Is economic adversity always a killer? Disadvantaged areas with relatively low mortality rates

Article *in* Journal of Epidemiology & Community Health · May 2007

DOI: 10.1136/jech.2006.049890 · Source: PubMed

5 authors, including:

Helena Tunstall
The University of Edinburgh
59 PUBLICATIONS **792** CITATIONS
SEE PROFILE

Stephen Platt
The University of Edinburgh
201 PUBLICATIONS **9,904** CITATIONS
SEE PROFILE

Danny Dorling
The University of Sheffield
235 PUBLICATIONS **5,195** CITATIONS
SEE PROFILE

RESEARCH REPORT

Is economic adversity always a killer? Disadvantaged areas with relatively low mortality rates

Helena Tunstall, Richard Mitchell, Julia Gibbs, Stephen Platt, Danny Dorling

J Epidemiol Community Health 2007;**61**:337–343. doi: 10.1136/jech.2006.049890

See end of article for authors' affiliations

Correspondence to: Dr Richard Mitchell, Research Unit In Health, Behaviour and Change, University of Edinburgh Medical School, Teviot Place, Edinburgh, EH8 9AG, UK; richard.mitchell@ed.ac.uk

Accepted 11 July 2006

Objectives: To identify areas of Britain whose residents have relatively low age specific mortality, despite experiencing long-term economic adversity.
Methods: Longitudinal, ecological study of all residents of Britain from 1971 to 2001.
Results: 54 of Britain's 641 parliamentary constituencies were identified as having been persistently economically disadvantaged in the period 1971–2001. Within this group, there was marked variation in age group specific mortality and in the age ranges with relatively high or low mortality. A systematic scoring process identified 18 constituencies as providing strong and consistent evidence of low mortality across a range of age groups, relative to the 54 constituencies as a whole. These 18 were labelled ''resilient''. Among age groups >24 years, mortality rates in the resilient areas were significantly lower than in the other economically disadvantaged areas. For example, at ages 45–59 years, the average all cause mortality rate in the resilient constituencies was 607 per 100 000 population (95% CI 574 to 641) and 728 (670 to 787) in the non-resilient constituencies ($p = 0.013$).
Conclusions: Areas with similar adverse economic histories do not all have similarly high mortality rates. It is unlikely that a single factor explains these results. Selective migration cannot be discounted as an explanation, but particular sociocultural features of areas (including the political, economic, ethnic and religious characteristics of their population) may also be protective.

It has been repeatedly shown that adverse socioeconomic circumstances in an area usually have an adverse effect on the health of the population.[1–4] In this paper, however, the focus is on areas that have experienced considerable long-term economic adversity, but which have low mortality relative to other areas with similar economic histories. These areas might be doing ''better than expected'' or ''overachieving''.[5] This status implies that there may be protective factors or practices in particular areas, which weaken the usually strong relationships between economic adversity and poor health.

Those who get by, or even thrive, in a situation where most would suffer or do badly are called ''resilient''. The term has been widely used within child psychology, social policy and ecology.[6 7] We find Health Canada's definition of the term the most helpful.[8]

> Resilience is the capability of individuals and systems (families, groups, and communities) to cope successfully in the face of significant adversity or risk. This capability develops and changes over time, is enhanced by protective factors within the individual/system and the environment, and contributes to the maintenance or enhancement of health. p 4

It should be noted that there are alternative definitions of resilience, and that others working in this field define resilience as a process, rather than an outcome or as being conditional on adversity.[9]

A small number of studies have begun to explore resilience in communities and places.[8 10] A recent study by Doran and Whitehead[5] found districts of England, where life expectancy was better than expected, given the level of deprivation in those areas. However, life expectancy, as a single measure of population health, may mask variation in resilience by age group, makes it harder to identify the causes of death, which have lower than expected rates and thus limits information on the potential mechanisms underlying the resilience. Further, Doran and Whitehead's focus on England excluded Britain's most deprived areas, found in Wales and Scotland.[4] In this study, our aim was to extend Doran and Whitehead's work. We took a longitudinal perspective on the whole of Britain and searched for areas with the strongest evidence of relatively low mortality across a range of ages, despite experiencing persistent economic adversity.

METHODS

The study had two stages. The first stage identified a group of areas with long-term experience of significant economic adversity. The second stage identified members of this group with relatively low age specific mortality rates.

Areas, timeframe and data

All analyses were based on 641 Westminster parliamentary constituencies in Britain, as at 1997–2001. Constituency size (average population 89 000 in 2001) allowed analysis of mortality within small age groups. Furthermore, constituencies group similar numbers of people together across Britain and fragment large urban areas. UK decennial census data for 1971, 1981 and 1991, corrected for undercount as appropriate, and for which areal definitions were constant over time, were obtained from the Linking Censuses Through Time website (http://census.ac.uk/cdu/software/lct/).[11] Census data for 2001 and individual level mortality data were obtained from the Office for National Statistics and the General Register Office for Scotland.

Measuring adversity

An index of adversity was created to trace the economic trajectory of each constituency over time. We did not use standard deprivation indices such as Townsend or Jarman,[12] as their values cannot be compared across the entire time span of

Table 1 Selected census variables as indicators of economic adversity by age groups for the four decennial censuses between 1971 and 2001

Age group (years)	1971	1981	1991	2001
0–14	Lone parent family	No adults economically active in the household	No adults working in the household	No adults working in the household
15–64	Unemployed, temporarily sick	Unemployed, permanently sick	Unemployed, permanently sick, on government scheme	Unemployed, permanently sick, on government scheme
⩾65	—	No car access	No car access	No car access

the study (1971–2001). Our index measured material rather than social disadvantage and was based predominantly on measures of labour market inactivity. We identified indicators of ''adverse economic circumstances'' separately for three age groups: 0–15, 16–64 and ⩾65 years. The aim was to identify the best indicator of economic adversity, for each age group, from each census (table 1), although the censuses vary in the variables they report and we were unable to produce entirely consistent indicators across time.

Data for smaller age groups were not available in 1971 and 1981. The indicator for children focused on their household circumstances as they have no formal relationship with the labour market. The censuses, particularly in earlier decades, offer little detail on the economic circumstances of retired people. In 1971, there were no appropriate census indicators of economic adversity for people aged >65 years and this age group was not included in the adversity index in that year. For the years 1981 to 2001, we selected car access as an indicator of adversity for this age group. Car access is often claimed to have limitations as a measure of poverty, particularly in rural areas.[13] However, it is a strong indicator of social status among the elderly at the individual level[14] and was closely associated with mortality in this age group. The index was the total number of constituency residents in adversity expressed as a percentage of the total population. It was strongly correlated with standard deprivation measures ($r = 0.9$, $p<0.001$ with the Carstairs index, Department of Environment's index of local conditions and Breadline Britain indices in 1991).

The adversity index was used to identify a group of constituencies with pronounced and prolonged economic adversity. We wished to identify a reasonably sized group of areas so as to maximise the chance to detect resilience. As economic adversity generally increased in the UK 1971–91, we opted to identify areas, which, in economic terms, ''started badly, and got worse''. To this end, the third of constituencies with the greatest adversity score in 1971 was identified ($n = 214$). Within this group, the quartile of constituencies with the greatest increase in adversity score between 1971 and 1991 was then isolated. This yielded 54 constituencies, which we labelled as ''persistently disadvantaged''. To confirm the suitability of the group identified, we ranked all 641 constituencies by economic adversity (rank 1 being the most deprived), in 1971 and 1991. The average rank increased from 65 in 1971 to 30 in 1991. In 1971, the least deprived constituency in the group was ranked 193, in 1991 it was 72. This confirmed that the group of 54 were persistently, and perhaps increasingly (in relative terms), disadvantaged.

Comparing mortality in persistently disadvantaged constituencies

All-cause mortality rates were calculated for the 54 constituencies for four time periods: 1981–85, 1986–90, 1991–95 and 1996–2001. Denominators were calculated from census data using straight-line estimates for which the rate of intercensal population change was assumed to be constant. Age and sex standardised mortality rates were calculated for the age groups 0–4, 5–9, 10–14, 15–19, 20–24, 25–29, 30–44, 45–59, 60–64, 65–74, 75–84, ⩾85 years.

Assessing the variety of mortality patterns among the 54 constituencies was a complex task, with 2160 age group, time and area specific mortality rates to compare and contrast. We aimed to identify constituencies which had relatively low mortality, in a wide range of age groups, consistently over time and to take account of the degree of economic adversity experienced. To do this we computed a ''resilience score''.

In step 1, for each age group, in each time period, we calculated the quartile boundaries of the mortality distribution in the group of 54 constituencies.

In step 2, for each of the 54 constituencies, in each time period, we counted the number of age groups with mortality rate within the best quartile of the distribution. We excluded the 5–9 years and 10–14 years age categories from this as small numbers of deaths in these groups made the rates, and thus the quartile boundaries, unstable. Counts for each time period were summed for each constituency.

In step 3, we weighted this total according to the level and persistence of economic adversity experienced across all four time periods. The weights were derived from the number of time periods in which the constituency fell in the worst half of the economic adversity score distribution, with an extra weight added for those areas which were in the worst half in all four time periods. For example, a constituency which was in the most economically disadvantaged half of the group in three time periods, had its score weighted by a factor of 3. A constituency in the most economically disadvantaged half of the group in all four time periods had its score weighted by 5.

Constituencies with an above average resilience score were labelled ''resilient''. Sensitivity analysis determined the extent to which results were method dependent. Results indicated that most constituencies identified as resilient by the system described above, were identified regardless of the precise parameters of the system (data not shown).

Determining the significance of resilience for mortality

The high risk of type 1 error prohibited testing all mortality rates for statistically significant difference.[15] We therefore tested for difference between average age group specific mortality rate in the resilient constituencies, and the rest of the persistently disadvantaged constituencies.

RESULTS

Figure 1 lists the group of 54 constituencies defined as persistently disadvantaged, along with an illustrative subset of age group specific mortality rates for just one time period (1996–2001). Most of the persistently disadvantaged constituencies were in urban areas, with the greatest number in London, Liverpool, Tyneside and Glasgow, but there were some from more rural ex-mining areas in south Wales. Figure 1 shades each cell according to the mortality rate, as described in the table key. Visualising the rates in this way allows the reader

Figure 1 All cause mortality rates by age group for the 54 persistently disadvantaged constituencies, shaded to identify mortality quartile (1996–2001). The constituency resilience scores ranged from 0–85, with a mean of 21.5 and a median of 18. The distribution of scores is shown.

Area		Death rates per 100 000 by age group in years											
		0–4	5–9	10–14	15–19	20–24	25–29	30–34	45–59	60–64	65–74	75–84	85+
	Great Britain	132	12	14	41	55	67	114	443	1122	2541	6335	17061
	Prolonged adversity group	175	15	18	44	56	83	172	676	1648	3366	7461	17474
London	Bethnal Green & Bow	163	13	23	24	30	53	154	654	1440	3156	7037	16945
	Camberwell & Peckham	248	6	16	45	65	87	184	621	1394	3220	6788	17221
	Greenwich & Woolwich	132	14	25	51	49	71	151	568	1452	3087	6731	17056
	Hackney North & Stoke Newington	216	23	15	45	55	56	134	503	1256	2652	5634	13076
	Hackney South & Shoreditch	189	15	28	71	64	81	168	641	1567	2983	6839	15167
	Holborn & St. Pancras	120	16	14	33	58	81	207	734	1638	2712	6763	15199
	Islington South & Finsbury	136	18	19	27	32	61	175	629	1466	3038	6480	17128
	North Southwark & Bermondsey	201	16	16	74	32	52	148	644	1493	3113	6387	14281
	Poplar & Canning Town	200	12	15	32	39	80	147	673	1600	3645	7706	16275
	Tottenham	197	36	20	37	49	61	165	582	1308	2782	6508	15109
	Vauxhall	235	10	17	44	53	84	229	734	1602	3118	6664	14507
	West Ham	171	14	13	35	46	58	183	608	1742	3223	7199	16729
West Midlands	Birmingham, Erdington	220	10	17	48	51	67	151	644	1456	3410	7887	17367
	Birmingham, Hodge Hill	240	8	11	35	54	66	156	612	1268	3188	6999	15834
	Birmingham, Ladywood	278	24	12	32	46	62	220	768	1677	3386	7134	13442
	Birmingham, Sprkbrk & Small Heath	247	19	18	33	65	65	123	633	1430	2753	5948	14272
East Midlands	Nottingham North	166	17	20	65	40	109	142	636	1460	3233	7056	16359
North West	Manchester, Blackley	223	19	20	44	99	161	244	849	1951	3787	7556	17859
	Manchester Central	239	17	38	54	47	105	303	1126	2256	4365	9167	20373
	Manchester, Gorton	196	16	22	33	31	70	183	764	1778	3219	7145	15784
	Salford	150	7	14	50	47	108	179	817	2198	3733	8147	18564
	Birkenhead	161	18	12	43	75	110	196	716	1789	3456	8066	20000
	Bootle	141	11	14	27	40	58	168	680	1580	3418	7555	17013
	Knowsley South	100	7	20	34	60	55	125	544	1610	3153	7621	19497
	Liverpool, Garston	133	12	11	17	51	42	124	559	1383	2850	6978	15284
	Liverpool, Riverside	198	18	23	39	33	97	212	889	1983	4123	8862	21005
	Liverpool, Walton	152	17	24	41	36	79	179	693	1782	3619	7853	19020
	Liverpool, Wavertree	150	12	31	40	39	86	128	630	1547	3139	6824	17234
	Liverpool, West Derby	126	28	17	42	64	82	153	626	1450	3542	7879	18749
Yorks & Hum.	Barnsley East & Mexborough	178	14	28	51	57	68	125	495	1356	3195	7398	18430
	Sheffield Central	193	36	17	46	53	75	155	614	1519	3231	8147	20900
	Kingston upon Hull East	170	10	13	42	60	112	121	556	1574	3241	7874	18750
North East	Newcastle upon Tyne East & Wallsend	134	13	20	43	29	94	118	591	1428	3270	7071	14655
	South Shields	102	12	18	23	42	52	124	535	1506	3134	6975	15899
	Sunderland North	125	20	9	3	41	79	137	627	1489	3235	7041	17520
	Sunderland South	183	9	23	26	64	92	126	545	1427	3289	7733	19924
	Tyne Bridge	133	13	16	69	76	62	188	797	1803	3584	7811	19544
	Easington	133	21	18	54	50	52	132	541	1527	3125	7314	18779
	Middlesbrough	184	15	22	34	47	64	170	685	1566	3347	7317	16396
Wales	Aberavon	158	8	16	42	78	104	154	476	1213	2860	7011	17054
	Blaenau Gwent	154	14	7	45	109	77	124	554	1342	3265	7580	18636
	Cynon Valley	107	8	7	40	83	85	129	522	1529	3284	7397	17559
	Merthyr Tydfil & Rhymney	107	7	22	38	55	106	160	588	1618	3441	8192	18855
	Rhondda	153	10	19	49	115	113	130	564	1479	3229	7782	17667
Central Scotland	Motherwell & Wishaw	117	8	16	66	88	95	160	635	1614	3349	7327	17503
Glasgow	Glasgow Anniesland	138	21	24	55	94	94	212	809	2119	3722	8102	19469
	Glasgow Baillieston	122	14	17	87	119	193	244	790	1996	4057	8833	17744
	Glasgow Cathcart	146	0	8	61	97	86	151	635	1571	2992	6859	16024
	Glasgow Govan	126	10	25	83	71	100	236	890	2150	3789	8352	20151
	Glasgow Maryhill	190	14	23	74	77	118	304	1043	2434	4360	8844	18773
	Glasgow Pollok	122	23	11	83	127	120	226	923	2168	4139	8309	18343
	Glasgow Rutherglen	119	4	12	44	82	79	149	665	1698	3578	8194	19906
	Glasgow Shettleston	191	47	10	73	92	182	316	1165	2602	4315	8063	16684
	Glasgow Springburn	232	21	49	73	102	209	308	1131	2521	4232	8459	17567

Mortality rate in highest quartile of the distribution for this age group	Mortality rate in the 3rd quartile of the distribution for this age group	Mortality rate in the 2nd quartile of the distribution for this age group	Mortality rate in lowest quartile of the distribution for this age group

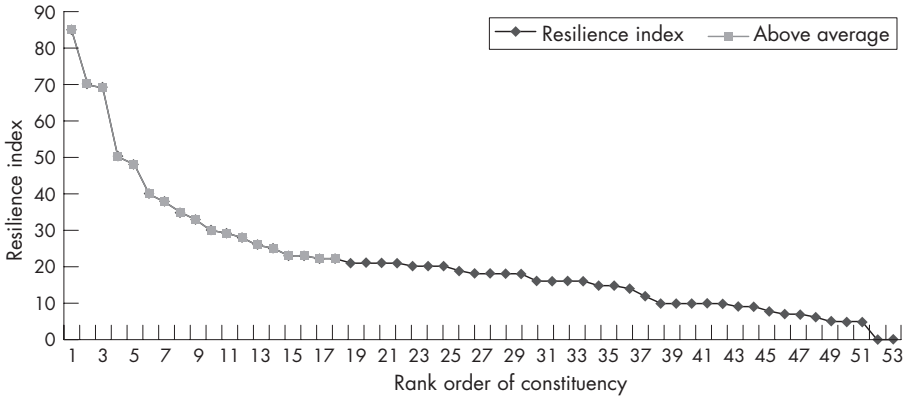

Figure 2 Distribution of the resilience index.

to see easily if, and at which ages, constituencies have relatively low mortality. The shading also serves to highlight between constituency variations in the ages where relatively high or low mortality rates were found. Those in Wales, for example, appear to exhibit relatively higher mortality around ages 20–24 years (roughly 80/100 000), but much lower mortality at younger and older ages. By contrast, some constituencies in the Liverpool area had particularly low rates at these ages, but higher at others. However, variation in mortality by age group within constituencies appeared relatively stable over the four time periods (data not shown).

The constituency resilience scores ranged from 0 to 85 years, with a mean of 21.5 years and a median of 18 years. The distribution of scores is shown in fig 2.

The five constituencies with the highest resilience score seemed distinct within the distribution, the remainder of which suggests that there is a spectrum of resilience. Constituencies with a resilience score value above the average are highlighted in fig 2 and identified in table 2.

Table 3 gives results of the Mann–Whitney U tests for difference in age-specific mortality rate (1996–2001) between the resilient constituencies, and the rest of the persistently disadvantaged group, along with mean mortality rates. Results for other time periods were similar (data not shown).

There were no significant differences in mortality at ages 0–14 years between the resilient and non-resilient, persistently disadvantaged constituencies. As previously noted, at ages 5–14 years there were few deaths and resilient constituencies were not selected on the basis of death rates in these age groups. There were also no significant differences between resilient and non-resilient constituencies at ages 20–24 years. At other ages, the mortality in the resilient areas is consistently and markedly lower than in other economically disadvantaged areas. We tested for differences in mortality between the five most resilient constituencies and the remaining 49 persistently disadvantaged constituencies, finding significantly lower rates among the most resilient for age groups 15–19 years and 30–44 years only (data not shown).

Figure 3 compares the age group specific mortality rates in the resilient and non-resilient constituencies (which shared a similar economic history), and between the resilient constituencies and the British average. Figures are expressed as percentage differences in mortality rate. Thus, a negative value denotes that the rate in the resilient constituency is lower than its comparators, and a positive value denotes a higher rate. The graph shows that mortality among younger adults in the resilient constituencies was about 20–25% lower than in the other persistently disadvantaged constituencies, and about 5–10% lower among older adults. However, at most ages, mortality rates in the resilient constituencies were still higher (20–30%) than the British average.

Table 2 Constituencies with above average resilience score

Constituency name	Rank	Score
Birmingham, Sparkbrook and Small Heath	1	85
Bootle	2	70
South Shields	3	69
Rhondda	4	50
Sunderland North	5	48
Liverpool, Walton	6	40
Birmingham, Hodge Hill	7	38
Liverpool, West Derby	8	35
Bethnal Green and Bow	9	33
Blaenau Gwent	10	30
Liverpool, Garston	11	29
North Southwark and Bermondsey	12	28
Nottingham North	13	26
Birmingham, Ladywood	14	25
Hackney North and Stoke Newington	15	23
Barnsley East and Mexborough	16	23
Liverpool, Wavertree	17	22
Cynon Valley	18	22

DISCUSSION

This study identified a group of constituencies with significantly lower mortality, at a range of ages, relative to other constituencies with similar adverse economic histories. It also showed that ''resilience'' varies markedly by age group and that resilience may be detected in Welsh, but not in Scottish, constituencies. These findings extend those of a previous study, which only focused on England and which used a single measure of life expectancy.[5] A clear finding, however, is that although the resilient constituencies have low mortality relative to their economic peers, their rates remain high relative to the British average. The effects of economic disadvantage on health are lessened but not entirely removed.

Methodological limitations

The results must be considered in the light of limitations in the methods and data. Census frequency limits the measurement of constituency economic trajectory. Unemployment rates within areas can change rapidly over short time periods, meaning both booms and busts may have been ''missed'' if they occurred within an intercensal period. Also, the timing of the census affects what it records. Censuses in 1981 and 1991, for example, fell in the middle of recessions which affected different parts of Britain at different times.[16] Changes in the structure of census data over time meant that the component indicators of adversity for a specific age group could not be held exactly

Table 3 Differences in age specific mortality rates for ''resilient'' and ''non-resilient'' constituencies (1996–2001)

Age group	Mean mortality rate per 100 000 in resilient constituencies (n = 18; 95% CI)	Mean mortality rate per 100 000 in non-resilient constituencies (n = 36; 95% CI)	p Value for difference
0–4	169 (146 to 191)	167 (153 to 181)	0.971
5–9	15 (13 to 18)	15 (12 to 18)	0.569
10–14	17 (14 to 20)	19 (17 to 22)	0.255
15–19	38 (30 to 46)	50 (45 to 56)	0.02
20–24	55 (44 to 67)	65 (57 to 74)	0.099
25–29	71 (63 to 80)	96 (84 to 109)	0.005
30–44	144 (133 to 156)	190 (172 to 208)	0.001
45–59	607 (574 to 641)	728 (670 to 787)	0.013
60–64	1470 (1410 to 1531)	1759 (1645 to 1874)	0.001
65–74	3188 (3075 to 3302)	3472 (3321 to 3622)	0.045
75–84	7081 (6798 to 7363)	7665 (7426 to 7904)	0.013
⩾85	16 512 (15 663 to 17 362)	17 829 (17 232 to 18 427)	0.029

constant. Furthermore, the cultural and socioeconomic character of life in Britain also changed substantially between 1971 and 2001, making comparison of adversity over time more difficult. For example, labour market activity of women changed considerably between 1971 and 1991 and will have changed the probability of economically inactive women describing their status as ''unemployed'' in the census.

However, the adversity scores themselves were not central to the identification of lower than expected mortality once the group of persistently disadvantaged constituencies had been defined. The group included a wide range of types of areas, both urban and rural, from across Britain, suggesting that the measure reflected a wide range of experiences and was not overly sensitive to one type of adversity at the expense of others.

The definition of resilience adopted by us was conditional on economic disadvantage. An area could only be identified as being resilient if it was in the most disadvantaged third of constituencies in 1971 and in the 25% of that group which experienced the greatest subsequent increase in adversity. Although this approach had the advantage of simplicity, these inclusion criteria will have influenced the results. Sensitivity analyses suggested that varying the parameters of the selection process did not dramatically change the list of areas identified as resilient. Nonetheless, areas which were not already in economic adversity in 1971, but which had catastrophic decline afterwards, and those which were very disadvantaged in 1971, but which did not decline a great deal further, were excluded.

We recognise that our choice of areal units will have dictated the results to some extent—this is the perennial problem of ecological analysis. Constituencies are relatively large and heterogeneous. Smaller resilient neighbourhoods may have been ignored because their candidacy was diluted by aggregation with other neighbourhoods that made up the constituency. Further work to explore the effect of areal unit selection is required.

In calculating the resilience score, constituencies were credited for each age group in which they had mortality rates in the lowest quartile of the distribution, relative to their economic peers. This approach has an important advantage in recognising that mortality varies by age. However, using quartiles to assess a distribution means that a group of death rates are always identified as ''best'', regardless of how low they actually are. Yet, if variation in mortality rates within the persistently disadvantaged constituency group was random, the resilience scores would be generally similar (fig 1 shows they are not) and there would be no significant difference in mortality between the constituencies with higher and lower resilience scores.

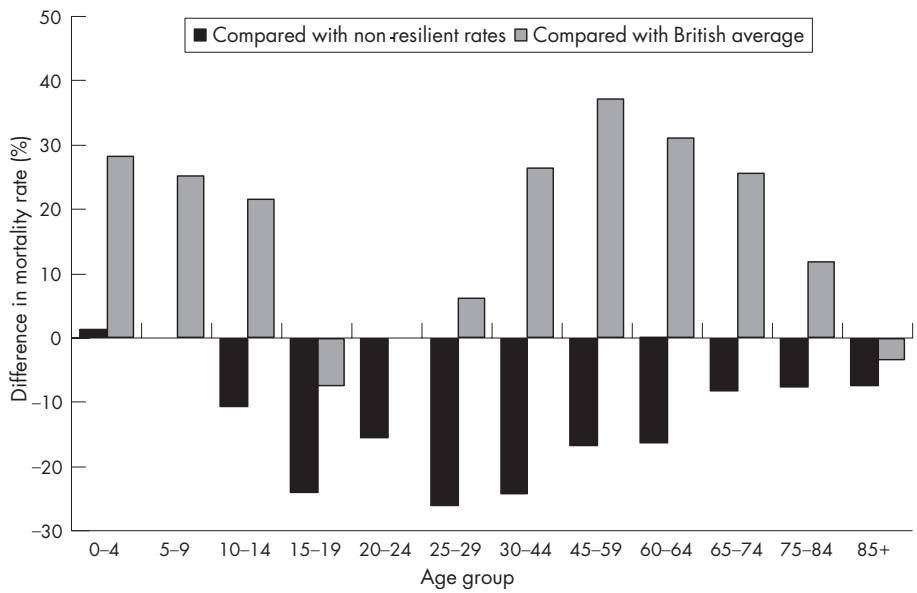

Figure 3 Comparison between mortality in resilient and non-resilient constituencies, and between resilient constituencies and the British average (1996–2001).

What is already known

- Adverse socioeconomic circumstances in an area usually have an adverse affect on population health.
- Those who do get by, or even thrive, in a situation where most would suffer or do badly are called ''resilient''.

What this paper adds

- This study is the first to identify a group of areas in Britain which had prolonged economic adversity, but which have considerable lower age group specific mortality relative to other constituencies with the same adverse economic histories.
- Diversity in the range of ages where mortality is lower, and in the types of area identified, suggests that there is no single factor responsible for this apparent resilience.
- The processes which convert economic adversity into higher mortality are weakened in some disadvantaged areas, perhaps by selective migration, by protective characteristics of the community, or by progressive local policies.

Finally, the present analyses and results are not disaggregated by sex. Men and women can have different exposures and responses to material deprivation. We intend to present these analyses in a dedicated paper at a future date.

Explaining the results

Although this secondary analysis was not designed to explain the resilience it has detected, it is useful to consider some plausible hypotheses. In this section we ''prepare the ground'' for future work to explain the results.

Exploration of the mortality rates by cause (data not shown) shows that some areas have lower than expected rates of cancer, whereas others did well in cardiovascular disease, suicide or even accidental deaths. This diversity (hence the variety of aetiological pathways which must be being influenced), strongly suggests that there is no simple ''x factor'' which is protecting health in these areas.

It must also be remembered that these analyses are of people grouped by area, not of individuals. Processes which influence area level mortality can be at both an individual and an ecological level.[17] Macintyre *et al*[17] offer a range of characteristics by which the influences on health in an area can be assessed and we use an adapted version of these to weigh possible mechanisms by which the resilience might be occurring.

The composition of an area's population is usually the greatest influence on its mortality rate. An economically disadvantaged area may, for example, ''acquire'' lower mortality via selective immigration of a healthier population.[18 19] Retaining or attracting population can also stem the erosion of public services and foster social capital, benefiting both the incoming and existing populations.[20] Population loss 1971–91 was about one third lower in the resilient constituencies compared with the 36 other persistently disadvantaged areas. It thus seems plausible that the resilient areas have done better at retaining, or attracting new, population and that this may have contributed to their resilience. However, even if keeping or attracting population is part of the process by which population level health resilience is attained, the question remains: why do some areas succeed in these processes while others apparently do not?

Policy implications

- There are practices and policies which weaken the detrimental health effects of economic decline in an area.
- If some areas can resist the translation of economic adversity into higher mortality, other areas can learn from their policies and approaches, so that they are better protected when economic recessions arrive.

Macintyre *et al*[17] also suggest five types of features of the local area, which could influence residents' health. These are: (1) physical features of the environment shared by all residents in a locality (eg, quality of air and water, latitude and climate); (2) the availability of healthy environments at home, work and play; (3) services provided, publicly or privately, to support people in their daily lives (including education, transport, policing, health and welfare services); (4) sociocultural features of a neighbourhood (including the political, economic, ethnic and religious history of a community: norms and values); and (5) the reputation of an area (how it is perceived by residents, service or amenity planners and providers, and investors). Initial investigation has yielded some evidence for positive characteristics under each of these headings, in at least some of the resilient constituencies. The geographical diversity of the resilient constituencies makes it unlikely that they all offer similarly benign or beneficial physical environments. The shared experience of economic adversity, and in many cases, community ties based on former industry of occupation, ethnic or religious identity, makes these constituencies a group in which levels of social cohesion are perhaps higher than average. However, this hypothesis remains to be tested. Further systematic research is underway to determine the recipe for resilience.

ACKNOWLEDGEMENTS

We are grateful to Prof Mel Bartley for comments on an earlier draft.

Authors' affiliations

Helena Tunstall, University of Glasgow, Glasgow, UK
Richard Mitchell, Research Unit in Health, Behaviour and Change, University of Edinburgh Medical School, Edinburgh, UK
Julia Gibbs, Blake Stevenson, Edinburgh, UK
Stephen Platt, University of Edinburgh, Edinburgh, UK
Danny Dorling, University of Sheffield, Sheffield, UK

Funding: This work was funded by the United Kingdom Economic and Social Research Council as part of the Research Priority Network on ''Human capability and resilience'' project no L326253061. RM and SP are also funded by the Chief Scientists Office of the Scottish Executive Health Department. The opinions are of the authors, not the funders.

Competing interests: None declared.

REFERENCES

1 **Mitchell R**, Shaw M, Dorling D. *Inequalities in life and death: what if Britain were more equal*. Bristol: Policy Press, 2000.
2 **Mitchell R**, Gleave S, Bartley M, *et al*. Do attitude and area influence health? A multilevel approach to health inequalities. *Health Place* 2000;**6**:67–79.
3 **Townsend P**, Davidson N, Whitehead M. *Inequalities in health: the black report*. Harmondsworth: Penguin, 1982.
4 **Shaw M**, Dorling D, Gordon D, *et al*. *The widening gap: health inequalities and policy in Britain*. Bristol: Policy Press, 1999.
5 **Doran T**, Drever F, Whitehead M. Health under- and over-achievement in English local authorities. *J Epidemiol Community Health* 2006;**60**:686–93.
6 **Luthar S**, Zelazo L. Research on resilience: an integrative review. In: Luthar S, eds. *Resilience and vulnerability:adaptation in context of childhood adversities*. Cambridge: Cambridge University Press, 2003:510–50.
7 **Adger WN**. Social and ecological resilience: are they related? *Progress in Human Geography* 2000;**24**:347–64.

8 **Stewart M**, Reid G, Buckles L, *et al. Atlantic Health Promotion Research Centre. A Study of Resiliency in Communities*. Ottawa: Office of Alcohol, Drug and Dependency Issues, Health Canada, 1999.
9 **Mitchell R**, Backett-Milburn K. *Health and resilience: what does a resilience approach offer health research and policy?* Edinburgh: RUHBC, University of Edinburgh, RUHBC Findings series, 2006.
10 **Gerrard N**, Kulig J, Nowatzki N. What doesn't kill you makes you stronger: determinants of stress resiliency in rural people of Saskatchewan, Canada: *J Rural Health* 2004;**20**:59–66.
11 **Mitchell R**, Dorling D, Martin D, *et al*. Bringing the missing million home: correcting the 1991 small area statistics for undercount. *Environ Plan A* 2002;**34**:1021–35.
12 **Jarman B**, Townsend P, Carstairs V. Deprivation indices. *BMJ* 1991;**303**:523.
13 **Shucksmith M**. *The definition of rural areas and rural deprivation*. Edinburgh: Scottish Homes, 1990:2.
14 **Gardiner C**, Hill R. Analysis of access to cars from the 1991 UK census samples of anonymised records: a case study of the elderly population of Sheffield. *Urban Studies* 1996;**33**:269–81.
15 **Altman DG**. *Practical statistics for medical research*. London: Chapman and Hall, 1991.
16 **Green AE**, Owen DW, Winnett CM. The changing geography of recession — analyses of local-unemployment time-series. *Transact Institute Br Geographers* 1994;**19**:142–62.
17 **Macintyre S**, Ellaway A, Cummins S. Place effects on health: how can we conceptualise, operationalise and measure them? *Soc Sci Med* 2002;**55**:125–39.
18 **Bentham G**. Migration and morbidity—implications for geographical studies of disease. *Soc Sci Med* 1988;**26**:49–54.
19 **Brimblecombe N**, Dorling D, Shaw M. Migration and geographical inequalities in health in Britain. *Soc Sci Med* 2000;**50**:861–78.
20 **Davey Smith G**, Shaw M, Dorling D. Shrinking areas and mortality. *Lancet* 1998;**352**:1439–40.