (that is, gross, post-tax, and disposable incomes).^{11 33} Over the same period there has been an enormous growth in the population living on less than half of average income, with the poorest

10% of households suffering a fall in real income¹²; this is a trend fuelled not only by the continuation of high levels of unemployment but also by changes in the tax and state benefit systems.³⁴ The area administered by Northern Regional Health Authority has the highest proportion of households in low income categories in England and Wales.³⁵ How far the effects on health of these structural changes in society have yet emerged in mortality remains open to question. This study raises the possibility that some of these effects on ill health may just be starting to appear.

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