Monitoring inequalities in health expectancies in England – small area analyses from the Census 2001 and General Household Survey 2001–05

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Abstract

Background

Deprivation and ill health are intimately linked. Monitoring this relationship in detail and with sufficient frequency is key in attempts to reduce health inequalities through more efficient targeting of healthcare resources. This study explores the potential of the General Household Survey (GHS) to provide an inter-censal measure of health expectancies in small areas experiencing differing degrees of deprivation.

Methods

The prevalence of health status and the health expectancy of males and females at birth and at age 65 by quintiles of small area deprivation are estimated. Comparisons are made between census 2001 and GHS 2001-05 to inform the suitability of the latter as an inter-censal measure of health expectancy across small areas. Comparisons are also made between the health expectancies of people living in more and less deprived areas.

Results

Reports of 'good' and 'fairly good' health fell and health expectancies declined as deprivation increased. Consistency between census and GHS data indicates that the latter is a suitable source for the inter-censal measurement of health expectancies across quintiles of deprivation. At birth, people living in the least deprived areas can expect more than 12 additional years of life in good or fairly good health than those in the most deprived areas, at age 65 the difference was more than four years. In terms of the proportion of life spent in favourable health states; at birth, those living in the least deprived areas could expect to spend around 91 per cent or more of their lives in good or fairly good health compared to 82 per cent for those in the most deprived areas. At age 65, people in the least deprived areas could expect to spend around 82 per cent of their remaining life in good or fairly good health compared to 69 per cent or less for those in the most deprived areas.

Conclusions

This study represents the first use of the Index of Multiple Deprivation (IMD) 2004 in the measurement of health expectancy across small areas. Both the census and GHS highlighted substantial differences in the health status and health expectancies of people experiencing differing degrees of ecological deprivation. These findings serve as a useful measure and benchmark in the targeting and assessment of interventions designed to ameliorate health inequalities.

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Introduction

The relationship between ecological (area based) measures of deprivation and health status measures are often used to determine the presence and scale of health inequality within national populations. These findings are used to assess different health needs and inform the targeting of health resources to reduce health inequalities.

The decennial census of the UK population provides a robust data source with which to explore health inequalities across a number of factors, including area-based deprivation. However, such analyses are only possible at ten year intervals, reducing scope to monitor progress during the inter-censal period. To assess change in health inequalities at more frequent intervals, alternative sources must be explored. Ideally a source should align closely with the census and be sufficiently large in sample terms to enable accurate estimates of populations of interest computed previously using census data.

This report explores the potential of the General Household Survey (GHS) to provide an accurate inter-censal measure of inequality in health expectancies across groups of small areas that experience differing levels of deprivation.

The Department of Health (DH) funded this project as part of a wider programme of work, focusing on the measurement of inequalities in health.

Background

There is a clear relationship between composite measures of health status, such as health expectancies (HE), and measures of socio-economic position (White *et al.* 1999, Melzer *et al.* 2000, Mackenbach *et al.* 2008). However, the incomplete assignment of socio-economic position at an individual level in death registrations, and the absence of inter-censal population estimates disaggregated by socio-economic position, restricts analyses of HE by the National Statistics Socio-economic Classification (NS-SEC), for example, mainly to longitudinal data sources.

To overcome this limitation, measures of deprivation assigned to small areas have often been used as alternative indicators of socio-economic position and several studies report a clear, linear association between health and level of deprivation, however each is defined (Bajekal 2005, O'Reilly, Rosato and Patterson 2005, Wood *et al.* 2006, Morgan and Baker 2006, Rasulo, Bajekal and Yar 2007). Measures of disadvantage based on area deprivation combine individual and environmental characteristics at a given point in time and provide a greater depth of analysis than measures based on occupation and employment status alone (MacIntyre, MacIver and Sooman 1993, Bajekal 2005).

The decennial census provides a wealth of data to explore the relationship between health and area deprivation, however its use to measure change over time is restricted to ten year intervals. Inter-censal analyses provide the opportunity to monitor progress in reducing inequalities in health at more frequent intervals.

Identifying a consistent and continual annual data source of sufficient size and complexity that is coherent with the decennial census is key to producing an inter-censal measure of inequalities in health expectancy. For such a measure to be worthwhile for informing policy, it must be: temporally distinct from the census year; deliverable at least once between census years; able to clearly and precisely distinguish between area deprivation clusters. One likely source is the GHS; which is now the General lifestyle module (GLF) of the Integrated Household Survey (IHS). This survey carries a general health question consistent with the Census 2001, and is currently in use to inform national estimates of Healthy Life Expectancy (HLE). With an annual sample of approximately 20,000 people in England, this survey is small compared to the census, but the data collected over several years can be combined to produce a larger aggregated dataset. In national estimates of HE, for example, current practice is to combine three years of GHS/GLF survey data (Smith, Olatunde and White 2010).

A further concern surrounds the measure of deprivation used in assessing health inequality. Previous studies have used the Carstairs index (Carstairs and Morris 1991) to define distinct geographical areas of deprivation, both at census and inter-censally using the Health Survey for England (HSE) (Bajekal 2005, Rasulo, Bajekal and Yar 2007). However, it is not possible to update the Carstairs index after 2001; an integral component, namely the Registrar General's Social Class (RGSC), has ceased collection in national surveys. Moreover, there is a lack of comparability between the census 2001 and HSE due to differences in the question used to capture general health prevalence in the population.

The Index of Multiple Deprivation (IMD), first introduced in 1999 for electoral wards, is a viable alternative to the Carstairs index; providing a numeric indicator of ecological deprivation based on

relative scores across a number of distinct domains such as income, employment and health. In 2004 the IMD was updated to allow for analysis at Lower Super Output Area (LSOA) geographies (Noble *et al.* 2004) see Box 1.

GHS data can be readily assigned to LSOA level deprivation groupings according to IMD 2004 through postcode matching. Restricting the analysis to quintiles of deprivation and combining five years of GHS data provides a sample of approximately 20,000 people for each quintile, which is sufficient for calculating an inter-censal estimate of health expectancy. Moreover, after the initial five year aggregated period, it is feasible to update the measure prior to the Census 2011, using subsequent years of GHS/GLF data to track change in the gap in health expectancies.

This study assesses the potential of using the GHS as a data source for the inter-censal measurement of inequalities in HE across quintiles of ecological deprivation as defined by IMD 2004. The initial focus compares health status prevalence and HLE by age and gender for each quintile of deprivation calculated from Census 2001 data and GHS 2001–05 (centred on 2003) data. The similarity of quintile specific estimates and therefore the inequality using each data source will indicate the usefulness of the GHS to provide an inter-censal measure of the inequality in HE by area deprivation.

Methods

The analyses in this report contain the prevalence of self-reported health status among the private household population of England; residents of communal establishments are excluded because the GHS does not survey the institutional population. The suitability of the five year aggregated GHS data to provide an inter-censal measure of HE between areas experiencing different degrees of deprivation is assessed by comparing the conformity of its estimates of health status prevalence and health expectancy with those based on the Census 2001 data. Boxes 2, 3 and 4 provide brief descriptions of the survey data and methods used during this study.

Box 1 Area deprivation

IMD 2004 combines seven distinct domains of data to produce a single measure of relative deprivation for each LSOA in England; similar measures have also been constructed for Wales, Northern Ireland and Scotland (Noble *et al.* 2001; 2003, National Assembly for Wales 2005). LSOAs are relatively homogenous in terms of population size and structure; each has approximately 1,500 residents. In this study, the 32,482 LSOAs in England are ranked into quintiles in order to achieve a sufficiently large sample size for subsequent analyses of survey data. Although these quintiles represent a continuum of relative deprivation, there is likely to be a significant degree of heterogeneity within each, such that (for example) those at the bottom of quintile 1 are more closely related to those at the top of quintile 2 than those at the top of quintile 1.

The IMD has been criticised as conceptually difficult when used in health related studies since it includes a 'health' domain to calculate relative levels of area deprivation (Morgan and Baker 2006). Therefore, measurements of health using the IMD as a geographical 'anchor' may potentially suffer from 'mathematical-coupling' where the integral health domain of the IMD influences the relationship with the health outcome under investigation. Recent studies, however, have found little evidence to support this effect, concluding that the presence or absence of the health domain in the IMD 2004 has little or no effect on observed health inequalities, particularly when using general health, limiting chronic illness and/or mortality as outcome measures (Adams and White 2006, Gartner *et al.* 2008).

Box 2 Survey data

Data relating to residents of private households in England were collected from Census 2001 and the GHS 2001–05. An aggregation of five years of GHS data achieves a sufficiently large sample for meaningful analysis across quintiles of deprivation. A similar approach is used in the annual ONS estimates of health expectancies for England.

Census and GHS records were mapped to LSOA geographical boundaries using a postcode identifier, and assigned to the relevant quintile of the IMD 2004 for that area. Census and GHS populations were evenly distributed across deprivation quintiles, each quintile contributing around one-fifth of the population/survey sample (see Table 1).

Residents of communal establishments were excluded from the census data to allow better comparison with the GHS which does not collect this data. It should be noted, however, that mortality data used to calculate HE includes deaths in both private household and communal establishment populations.

Table 1 The number and distribution of private household residents in England responding to the Census in 2001 and to the GHS in 2001–05 by IMD 2004 area deprivation quintile

England		Numbers/ Per cent		
Deprivation quintile	Census 2001 ¹	GHS 2001–2005		
	Persons (000's)	Per cent	Persons	Per cent
1 – Least deprived	9,694	20.1	20,847	21.4
2	9,682	20.1	19,831	20.3
3	9,631	20.0	19,536	20.0
4	9,596	19.9	18,249	18.9
5 – Most deprived	9,645	20.0	18,896	19.4
Total	48,248	100	97,539	100

1 Source: Census 2001. Crown Copyright applies unless otherwise stated, Copyright@ons.gov.uk

Box 3 Health status prevalence

The prevalence of health status by sex and five year age–band was derived from responses to the following general health question asked in both census 2001 and GHS 2001-05:

‘Over the last 12 months would you say your health has on the whole been....

Good

Fairly Good

Not good

In this analysis, a binary measure of general health is used to distinguish states of ‘good’ and ‘poor’ health; specifically, responses to the general health question were dichotomised by collapsing those reporting ‘good’ or ‘fairly good’ health into a single state of ‘good’ health. The remainder were classified as being in ‘poor’ health. In comparisons of health status prevalence between census and GHS, data were age standardised to the European standard population to control for the possibility of differences in the age structure between the 2001 census and the GHS samples used.

Box 4 Health expectancies (HE); healthy life expectancy (HLE) and disability free life expectancy (DFLE)

HLE is partly derived from health status prevalence (see Box 3) and partitions life expectancy (LE) into periods of 'good' and 'not good' health. DFLE is partly derived from reports of limiting long-standing/term illness.

HE were calculated using the Sullivan method, combining prevalence and mortality data and mid-year population estimates (MYPE) (Sullivan 1971, Jagger 1996). LSOA level MYPE and mortality data are not available prior to 2001, therefore estimates of HLE derived from Census 2001 data use mortality data only from 2001 and the Census population was used as a proxy measure of the MYPE. For estimates of HLE and DFLE based on the GHS, all data (survey, mortality and MYPE) were aggregated over the period 2001-05.

Comparisons were made between census and GHS based estimates of HLE for males and females at birth and at age 65 across deprivation quintiles.

Results

Comparison of health status prevalence and HLE by area deprivation quintile according to Census 2001 and GHS 2001–05

Health Status prevalence

Both Census and GHS data showed a similar, consistent pattern of increasing prevalence of 'poor' health with rising levels of deprivation and a greater degree of inequality between extremes of deprivation for males compared to females (see Table 2).

Table 2 Comparison of age standardised rates of 'poor' health amongst residents of private households in England by IMD 2004 quintile and sex, Census 2001 and GHS 2001–05

England			Per cent	
Deprivation quintile	Census 2001 ¹		GHS 2001–2005	
	Males	Females	Males	Females
1 – Least deprived	4.4	4.9	5.9	7.2
2	5.6	6.0	7.8	8.7
3	7.0	7.3	8.6	10.1
4	9.2	9.4	11.2	12.5
5 – Most deprived	13.2	13.1	16.4	16.8
Ratio (5/1)	3.0	2.7	2.8	2.3
95% CI of ratio	3.0–3.0	2.7–2.7	2.6–3.0	2.2–2.5
England	7.7	7.9	9.6	10.8

Significant difference between males and females

Significant difference between males and females and Census 2001 and GHS 2001–05

1. Source: Census 2001. Crown Copyright applies unless otherwise stated, Copyright@ons.gov.uk

At national level, the prevalence of 'poor' health was somewhat higher according to the GHS compared to the census and the gender gap was also more pronounced. Approximately 8 per cent of males and females were in 'poor' health according to census and around 10 and 11 per cent of males and females, respectively, were in 'poor' health according to the GHS.

Compared to the census, the prevalence of 'poor' health was higher for both males and females in the GHS in each quintile of deprivation and this difference was greatest in those living in the most deprived areas. As with national figures, the gender gap was also more pronounced in the GHS compared to the census at each quintile of deprivation.

In the 2001 Census, the prevalence of 'poor' health for males living in the most deprived fifth of LSOAs was three times higher than for males living in the least deprived areas. For females the equivalent inequality was narrower; the prevalence of 'poor' health in the most deprived areas being 2.7 times higher than in the least deprived areas.

Similarly, in the GHS the prevalence of 'poor' health for males in the most deprived areas was 2.8 times higher than in the least deprived areas. The equivalent inequality was again less pronounced for females, the prevalence of 'poor' health being just 2.3 times higher in the most compared to the least deprived areas.

Healthy life expectancy

As with health prevalence, census and GHS estimates of HLE showed similar and consistent patterns across the deprivation quintiles and between the sexes. For both sources, each quintile of deprivation in the cohorts of males or females at birth or at age 65 was significantly different. Estimates of HLE got significantly worse with increasing levels of deprivation and were lower at

birth and at age 65 for males compared to females. In addition, the difference between the extremes of deprivation was greater for males than for females (see Table 3).

Table 3 Census 2001 and GHS 2001–05 estimates of HLE for males and females at birth and at age 65

England											Years/ Per cent	
Deprivation quintile	Males						Females					
	Census 2001			GHS 2001-05			Census 2001			GHS 2001-05		
	At birth	Lower 95 per cent	Upper 95 per cent	Lower 95 per cent	Upper 95 per cent		At birth	Lower 95 per cent	Upper 95 per cent	Lower 95 per cent	Upper 95 per cent	
	HLE	CI	CI	HLE	CI	CI	HLE	CI	CI	HLE	CI	CI
1- Least deprived	74.8	74.7	74.8	73.8	73.3	74.2	77.4	77.4	77.4	75.9	75.4	76.3
2	72.6	72.5	72.6	71.2	70.7	71.6	75.6	75.6	75.7	73.3	72.8	73.8
3	70.5	70.4	70.5	69.5	69.0	69.9	73.7	73.7	73.7	71.8	71.3	72.3
4	67.1	67.1	67.1	65.7	65.2	66.2	70.8	70.8	70.8	68.6	68.1	69.2
5 - Most deprived	61.7	61.6	61.7	59.5	58.9	60.0	66.2	66.1	66.2	63.7	63.1	64.3
Range	13.1	13.1	13.1	14.3	13.6	15.0	11.2	11.2	11.3	12.2	11.4	13.0
England	69.3	69.3	69.3	68.0	67.8	68.3	72.8	72.8	72.8	70.7	70.5	71.0
At age 65												
1- Least deprived	15.0	15.0	15.0	15.0	14.6	15.3	17.1	17.1	17.1	17.2	16.8	17.5
2	14.0	14.0	14.0	13.9	13.5	14.2	16.2	16.2	16.2	15.7	15.3	16.1
3	13.1	13.0	13.1	13.0	12.6	13.3	15.3	15.3	15.3	15.3	15.0	15.7
4	11.7	11.7	11.7	11.5	11.1	11.8	14.1	14.1	14.1	13.8	13.4	14.2
5 - Most deprived	10.0	10.0	10.0	9.5	9.1	9.9	12.4	12.4	12.4	12.3	11.9	12.7
Range	5.0	5.0	5.0	5.5	4.9	6.0	4.7	4.7	4.8	4.8	4.3	5.4
England	12.8	12.8	12.8	12.7	12.5	12.8	15.0	15.0	15.0	14.9	14.7	15.1

Significant difference in HLE between Census and GHS

HLE was lower for males and females at birth in the GHS compared to census; but estimates at age 65 were similar in both data sources. At national level, HLE for males at birth according to census was around 69 years, significantly higher than in the GHS where HLE was approximately 68 years. Similarly HLE was significantly higher at census for females at birth; 72.8 years compared to the GHS at 70.7 years.

By deprivation quintile, estimates of HLE at birth for males and females were also significantly greater in the census compared to the GHS. Additionally, the inequality of HLE between the least and most deprived quintiles was greater in the GHS than in the census; 14.3 vs. 13.2 years for males and 12.2 and 11.2 years for females in the GHS and census respectively. The difference in the scale of inequality between genders, however, was similar at around 2 years in each data source.

At age 65, estimates of HLE for males and females according to census and GHS data were largely equivalent. Nationally at this age, HLE was 12.8 and 12.7 years for males and 15.0 and 14.9 years for females according to census and GHS based data respectively.

For each quintile at age 65, estimates of HLE for males and females were comparable across sources with one exception: among females in quintile 2, HLE was significantly higher at 16.2 years according to census compared to only 15.7 years according to the GHS.

Confidence intervals (CI), signifying the precision of estimates of HLE, were substantially narrower for census based estimates compared to those derived from the GHS. However the 95 per cent CI surrounding estimates based on GHS data are broadly in line with ONS national HLE series for England – i.e. approximately 1 year at birth and 0.7–0.8 of a year at age 65.

HLE and DFLE by deprivation quintile according to the GHS 2001–05

Healthy Life Expectancy

For the most part, salient points relating to HLE by deprivation quintile according to the GHS 2001–05 are detailed above in the comparison of census and GHS data. Further comparisons of life expectancy (LE), HLE and DFLE and the proportions of life spent either in good or fairly good health or free from a limiting long-standing illness or disability by quintile of deprivation according to GHS 2001–05 are shown in table 4.

Table 4 **LE, HLE and DFLE for males and females at birth and at age 65 by area deprivation; GHS 2001–05**

England

Years/ Per cent

Deprivation quintile										
	At birth	LE	HLE	Lower 95 per cent CI	Upper 95 per cent CI	Proportion of life in 'Good'/'Fairly good' Health (%)	DFLE	Lower 95 per cent CI	Upper 95 per cent CI	Proportion of life free from a limiting long- standing illness or disability (%)
Males	1- Least deprived	79.8	73.8	73.3	74.2	92.4	67.7	67.2	68.3	84.9
	2	78.5	71.2	70.7	71.6	90.7	65.3	64.7	65.8	83.1
	3	77.2	69.5	69.0	69.9	90.0	63.7	63.1	64.2	82.5
	4	75.2	65.7	65.2	66.2	87.3	59.8	59.2	60.4	79.5
	5 - Most deprived	72.1	59.5	58.9	60.0	82.5	54.3	53.6	54.9	75.2
	Range	7.7	14.3	13.6	15.0	..	13.5	12.7	14.3	..
	At age 65									
	1- Least deprived	18.2	15.0	14.6	15.3	82.2	12.0	11.6	12.4	65.8
	2	17.4	13.9	13.5	14.2	79.6	11.0	10.6	11.4	63.2
	3	16.8	13.0	12.6	13.3	77.4	10.4	10.0	10.8	61.9
	4	15.8	11.5	11.1	11.8	72.5	9.0	8.6	9.4	56.9
	5 - Most deprived	14.6	9.5	9.1	9.9	65.3	7.5	7.1	7.9	51.3
	Range	3.6	5.5	4.9	6.0	..	4.5	3.9	5.1	..
Females	1- Least deprived	83.3	75.9	75.4	76.3	91.1	69.2	68.6	69.8	83.1
	2	82.3	73.3	72.8	73.8	89.1	67.2	66.6	67.7	81.6
	3	81.4	71.8	71.3	72.3	88.2	66.5	65.9	67.1	81.7
	4	80.0	68.6	68.1	69.2	85.8	62.2	61.5	62.8	77.7
	5 - Most deprived	77.9	63.7	63.1	64.3	81.8	57.7	57.1	58.4	74.1
	Range	5.4	12.2	11.4	13.0	..	11.4	10.6	12.3	..
	At age 65									
	1- Least deprived	20.8	17.2	16.8	17.5	82.5	13.4	12.9	13.8	64.3
	2	20.2	15.7	15.3	16.1	77.8	12.7	12.3	13.1	63.2
	3	19.6	15.3	15.0	15.7	78.2	12.4	12.0	12.8	63.4
	4	18.9	13.8	13.4	14.2	73.3	10.4	10.0	10.9	55.4
	5 - Most deprived	17.8	12.3	11.9	12.7	69.3	9.4	8.9	9.8	52.6
	Range	3.0	4.8	4.3	5.4	..	4.0	3.4	4.6	..

As with HLE, LE declined with increasing levels of deprivation; however the difference between the least and most deprived quintiles was much narrower. The range in LE at birth between the least and most deprived areas was around half that of HLE at birth (range in LE at birth: 7.7 years for males and 5.4 years for females) and two-thirds that of HLE at age 65 for both sexes (range in LE at age 65: 3.6 years for males and 3 years for females).

The proportion of life spent in good or fairly good health, that is, HLE divided by LE, was broadly similar for males and females in each quintile of deprivation but between quintiles this proportion varied notably. At birth, males and females in the least deprived quintiles could expect to spend approximately 91 to 92 per cent of their lives in good or fairly good health, but for the most deprived quintiles this fell to just 81 to 82 per cent; a difference of around 10 per cent between the extremes of deprivation.

For males, in particular, the greatest difference exists between the most (quintile 5) and next most (quintile 4) deprived areas, where the proportional difference was almost as great as that between quintiles 1 to 4 combined.

At age 65, differences in the estimated proportion of remaining life spent in good or fairly good health between quintiles was more extreme than at birth. At this age, the gap between the least and most deprived areas was around 17 per cent for males and 13 per cent for females; however, the incremental change between quintiles was on the whole smoother than at birth.

Disability Free Life Expectancy

As with HLE, there were clear and significant differences between estimates of DFLE in each quintile of deprivation within the cohorts of males and females at birth and at age 65. DFLE was observed to decrease with increasing level of deprivation. Males at birth and at age 65 had significantly lower estimates than females in each quintile and the inequality in estimated DFLE between the least and most deprived quintile was narrower for females than for males (see Table 4).

At birth, males and females living in the least deprived areas could expect some 13.5 (males) or 11.4 (females) more years of life free from a limiting long-standing illness or disability than their counterparts in the most deprived areas. At age 65, the inequality in DFLE between the least and most deprived quintiles was approximately 4.5 years for males and 4.0 years for females. This difference was of a similar magnitude to the inequality between quintiles seen with HLE although the 95 per cent CIs were a little wider, at around 1.1–1.2 years at birth and 0.8–0.9 years at age 65.

At birth, males and females in the least deprived areas could expect to spend around 9–10 per cent more of their lives without a disability than those in the most deprived areas. At age 65, these differences are larger: 14 per cent for males and 12 per cent for females (see Table 4).

Discussion

This report explores the potential of the GHS to provide an adequate inter-censal measure of health inequality between advantaged and disadvantaged populations, defined using the IMD 2004 measure of deprivation at small area level. Initially, comparisons of health status prevalence and

HLE for area-based deprivation quintiles in each data source were undertaken to assess level of conformity. These represent the first use of LSOA level geographical groupings in health expectancy reporting by ONS and provide further supporting evidence of the relationship between deprivation and health found in previous investigations. The strong association of deprivation and health status and health expectancies are consistent with previous research; increasing levels of deprivation equate to shorter lives, and longer periods of life in states of poor health and disability in both absolute and relative terms.

Census 2001 data clearly distinguishes between level of health status and health expectancy by quintile of deprivation. Significantly fewer people residing in the least deprived areas reported poor health than their counterparts experiencing greater deprivation. The reporting of poor health increased in a predominantly linear pattern with increasing deprivation, which produces a substantial gap between the least and most deprived quintiles. In fact these data show that in 2001 there were three times as many people reporting poor health in the most compared to the least deprived areas.

Similar and consistent differentials were found using the GHS in 2001–05, although the prevalence of poor health was greater in each quintile and the inequality between the least and most deprived areas was slightly narrower, significantly so for females.

Survey data were age-standardised and so differences in the ages of respondents between the GHS and census would not account for the differences observed. Differences in the design of the census and GHS however, in addition to the wider time period applying to GHS data, may contribute to the observed differences in the prevalence of poor health between sources.

There is evidence to suggest that respondents completing self-administered questionnaires (such as the census) are subject to 'primacy effects' whereby the uppermost choices in a list are more likely to be selected. In contrast, respondents in face-to-face interviews (such as the GHS) are more likely to be influenced by 'recency effects' where the answers at the bottom of a list are more likely to be selected (Bowling 2005). Such effects could go some way to explain the differences between the census and GHS in this study. Other likely contributors to the observed differences include interviewer prompting in the GHS and proxy effects in the census data whereby forms may be completed by one household member on behalf of another.

It is also noteworthy that studies have shown that face-to-face interviews result in more positive and socially desirable responses, particularly for health status and behaviour, compared with self-administered questionnaires (Bowling 2005). In the GHS, responses to the general health question may vary with other forms of bias such as interviewer characteristics and the social setting in which questions are asked. In contrast, the self-completion nature of the census may present a cognitive burden on respondents as it assumes a certain level of literacy, understanding of the question and ability to recall events without probing. Given the complex interaction of mode effects and responses to the general health question, it is difficult to disentangle their impact on the reported prevalence of poor health in this study.

The patterns in health status prevalence rates were also observed in estimates of HLE. For the census, there was again a clear linear relationship between deprivation and estimates of life spent in good or fairly good health. HLE decreased significantly with each declining quintile leading to a

substantial gap in HLE between those in the least compared to the most deprived areas. Female HLE was significantly higher than for males at birth and at age 65 in each deprivation quintile although the inequality in estimates between the least and most deprived areas was narrower.

For the reasons noted above and because of differences in mortality and mid-year population estimate data used in their construction, estimates of HLE derived from GHS 2001–05 and Census 2001 cannot be directly compared; however, the relationships between HLE and deprivation, between males and females and between areas of deprivation within each cohort at birth and at age 65 are consistent between the GHS and census.

In the GHS 2001–05, the scale of inequality in HE (HLE and DFLE) between the least and most deprived quintiles was substantial. Some 11 to 14 years of HLE separated people residing in the least and most deprived quintiles. Males and females at birth living in the least deprived areas between 2001 and 2005 could expect to spend approximately 91 to 94 per cent of their lives in good or fairly good health compared with only 82 to 86 per cent in the most deprived areas. At age 65, these differences were more pronounced; those in the least deprived areas can expect to spend 82 to 84 per cent of their remaining lives in good or fairly good health states compared with just 65 to 70 per cent for those in the most deprived areas. Similar patterns were observed for DFLE.

The scale of inequality was greater for men than for women at each point in life examined. This concurs with previous evidence on inequalities in LE and HE by socio-economic position. However, the pattern of inequality across social classes or NS-SEC classes in women is more irregular than the predominantly linear pattern in men (Langford and Johnson 2009, White, Van Galen and Chow 2003). However, by area deprivation, the pattern is predominantly linear for both sexes and therefore provides a better indication of graduated need.

The estimates reported here are broadly consistent with those found in a study using Carstairs deprivation twentieths to identify health inequalities between electoral ward groupings (Rasulo, Bajekal and Yar 2007, Morris and Carstairs 1991). In this study, differences in HLE at birth between the least and most deprived twentieth of wards for males and females respectively were 13.4 and 11.8 years at birth and 5.2 and 4.7 years at age 65. The finer gradation used in that study did not lead to an undue difference in the scale of inequality, suggesting breakdowns of areas into fifths on the basis of level of deprivation are adequate for determining the presence of inequality and its scale. The similar findings serve to verify the approach taken here.

As with other studies, results here also show that measures of longevity alone underestimate the magnitude of inequality between areas or extremes of deprivation when compared with measures which combine mortality and morbidity data into a summary index of quality and quantity of life. The gaps in inequality found in HLE and DFLE were much wider than those found in LE. The gaps in HLE and DFLE at birth between the least and the most deprived areas were approximately twice as great as those observed for LE.

We now intend to extend this analysis to cover more recent years of the GHS/GLF in an attempt to monitor changes in health inequalities over time. This planned work will focus on DFLE as the measure of inequality as the general health question used to inform estimates of HLE in this study

was discontinued in the GHS in 2007; replaced by a EU-harmonised question (Smith and White 2009).

Limitations of GHS data

Of primary concern is the precision of estimates of HLE computed by pooling five years of survey data to form quintiles of deprivation populations. This precision is determined by the width of the 95 per cent CIs surrounding estimates of HLE. Ideally the 95 per cent CI should be less than ± 1 year at birth and less than ± 0.5 years at age 65 in order to detect real changes over time. The estimates surrounding GHS based estimates of HLE presented here are a little wider than this target, but broadly equivalent to national estimates of HLE for England and considerably narrower than national estimates for Wales and Scotland. The CIs would become narrower with each additional year of survey data but this would make the time period of the estimate much less desirable as an inter-censal measure.

Despite the fact that the CI's are a little larger than desired, the similarities in the differentials and relationships by deprivation quintile, gender and age between the data sources used in this study, indicates that the GHS is a suitable source for an inter-censal measure health expectancy by quintile of area deprivation. The precision of inter-censal estimates in the near future will improve as data from the Integrated Household Survey core module becomes available for use. This source has a considerably larger sample compared with the GHS/GLF used in this analysis.

Conclusions

The GHS is a useful data source to inform inter-censal estimates of HLE across quintiles of ecological deprivation as defined by IMD 2004 as the pattern observed by level of deprivation concurs with that reported using the Census 2001.

This report provides estimates of LE, HLE and DFLE at birth and age 65 by quintile of deprivation across England for the period 2001–05. As such it provides further evidence of the importance of material deprivation for health outcomes; the clustering of deprivation found in very small population units such as LSOAs serves to guide the targeting of interventions to mitigate differences and set benchmarks to monitor change.

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