

## RESEARCH REPORT

## Neighbourhood environment and its association with self rated health: evidence from Scotland and England

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**Objectives:** To investigate associations between measures of neighbourhood social and material environment and self rated health.

**Design:** New contextual measures added to cross sectional study of a sample of people from the Health Survey for England and the Scottish Health Survey to provide multilevel data.

**Participants:** 13 899 men and women aged 16 or over for whom data on self rated health were available from the Health Survey for England (years 1994–99) and the Scottish Health Survey (years 1995 and 1998).

**Results:** Fair to very bad self rated health was significantly associated with six neighbourhood attributes: poor physical quality residential environment, left wing political climate, low political engagement, high unemployment, lower access to private transport, and lower transport wealth. Associations were independent of sex, age, social class, and economic activity. Odds ratios were larger for non-employed residents than for employed residents. Self rated health was not significantly associated with five other neighbourhood measures: public recreation facilities, crime, health service provision, access to food shops, or access to banks and buildings societies.

**Conclusions:** Some, but not all, features of the neighbourhood environment are associated with self rated health and may be indicators of important causal pathways that could provide a focus for public health intervention strategies. Associations were more pronounced for non-employed residents, perhaps because of greater exposure to the local environment compared with employed people. Operationalising specific measures of the characteristics of local areas hypothesised to be important for living a healthy life provides a more focused approach than general measures of deprivation in the search for area effects.

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Intervening at the area level has become an important strategy to help reduce health inequalities.<sup>1,2</sup> Studies investigating the role of neighbourhood social and material environment in determining health have become increasingly common since a resurgence of theoretical interest in "contextual effects" during the early 1990s.<sup>3,4</sup> Contextual effects have been found for a variety of health outcomes and behaviours including long term illness,<sup>5</sup> mortality,<sup>6,7</sup> smoking,<sup>8,9</sup> and coronary heart disease.<sup>10–12</sup> In a review of multi-level studies of neighbourhood and health, Pickett and Pearl<sup>13</sup> concluded that most studies show some association between contextual factors and health outcomes but that these associations are generally smaller than associations between individual socioeconomic status and health (termed "compositional" effects). Several studies have shown interactions between area and individual characteristics (such as age, gender, social class, and employment status) in predicting health.<sup>5,7,10,14</sup>

### AREA AND SELF RATED HEALTH

Recent papers have investigated neighbourhood effects on self rated health. One study in Amsterdam found that individual and area deprivation fully explained variation in health between areas.<sup>15</sup> Two further studies showed that lower socioeconomic context is associated with self rated health over and above individual sociodemographic and lifestyle factors.<sup>16,17</sup> A study in the south east of England found that area deprivation was associated with poorer self rated health and that this association was mediated by perceived neighbourhood problems (lack of facilities, noise, etc) and perceived housing problems.<sup>18</sup> Longitudinal US data show that people who reported having excellent or good

health in 1965 were at higher risk for having fair or poor health nine years later if they lived in a "poverty" area.<sup>19</sup>

"Non-deprivation" contextual level indicators and self rated health have also been investigated. US state level inequality in voter turnout was associated with self rated health after adjusting for state income inequality and state median income.<sup>20</sup> State level trust and participation was associated with self reported poor health adjusting for sex, low income, race, obesity, smoking, and educational status.<sup>21</sup>

Most studies investigating the residential context and health have important limitations. Area based measures of deprivation are still widely used as global proxies for describing the local social and material environment. These measures are usually aggregated from individual level characteristics (for example, Townsend scores) and thus do not capture broader health promoting or health damaging features of the neighbourhoods themselves. While this critique has been partially addressed by some of the latter studies outlined above, there is still a lack of conceptualisation, operationalisation, and measurement of possible pathways of linking area of residence and health.<sup>22</sup> Socioeconomically disadvantaged areas may suffer from having poor social and material infrastructure such as low quality and quantity of leisure facilities, transport, housing, physical environment, food shopping opportunities, and primary and secondary health services.<sup>22</sup> Concentrated deprivation may also undermine civic engagement and increase crime. These features may influence health directly or indirectly (and different features may influence different health outcomes and vary by sociodemographic group in their impact). Global measures of area deprivation based upon individual characteristics may not capture these features of the local social and material environment and they do not

**Table 1** Neighbourhood attributes and their constituent variables

Neighbourhood attribute	Variables included in factor scores
Physical quality of residential environment	Number of missed waste collections per 100000 collections. Public sector housing vacancy rate (%). Vacant and derelict land (ha).
Public recreation	Number of swimming pools per 100000 population. Number of public branch libraries per 10000 population. Number of leisure attendances per 1000 population.
Crime	Expenditure on police services per capita. Sexual/indecent crimes per 1000 population. Violent offences per 1000 population. Constables by police force area. Special constables by police force area.
Access to multiple owned food shops	Number of multiple owned food stores available in the wider postcode district (three largest companies)
Access to banks and building societies	Number of banks per 1000 population. Number of building societies per 1000 population. Number of ATMs/cash dispensers per 1000 population.
Health services	Number of GP practices per 1000 population. Number of pharmacies per 1000 population. Number of optical practices per 1000 population. Number of dental practices per 1000 population.
Left wing political climate	Political party in power 1997. Political party in power 2001.
Political engagement	Voter turnout in UK election 1997 (%). Voter turnout in UK election 2001(%).
Unemployment	Residents out of work and claiming any benefit per 1000 population. Claimants unemployed over six months (%). Working age pop claiming income support (%)
Access to private transport	Number of cars per 1000 population. Number of private cars per 1000 population. Number of company cars per 1000 population.
Transport wealth (value/prestige)	Percentage of all cars in area with high value/prestige insurance groups (13–16, 17–20)

permit detailed specification of influences and effects. In this paper we aim to “get behind” these global measures of deprivation and investigate whether a range of attributes of local social and material infrastructure, chosen on the basis of a framework of how neighbourhoods might meet universal human needs required for a healthy life, is associated with individual self rated health. We also examine whether those not in paid employment, who might be hypothesised to spend more time in their residential environment, show stronger associations between neighbourhood characteristics and self rated health.

## DATA AND METHODS

### Area sample selection

A sample of 178 census wards in England and 81 postcode sectors in Scotland were drawn from areas included in the Health Survey for England (HSE) and the Scottish Health Survey (SHS).<sup>23</sup> The sample was selected as follows: 109 wards in London and the south east of England (chosen in linked projects using other study cohorts but where HSE participants also happened to reside); 69 wards in the rest of England (chosen randomly from all wards with a minimum of 40 HSE respondents stratified by population density and Carstairs deprivation index); 81 postcode sectors in Scotland (chosen randomly from all postcode sectors with a minimum of 35 SHS respondents stratified as above). Full and part

postcode sectors (administrative units created for the organisation of mail delivery with average population of about 8500) were determined for each English ward using a look up table available from Manchester Information and Data Services.<sup>24</sup> Conversion of geography was required, as most of the relevant data were more widely available for postcode geography. When combined with selected Scottish areas, a total of 425 postcode sectors were available in this analysis.

### Individual data

Within each selected area data on self rated health status and other individual characteristics were drawn from the HSE and SHS for men and women aged 16 or over (n = 13 899). The HSE is a continuous cross sectional survey that started in 1991 and has had a large sample size since 1994. The SHS collected data in 1995 and 1998. Here data from years 1994 to 1999 (HSE) and 1995 and 1998 (SHS) were combined. These surveys are conducted in the home of participants, collect a wide range of health and sociodemographic data by face to face interview and nurse screening visit,<sup>23</sup> and have achieved an estimated response rate ranging from 69% to 81%. Self rated health is used as the health outcome of interest as it is a robust powerful predictor of future mortality and morbidity.<sup>25</sup> Five possible responses to the question on self rated health were dichotomised by assigning 0 to those who answered

**Table 2** Neighbourhood constructs and correlation between them using data from areas in England and Scotland

Construct	Cronbach's $\alpha$	Public recreation	Crime	Food shops	Banks building societies	Health services	Political climate	Political engagement	Unemployed	Private transport	Transport wealth
Quality of residential environment	0.30	0.09	-0.09	-0.13	-0.06	0.004	-0.46	-0.28	0.30	-0.18	-0.40
Public recreation	0.65		-0.48	-0.36	-0.002	-0.09	0.008	0.11	-0.06	-0.01	-0.29
Crime	0.89			0.20	-0.005	0.15	-0.16	-0.34	0.42	-0.32	0.54
Access to multiple owned food shops	0.33				0.06	0.002	0.08	0.02	0.07	-0.07	0.27
Access to banks and building societies	0.87					0.18	0.03	0.003	-0.05	0.16	0.15
Health services	0.73						-0.07	-0.18	0.08	-0.07	0.13
Left wing political climate	0.98							0.48	-0.50	0.43	0.29
Political engagement	0.95								-0.68	0.57	0.07
Unemployment	0.78									-0.68	-0.11
Access to private transport	0.84										0.16
Transport wealth	0.92										

**Table 3** Characteristics of 13 899 Health Survey for England (HSE) and Scottish Health Survey (SHS) respondents and number reporting fair to very bad health

Characteristic	Number (%)	Number (%) reporting fair to very bad health
<b>Sex</b>		
Male	6213 (44.7)	1568 (25.2)
Female	7686 (55.3)	1997 (26.0)
<b>Age</b>		
16–24	1748 (12.6)	297 (17)
25–34	2899 (20.9)	472 (16.3)
35–44	2719 (19.6)	535 (19.7)
45–54	2292 (16.5)	605 (26.4)
55–64	2008 (14.5)	722 (35.9)
65–74	1470 (10.6)	578 (39.3)
75–84	603 (4.3)	276 (45.8)
85+	159 (1.2)	80 (50.3)
<b>Social class</b>		
I	568 (4.1)	55 (9.7)
II	3146 (22.6)	541 (17.2)
III nm	3259 (23.4)	666 (20.4)
III m	2649 (19.1)	845 (31.9)
IV	2331 (16.8)	809 (34.7)
V	943 (6.8)	374 (39.7)
<b>Economic activity</b>		
Employed	7622 (55.0)	1100 (14.4)
Unemployed	660 (4.7)	203 (30.8)
Retired	2419 (17.4)	973 (40.2)
Other (long term sick, homemakers, etc)	3170 (22.8)	1275 (40.2)
<b>Self rated health</b>		
Very good	4686 (33.7)	–
Good	5647 (40.6)	–
Fair	2692 (19.4)	–
Bad	680 (4.9)	–
Very bad	193 (1.4)	–
Data missing	1 (0)	–

very good or good and 1 to those responding fair, bad or very bad. Age, sex, registrar general's occupational social class<sup>26</sup> and whether the respondent was employed, unemployed, retired, or other economically inactive (including students, homemakers, and those who do not classify themselves as long term sick) were also obtained at interview. The mean number of HSE/SHS respondents with complete data on self rated health, social class, economic activity, age, and sex was 34 per postcode sector.

### Contextual data

To each of the 13 899 people in 425 postcode sectors in this study we attached 11 neighbourhood factor scores reflecting aspects of the residents' local social and material environment. The origin of these scores lay in an attempt to measure 17 domains that we have previously argued represent the ways in which neighbourhoods might meet basic human needs (ranging from air, water, food and shelter through education, healing, housekeeping, means of exchange, to play).<sup>22</sup> We have described elsewhere the disjunction between the data one would ideally want to measure these domains and the data that were available at the appropriate spatial scale.<sup>27</sup> In brief, we were only able to collect reasonably robust data on 11 factors. Table 1 describes what constitutes each neighbourhood factor and table 2 shows correlations between the neighbourhood factor scores. Most factors had a high internal reliability, however a Cronbach's  $\alpha$  score of 0.30 for physical residential environment warrants caution over use of this measure. Neighbourhoods were ranked according to each factor score and split into three equal groups (tertiles).

### Data analysis

Analysis was undertaken using a multilevel logistic model to allow for the non-independence of participants clustered

within postcode sectors (MLwiN version 1.10). In a two level model, the overall prevalence of fair to very bad health was estimated (called the fixed effect) and the prevalence in each neighbourhood was allowed to vary from this overall value (called random intercepts). Second order PQL estimates were obtained as these are the least biased.<sup>28</sup> Explanatory variables were added to this basic model. Firstly, each neighbourhood attribute in turn was added. Secondly, we examined the same relations controlling for individual sex, age, social class, and economic activity. Finally we tested for interactions between economic activity, neighbourhood attributes, and health, hypothesising that neighbourhood attributes would have larger effects on non-working participants than those in current employment. Where interactions were indicated ( $p < 0.1$ ), we divided the sample into employed and not employed (comprising unemployed, retired, students, homemakers, and otherwise economically inactive participants) and present results separately.

### RESULTS

Table 3 summarises characteristics of the respondents and bivariate relations with fair to very bad health. Women were slightly over-represented in the sample. As expected, older respondents were more likely to assess their health as fair to very bad, and large differences in self rated health by economic activity and by social class were observed.

Table 4 shows the associations between each neighbourhood attribute and fair to very bad self rated health. Significant increased odds of reporting fair to very bad self rated health were seen for people in neighbourhoods with a poor quality physical environment, a more left wing political climate, lower political engagement, high unemployment, low access to private transport, or low transport wealth. For example, the odds ratio of residents in a neighbourhood with the poorest quality physical residential environment rating their health as fair to very bad compared with those in neighbourhoods with the highest quality residential environment was 1.28 (95% CI 1.09 to 1.49). These associations were attenuated but remained significant after adjustment for sex, age, social class, and economic activity (table 4). There were no significant associations with the remaining factors (public recreation, crime, health services, access to food shops, and access to banks and building societies).

There were suggestions of interactions between economic activity and left wing political climate, health services, public recreation, private transport, and transport wealth in predicting self rated health ( $p < 0.10$ ). With the exception of public recreation, the association with each neighbourhood attribute was greater for non-working participants (table 5). Over and above individual age, sex, and social class, residence in neighbourhoods with poorer quality or quantity infrastructure may have a greater impact on the health of those who are not working, although we note that the power to estimate effects separately for working and non-working participants was not optimal. It was not possible to break the non-working group down into finer categories because of sample size limitations.

### DISCUSSION

Most contextual studies of health tend to be data driven, relying on off the shelf global measures of deprivation derived from the census or other surveys, rather than attempting to conceptualise, operationalise, and directly measure "true" features of the local social and material environment that may affect health.<sup>22</sup> We generated a range of neighbourhood attributes that attempted to capture different facets of neighbourhoods using data from routine and non-routine sources.<sup>27</sup> Despite difficulties obtaining robust, up to date information at the appropriate spatial

**Table 4** Odds ratios (95% confidence intervals) of reporting fair to very bad health by neighbourhood attributes

Independent variables	Tertile	Unadjusted odds ratio	Odds ratio adjusted for sex, age, social, class, and economic activity
<b>Neighbourhood attributes*</b>			
Physical quality of residential environment	High	1	1
	Med	1.23 (1.05 to 1.44)	1.20 (1.04 to 1.38)
	Low	1.28 (1.09 to 1.49)	1.20 (1.05 to 1.38)
Public recreation	High	1	1
	Med	1.02 (0.86 to 1.19)	0.97 (0.79 to 1.20)
	Low	0.99 (0.85 to 1.15)	0.94 (0.77 to 1.16)
Crime	Low	1	1
	Med	1.01 (0.88 to 1.21)	1.06 (0.93 to 1.20)
	High	0.93 (0.80 to 1.08)	1.01 (0.86 to 1.20)
Access to multiple owned food shops	High	1	1
	Med	1.15 (0.98 to 1.33)	1.08 (0.93 to 1.27)
	Low	1.14 (0.99 to 1.29)	1.08 (0.94 to 1.23)
Access to banks and building societies	High	1	1
	Med	0.89 (0.76 to 1.04)	0.88 (0.76 to 1.02)
	Low	1.09 (0.93 to 1.28)	1.07 (0.93 to 1.25)
Health services	High	1	1
	Med	1.03 (0.88 to 1.21)	0.93 (0.70 to 1.09)
	Low	1.05 (0.88 to 1.25)	1.01 (0.86 to 1.20)
Left wing political climate	Low	1	1
	High	1.32 (1.16 to 1.52)	1.29 (1.11 to 1.53)
Political engagement	High	1	1
	Med	1.30 (1.11 to 1.52)	1.22 (1.06 to 1.39)
	Low	1.52 (1.30 to 1.79)	1.26 (1.10 to 1.45)
Unemployment	Low	1	1
	Med	1.36 (1.18 to 1.56)	1.24 (1.08 to 1.42)
	High	1.43 (1.23 to 1.66)	1.27 (1.10 to 1.47)
Access to private transport	High	1	1
	Med	1.25 (1.09 to 1.43)	1.16 (1.00 to 1.37)
	Low	1.56 (1.32 to 1.75)	1.33 (1.11 to 1.59)
Transport wealth	High	1	1
	Med	1.23 (1.08 to 1.43)	1.12 (0.99 to 1.28)
	Low	1.47 (1.25 to 1.72)	1.26 (1.07 to 1.47)
Female			0.98 (0.89 to 1.09)
Age (per one year over age 16)			1.03 (1.02 to 1.03)
Social class (per one class increase)†			1.29 (1.25 to 1.33)
<b>Economic activity</b>			
Unemployed			2.44 (2.01 to 2.96)
Retired			1.82 (1.57 to 2.11)
Other economic activity, inactive men			8.55 (7.01 to 10.30)
Other economic activity, inactive women			2.78 (2.04 to 3.79)

\*The reference for each scale is that which was hypothesised as the most “advantageous” context in which to live for health—that is, the highest physical quality of the residential environment, lowest crime, etc. †A linear association between social class and reporting of fair to very bad self rated health was found and so social class was modelled as a continuous variable ranging from 1 (most advantaged) to 6 (least advantaged).

scale, we found that fair to very bad self rated health was significantly associated with six neighbourhood attributes. A poorer physical quality residential environment, a more left wing political climate, lower political engagement, higher unemployment, lower access to private transport, and lower transport wealth were all associated with poorer self rated health adjusting for individual age, sex, social class, and economic activity. The associations with health of these neighbourhood attributes were generally larger in the non-employed population than among those in paid employment in the same areas.

Similar findings of relations between poor quality physical environment and health have been found in the US. Using the “broken windows” index a study in New Orleans<sup>29</sup> collected data on homes with structural damage, street litter, prevalence of abandoned cars, graffiti, and physical problems with public high schools. Their research showed associations between these poor neighbourhood physical conditions and high gonorrhoea rates. In addition this “broken windows” index explained more of the variance in gonorrhoea than did a poverty index measuring income, unemployment and low

education. A later study by the same authors, which used “boarded up windows” as a proxy for poor neighbourhood conditions in 107 US cities, found that this measure predicted gonorrhoea rates, all cause premature mortality, and premature mortality attributable to malignant neoplasms, diabetes, homicide, and suicide.<sup>30</sup> Areas with poorer quality residential environments may affect health through limiting opportunities for physical activity such as walking, play and sports, or through the increase of stress from “threatening” environmental cues. Our investigation of poor quality residential environments used differing but similar variables in the construct (missed waste collections, public sector housing vacancy rate, and amount of vacant and derelict land) and a different health outcome (self rated health) but does show that similar social, cultural, and cognitive processes that have an impact upon health may be at work in the UK in areas of neighbourhood decline. Reversal of neighbourhood decline may improve the physical and mental health of residents.

Residents in areas with lower political engagement tend to have poorer self rated health. Low political engagement as

**Table 5** Odds ratios (95% confidence intervals) of reporting fair to very bad health for working and non-working participants adjusting for sex, age, and social class

Independent variables*	Terile	Working participants	Non-working participants
		Odds ratios adjusted for sex, age, and social class	Odds ratios adjusted for sex, age, and social class
Physical quality of residential environment	High	1	1
	Med	1.12 (0.93 to 1.35)	1.30 (1.08 to 1.58)
	Low	1.21 (1.02 to 1.45)	1.23 (1.02 to 1.47)
Public recreation	High	1	1
	Med	1.00 (0.83 to 1.22)	1.05 (0.86 to 1.27)
	Low	1.11 (0.93 to 1.33)	0.90 (0.75 to 1.08)
Health services	High	1	1
	Med	0.86 (0.72 to 1.05)	1.16 (0.95 to 1.41)
	Low	0.94 (0.77 to 1.14)	1.09 (0.89 to 1.33)
Left wing political climate	High	1	1
	Med	1.06 (0.89 to 1.25)	1.36 (1.16 to 1.61)
	Low	1	1
Access to private transport	High	1	1
	Med	1.16 (0.96 to 1.41)	1.16 (0.97 to 1.39)
	Low	1.13 (0.93 to 1.37)	1.61 (1.33 to 1.92)
Transport wealth	High	1	1
	Med	0.99 (0.83 to 1.18)	1.23 (1.04 to 1.47)
	Low	1.05 (0.85 to 1.30)	1.47 (1.20 to 1.79)

\*The reference for each scale is that which was hypothesised as the most "advantageous" context in which to live for health—that is, the highest physical quality of the residential environment, etc.

measured by voter turnout may represent marginalisation, social disenfranchisement, and lack of trust in political institutions to bring about change in the local area. This association has been well established in the US<sup>30</sup> but not previously in the UK. Areas with a more left wing political climate also had fair to very bad self rated health. Related work in the UK has shown that voting Conservative in the 1983, 1987, and 1992 general elections had a strong negative correlation with mortality and vice versa when voting for Labour.<sup>31</sup> Those authors also found that Labour and Conservative voting explained more of the variance in mortality than Townsend deprivation score. A further analysis of voting in the 1997 general election found that in terms of absolute mortality improvements, gains in mortality

rates were smaller in areas with a higher percentage of Labour voters.<sup>32</sup>

Neighbourhoods with high unemployment, low access to private transport, and low transport wealth (low value/prestige cars) were also found to predict fair to very bad self rated health. These aggregate measures are often assumed to operate simply as markers of income (or more general material circumstance—for example, low transport wealth cars) but may also provide a more specific focus on the meanings of suffering from multiple deprivation. Studies on the meaning of car access and housing tenure<sup>33, 34</sup> have suggested that in addition to being markers of material circumstance these items may be related to elements of ontological security such as protection, prestige, and autonomy that may have an impact on a range of psychosocial health outcomes (such as self rated health). Similar processes may be operating at an area level in our study.

We also observed that for each of these six neighbourhood attributes, the association with fair to very bad self rated health was larger for non-employed residents than in employed residents, controlling for sex, age, and social class. Those not in paid employment may spend more time in their neighbourhood and thus have greater exposure to local socioenvironmental conditions. Analysis of the 1958 British Birth Cohort suggests that for self rated health there is a cumulative effect at the individual level that is correlated with duration of exposure to adverse personal deprivation.<sup>35</sup> It has also been reported that for common mental disorders there is a contextual effect for those who are not employed.<sup>36</sup> Fewer personal resources may also limit a person's ability to range outside a local area creating greater dependence on what is locally provided. The data also suggest that non-employed residents in areas of low unemployment report better self rated health than those who are unemployed in high unemployment areas, after adjusting for sex, age, and social class. This suggests that features of the local environment may mitigate or amplify the effects of individual deprivation.

Certain limitations must be acknowledged. Income data were missing for a sizeable number of participants. We could have controlled for individual behaviours in our analyses but we were seeking a balance between adding more individual level variables to our model (which may have reduced residual confounding by individual characteristics),

### Key points

- Most studies of area and health tend to be data driven, relying on off the shelf global measures of poor material circumstance derived from the census or other surveys, rather than attempting to conceptualise, operationalise, and directly measure specific features of the local social and material environment that may affect health.
- We generated a range of neighbourhood attributes that attempted to capture different facets of neighbourhoods using data from routine and non-routine sources.
- We found that fair to very bad self rated health was significantly associated with six neighbourhood attributes. A poorer physical quality residential environment, lower political engagement, a more left wing political climate, higher unemployment, lower access to private transport, and lower transport wealth were all associated with poorer self rated health adjusting for individual age, sex, social class, and economic activity.
- We observed that the association with fair to very bad self rated health was generally larger for non-employed residents than for employed residents, controlling for sex, age, and social class.

and over-adjusting (controlling for variables that were themselves on the pathway between neighbourhoods and individual health). This study was cross sectional in nature. Longitudinal studies are required to chart change over time and show whether a lag effect from change in the local environment to health status exists. A further limitation was the use of postcode sectors as an approximation of neighbourhoods. Resident's perceptions of their neighbourhood boundaries are not usually coterminous with administrative or postal boundaries.<sup>22</sup> Residents may define their neighbourhoods in different ways and in this they may be influenced by, among other factors, their age, sex, social background, family size, and mobility. Some contextual variables included here are not coterminous with postcode sectors. Swimming pools and libraries are designed to serve more than a specific postcode sector population. However, we retained these data as they provide a useful (if not precise) approximation of general access to supra-neighbourhood resources. Although these measures would be subject to some mis-specification, resources such as these are available to residents of small areas and "a priori" may vary between local authorities. These should be investigated even if the measures are not ideal at that scale.

Although some of the factors used here predict self rated health, several did not. There is no clear rationale for explaining why some did and some did not. It may be that some area characteristics might influence specific health outcomes or risk factors (for example, food shops and diet, crime rates, and mental health) but not self rated health.

This paper has begun to operationalise and identify the specific features of the neighbourhood environment that are associated with self rated health in England and Scotland. It attempts to "get behind" global measures of area deprivation uncritically used in other multilevel and ecological studies and points towards indicators of important causal pathways manifest in the neighbourhood social and material environment that could provide a focus for public health intervention strategies. Of the comparatively limited number of UK studies that attempt to directly measure a wide number of features of the social and material environment and its association with self rated health, this is the first that shows associations in the UK after adjusting for individual socio-demographic variables. Previous work suggests a contextual mediator between income inequality and health<sup>37, 38</sup> although this work relates to somewhat larger areas than studied here and may only operate in the USA.<sup>39, 40</sup> Our findings provide some evidence that similar social, cultural, and cognitive contextual processes may be at work in England and Scotland. Operationalising pre-theorised measures of the characteristics of local areas required to live a healthy daily life may provide a more focused approach than using general measures of deprivation in the search for causal mechanisms by which area effects may operate, although there are major difficulties in obtaining the area level data one might require.

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## REFERENCES

- Marmot M. Improvement of social environment to improve health. *Lancet* 1998;**351**:57–60.
- Acheson D. *Independent inquiry into inequalities in health*. London: The Stationery Office, 1998.
- Macintyre S, Maciver S, Sooman A. Area, class and health: should we be focusing on places or people? *Journal of Social Policy* 1993;**22**:213–34.
- Phillimore P. How do places shape health? Rethinking locality and lifestyle in north-east England. In: Platt S, Thomas H, Scott S, et al, eds. *Locating health: sociological and historical explorations*. Aldershot: Avebury, 1993:163–78.
- Shouls S, Congdon P, Curtis S. Modelling inequality in reported long term illness in the UK: combining individual and area characteristics. *J Epidemiol Community Health* 1996;**50**:366–76.
- Yen I, Kaplan G. Neighbourhood social environment and risk of death: multilevel evidence from the Alameda county study. *Am J Epidemiol* 1999;**149**:898–907.
- Waizman NJ, Smith KR. Phantom of the area: poverty-area residence and mortality in the United States. *Am J Public Health* 1998;**88**:973–6.
- Duncan C, Jones K, Moon G. Smoking and deprivation: are there neighbourhood effects? *Soc Sci Med* 1999;**48**:497–505.
- Frolich K, Potvin L, Chabot P. A theoretical and empirical analysis of context: neighbourhoods, smoking and youth. *Soc Sci Med* 2002;**54**:1401–17.
- Diez-Roux A, Nieto F, Muntaner C, et al. Neighbourhood environments and coronary heart disease: a multilevel analysis. *Am J Epidemiol* 1997;**146**:48–63.
- Diez-Roux AV, Nieto FJ, Caulfield L, et al. Neighbourhood differences in diet: the atherosclerosis risk in communities (ARIC) study. *J Epidemiol Community Health* 1999;**53**:55–63.
- Sundquist J, Malmstrom M, Johansen SE. Cardiovascular risk factors and the neighbourhood environment: a multilevel analysis. *Int J Epidemiol* 1999;**28**:841–5.
- Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health* 2001;**55**:111–22.
- Stafford M, Bartley M, Mitchell R, et al. Characteristics of individuals and characteristics of areas: investigating their influence on health in the Whitehall II study. *Health Place* 2001;**7**:117–29.
- Reijneveld SA. The impact of individual and area characteristics on urban socioeconomic differences in health and smoking. *Int J Epidemiol* 1998;**27**:33–40.
- Reijneveld SA. Neighbourhood socio-economic context and self-reported health and smoking: a secondary analysis of data on seven cities. *J Epidemiol Community Health* 2002;**56**:935–42.
- Malmstrom M, Sundquist J, Johansson SE. Neighborhood environment and self-reported health status: a multilevel analysis. *Am J Public Health* 1999;**89**:1181–6.
- Stafford M, Marmot M. Neighbourhood deprivation and health: does it affect us all equally? *Int J Epidemiol* 2003;**32**:357–66.
- Yen I, Kaplan GA. Poverty area of residence and changes in depression and perceived health status: evidence from the Alameda county study. *Int J Epidemiol* 1999;**28**:90–4.
- Blakely TA, Kennedy BP, Kawachi I. Socio-economic inequality in voting participation and self-rated health. *Am J Public Health* 2001;**91**:99–104.
- Kawachi I, Kennedy BP, Glass R. Social capital and self-rated health: a contextual analysis. *Am J Public Health* 1999;**89**:1187–93.
- 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.
- University of Essex Data Archive. <http://www.data-archive.ac.uk/findingData/majorStudies.asp> (accessed on 2 Sep 2003).
- MIMAS Postcode sector conversion tables. <http://convert.mimas.ac.uk/main.cfm> (accessed 2 Sep 2003).
- Eriksson I, Unden AL, Elofsson S. Self-rated health. Comparisons between three different measures. Results from a population study. *Int J Epidemiol* 2001;**30**:326–33.
- OPCS. 1991 Census user guide. 44, Social class based on occupation: definitions in terms of standard occupational classification (SOC) unit groups and employment status. London: OPCS, 1991.
- Cummins S, Macintyre S, Davidson S, et al. Measuring neighbourhood social and material context: generation and interpretation of ecological data from routine and non-routine sources. *Health Place* (in press).
- Moerbeek M, van Breukelen GJ, Berger MP. A comparison between traditional methods and multilevel regression for the analysis of multicenter intervention trials. *J Clin Epidemiol* 2003;**56**:341–50.
- Cohen DA, Spear S, Scribner R, et al. Broken windows and the risk of gonorrhoea. *Am J Public Health* 2000;**90**:230–6.
- Cohen DA, Mason K, Bedimo, et al. Neighbourhood physical conditions and health. *Am J Public Health* 2003;**93**:467–71.
- Davey Smith G, Dorling D. I'm all right, John: voting patterns and mortality in England and Wales, 1981–92. *BMJ* 1996;**313**:1573–7.
- Dorling D, Davey Smith G, Shaw M. Analysis of trends in premature mortality by Labour voting in the 1997 general election. *BMJ* 2001;**322**:1336–7.
- Macintyre S, Ellaway A, Der G, et al. Do housing tenure and car access predict health because they are simply markers of income or self-esteem? A Scottish study. *J Epidemiol Community Health* 1998;**52**:657–64.
- Hiscock R, Macintyre S, Kearns A, et al. Means of transport and ontological security: do cars provide psycho-social benefits to their users? *Trans Res D* 2002;**7**:119–35.

- 35 **Power C**, Manor O, Matthews S. The duration and timing of exposure: effects of socio-economic environment on adult health. *Am J Public Health* 1999;**89**:1059–65.
- 36 **Weich S**, Twig L, Holt G, *et al.* Contextual risk factors for the common mental disorders in Britain: a multilevel investigation of the effects of place. *J Epidemiol Community Health* 2003;**57**:616–21.
- 37 **Kawachi I**, Kennedy B, Lochner K, *et al.* Social capital, income inequality, and mortality. *Am J Public Health* 1997;**87**:1491–8.
- 38 **Lynch JW**, Davey Smith G, Kaplan GA, *et al.* Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *BMJ* 2000;**320**:1200–4.
- 39 **Ross NA**, Wolfson MC, Dunn JR, *et al.* Relation between income inequality and mortality in Canada and in the United States: cross sectional assessment using census data and vital statistics. *BMJ* 2000;**320**:898–902.
- 40 **Mackenbach JP**. Income inequality and population health. *BMJ* 2002;**324**:1–2.

## POEM.....

### Hot from the sky

“I interrupt the silence  
to bring to your attention  
the gases that protect the EARTH  
are faced with mass destruction.”  
“I feel it is important  
to give you this information  
because of the severity  
of the situation.”

The sun’s ULTRA-VIOLET RAYS  
have come out to play  
they’re having fun on our skin  
and we are slowly dying  
people bathing in the sun  
it’s time to take cover  
scientific evidence suggests  
these rays can cause skin cancer  
people with a light skin tone  
you’d better beware  
you see you are prone to this  
because your skin is fair.  
The EARTH is crying out in pain  
as her surface turns bone dry  
the ULTRA-VIOLET RAYS  
keep beaming from the sky  
food is getting very scarce  
crops refuse to grow  
man has got himself to blame  
you reap what you sow  
mortality is very high  
hunger and starvation  
we need to act rapidly  
to rectify this situation  
do away with CFC’s  
and other forms of pollution  
otherwise things will crash!  
the end of this CREATION.  
“THINK GLOBALLY,  
ACT LOCALLY.”

“And that concludes  
this brief interruption  
thanks for listening  
thanks for your attention.”

“Don’t have nightmares.”

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