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Neighbourhood deprivation and health: does it affect us all equally?

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Background Neighbourhood socioeconomic status (SES) may affect rich and poor residents differentially. Two models are proposed. Model 1: living in a non-deprived neighbourhood is better for health because better collective material and social resources are available. Model 2: being poor (rich) relative to the neighbourhood average is associated with worse (better) health because of the discrepancy between an individual's situation and those around them.

Methods Individual data from the Whitehall II study covering health, SES, and perceived status were linked to census data on neighbourhood deprivation.

Results Both individual and neighbourhood deprivation increased the risk of poor general and mental health. There was a suggestion that the effect of living in a deprived area was more marked for poorer individuals, although interactions were not statistically significant. Poor people in poor neighbourhoods reported more financial and neighbourhood problems and rated themselves lowest on the ladder of society.

Conclusions We found no evidence that personal poverty combined with affluent neighbourhood had negative health consequences. Rather, living in a deprived neighbourhood may have the most negative health effects on poorer individuals, possibly because they are more dependent on collective resources in the neighbourhood.

Keywords Context, neighbourhood, area deprivation, relative deprivation, multilevel

Evidence is accumulating that the place where a person lives may influence their health, even after accounting for individual risk factors,[1–10] although some studies have found no independent effects of area on health once individual factors have been controlled for.[11–13] On the whole, the literature points to relatively small effects of area characteristics in comparison with the larger effects of individual socioeconomic position,[10] although most findings are based on secondary analysis of existing datasets so may not have identified and measured important area level determinants of health. Some studies have used ecological analyses relating average health in an area to some characteristic of that area, such as neighbourhood socioeconomic status (SES).[14–16] It is argued that a relationship between neighbourhood status and health in these studies cannot be taken to mean that living in a deprived neighbourhood is bad for one's health —the influence of an individual's SES on health may be driving this association. Individual-level data on health and SES and neighbourhood level data on deprivation must be analysed simultaneously to determine whether living in a deprived neighbourhood increases the risk of poor health over and above the effect of individual risk factors. Another possibility is that the health effects of living in a deprived neighbourhood are different for rich and poor individuals. Poorer people tend to live in poorer places and an individual's decisions and options are played out in various settings, including the residential setting. The SES of a neighbourhood may affect rich and poor individuals' decisions and options, and ultimately their health, differentially. We are now dealing with the interaction between person and place in determining health.

Socioeconomic factors at the individual and area level may act together to influence health in two ways. In a 'collective resources model', people in non-deprived areas have better health than people in deprived areas because there are more collective resources (including material and social resources, such as services, job opportunities, and social supports). The ability of wealthier, more powerful individuals to attract high

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quality amenities and services enhances the area for all residents. The beneficial effect of living in an area with greater collective resources may be greater for poorer individuals; they may be less able to purchase goods and services privately and may be more dependent on locally provided facilities. The second model, called here a 'local social inequality model', posits that the disparity between an individual's own socioeconomic position and the socioeconomic position of those living nearby affects health. A poorer individual living in a more wealthy area may have worse health than a poorer individual living in a deprived area. They might be able to afford less for the same amount of income because of higher demand and greater wealth in the area pushing up the prices of goods and services. Being relatively poor may be a barrier to taking a fully active part in society.[17] For example, parents whose children moved to a higher SES school described financial, cultural, and behavioural barriers to their acceptance by other parents.[18] There are parallels with Wilkinson's hypothesis that feeling deprived of status is one explanation for the association between income inequality and mortality.[19] This assumes that one's neighbours are a relevant comparison group—an assumption that will be investigated here. At the other end of the socioeconomic spectrum, a wealthy individual living in a more deprived area may have better health than a wealthy individual in a non-deprived area. The local social inequality model incorporates material and psychosocial explanations for the association between health and the discrepancy between personal and neighbourhood socioeconomic position.

Despite increasing interest in neighbourhood-level influences on health, a limited number of studies have considered how individual and neighbourhood deprivation might interact to influence health and the evidence so far is mixed. Greater health differences between affluent and deprived individuals have been found in more affluent areas in some studies,[20–22] but others suggested that differences between individuals were greater in more deprived areas.[23,24] A similar issue has been addressed by looking at the effect of socioeconomic factors in areas surrounding the area of interest. A study in Scotland found that the health of people living in a deprived area surrounded by affluent areas was higher than expected whereas the health of people living in an affluent area surrounded by deprived areas was lower than expected.[25] Mortality rates in England were low in neighbourhoods which were of similar SES to others in the same local government district and higher in neighbourhoods which were located in more heterogeneous districts.[26] The apparent inconsistency in these findings may be a result of the different geographical coverage of studies, varying residential mobility, the different size of areas used to analyse contextual effects, the different health outcomes investigated, and the different measures of both individual and area deprivation used.

Data from the Whitehall II study of British civil servants were used to investigate how individual socioeconomic position and area deprivation act together to influence health and to test the two models described above. Measures include neighbourhood problems, financial strain, satisfaction with standard of living, and participant's perception of their relative position in society. Support for an effect of local social inequality is given if being well-off relative to one's neighbours is associated with better health, fewer financial problems, greater satisfaction with standard of living, and a higher self-rating on the ladder of society than expected (assuming that the neighbourhood is an appropriate reference group), given individual SES. Similarly, if those who are less well-off than their neighbours have worse health, more financial problems, greater dissatisfaction with standard of living, and lower self-rating on the ladder of society then there is support for the local social inequality model. Support for a collective resources model is given if residence in a less-deprived area is associated with better health and fewer problems with the neighbourhood. Poorer individuals are hypothesized to benefit more from residence in a richer area.

Methods

Whitehall II study

The Whitehall II study is a longitudinal study of over 10 000 civil servants which was set up in 1985 to investigate the social gradient in health. At the fifth phase of the study (1997–1999) participants completed a questionnaire covering socio-demographic characteristics and health status and also attended a screening clinic. Details are given elsewhere.[27] The majority of Whitehall II participants live in London and the southeast of England, an area which has some of the greatest disparities in wealth and where poorer people live in close proximity to richer people.[28] Although some participants have retired in recent years, this is essentially an office-based working cohort.

Health outcomes

Inconsistencies in existing literature on small-area variations in health may be due partly to the fact that different health outcomes have been studied. Three health outcomes were chosen for this study, covering depression (using the GHQ-30), general health (using a single item on general self-rated health) and an objective measure (using waist/hip ratio). Depression was defined as a score of $\geqslant 4$ (out of a possible 12) on the depression sub-scale (an adaptation of the GHQ-28).[29] Those who rated their general health as poor or fair (rather than excellent, very good or good) were deemed to have poor self-rated health. Waist/hip ratio is a predictor of coronary heart disease incidence and mortality[30–32] and is related to the metabolic syndrome.[33] It was included here because such objective measures (obtained by a nurse at screening clinic) are not subject to positive or negative affect bias.

Socioeconomic status

Employment grade was used as a measure of individual socioeconomic position and was coded into high grades (those employed in Executive posts), medium grades (Administrative and Professional) and low grades (Clerical and Support). Participants reported problems with the neighbourhood (such as noise, unsafe streets, and few local facilities), financial problems (based on not being able to afford food and clothing or having difficulty paying bills), and satisfaction with their standard of living. Participants were also asked how far up the ladder of society they saw themselves by placing a cross on one of the 10 rungs of a diagram of a ladder.

A measure of neighbourhood deprivation was obtained from the 1991 census data stored at MIMAS (a national data centre providing for the UK research community). The Townsend index of deprivation combines percentage of households with access

to car, percentage owner occupiers, percentage unemployed and percentage overcrowded into a single value for each electoral ward. Electoral wards have an average population of about 5500 and were used here to define neighbourhood boundaries.

Hypotheses and statistical methods

We tested the collective resources model using the following hypotheses:

- People living in neighbourhoods with a lower deprivation index score (less deprived) have better health than people living in neighbourhoods with a high index score.
- People living in neighbourhoods with a lower deprivation index report fewer problems with their neighbourhood than people living in neighbourhoods with a high index score.
- The effect of deprivation is greater for individuals occupying lower socioeconomic positions.

We tested the local social inequality model using the following hypotheses:

- Low individual socioeconomic position combined with low Townsend deprivation index in the neighbourhood is associated with poorer health than expected (for a given individual socioeconomic position).
- Low individual socioeconomic position combined with low Townsend deprivation index in the neighbourhood is associated with greater dissatisfaction with standard of living than expected.
- Low individual socioeconomic position combined with low Townsend deprivation index in the neighbourhood is associated with rating self lower down the 'ladder of society' than expected.
- Similarly, high individual socioeconomic position combined with high Townsend deprivation index in the neighbourhood is associated with better health, less dissatisfaction with standard of living, and rating self higher on the ladder than expected.

Two-level models (with individuals nested within neighbourhoods) were used to investigate simultaneously the influences of individual and neighbourhood deprivation on health. In this way, the non-independence of individuals living in the same residential area was taken into account. All models were adjusted for age and sex. Employment grade was entered as a categorical variable taking three levels and the Townsend index was entered as a continuous variable. The prevalence of poor self-rated health and depression and mean waist-hip ratio were estimated for each employment grade at three levels of area deprivation (the 10th centile, the median, and the 90th centile). The Wald statistic was used to test the significance of interaction terms.[34] A random intercept model was used:

$$y_{ij} = \beta_0 + \beta_1 x_{1ij} + \ldots + \beta_n x_{nij} + \gamma_1 T_{1j} + \delta_1 T_{1j} x_{1ij} + (u_{0j} + e_{ij})$$
(for continuous outcomes)

where y_{ij} is the health outcome for individual i in neighbourhood j, x_{1ij} is the socioeconomic status of individual i in neighbourhood j, T_{1j} is the Townsend index of deprivation score in neighbourhood j, and $T_{1j}\,x_{1ij}$ is the cross-level interaction term. The term u_{0j} is the residual for the j^{th} neighbourhood (that is the difference from average health in neighbourhood j), once individual socioeconomic position and Townsend deprivation have been accounted for. A logit transformation was used to model poor self-rated health and depression since they are binary outcomes.

Results

A total of 5539 participants took part in the Phase 5 follow-up and provided complete data on at least one health outcome. Participants were clustered within wards as follows: 1041 wards contained one participant, 848 wards contained 2–5 participants, 178 wards contained 6–10 participants, and 45 wards contained 11–29 participants. High-grade participants were more likely to live in less-deprived areas. There are more men in the high grades, which may explain the unequal sex distribution across quartiles of the Townsend index (Table 1).

Table 1 Characteristics of participants (n = 5539) at Phase 5 of the Whitehall II Study by deprivation in the neighbourhood

		Townsend deprivation index			
Min. to max. Townsend score	**All residential areas**	Quartile 1 (least deprived) –7.5 to –2.4	Quartile 2 –2.4 to –0.3	Quartile 3 –0.3 to 2.9	Quartile 4 (most deprived) 2.9 to 13.7
Men; %	70.4	78.4	75.4	69.6	55.5
Age; mean (SD)	55.9 (6.0)	56.5 (6.1)	55.9 (6.0)	55.6 (6.1)	55.7 (6.2)
High employment grade; % (n)	41.5 (2299)	51.9 (776)	43.6 (635)	38.9 (535)	29.1 (353)
Low employment grade; % (n)	14.4 (798)	7.0 (104)	10.5 (152)	14.2 (195)	28.6 (347)
Problems with neighbourhood; %	13.4	8.3	11.0	13.1	23.2
Financial problems; %	12.9	9.2	11.4	13.2	18.8
Dissatisfied with standard of living; %	14.3	12.2	13.2	14.4	18.0
Position on ladder; mean (SD)	6.5 (1.7)	6.8 (1.5)	6.5 (1.7)	6.4 (1.7)	6.2 (1.9)
Poor self-rated health; %	13.9	9.8	11.6	15.3	20.3
Depression; %	13.4	11.1	12.0	13.6	17.8
Waist-hip ratio; mean (SD) men	0.92 (0.06)	0.92 (0.06)	0.92 (0.06)	0.93 (0.06)	0.93 (0.07)
Women	0.80 (0.07)	0.79 (0.07)	0.80 (0.07)	0.80 (0.07)	0.81 (0.07)

The independent effects of employment grade and neighbourhood deprivation on the three health outcomes are summarised in Table 2. Living in a deprived neighbourhood was associated with an increased risk of poor self-rated health, over and above individual grade, age, and sex. For each 1 standard deviation increase in Townsend index, the odds of poor self-rated health increased by 1.22 (95% CI: 1.13–1.32). Neighbourhood deprivation was also associated with an increased risk of poor mental health and with a higher mean waist/hip ratio, independently of individual grade, age, and sex.

Multiplicative effects of individual and neighbourhood deprivation on health are summarized in Table 3. This shows increasing probability of poor health with decreasing employment grade as well as with increasing neighbourhood deprivation, accounting for age and sex. In other words, for a given employment grade, people living in deprived neighbourhoods were more likely to have poor health than people living in less-deprived neighbourhoods. There was a suggestion that the grade gradient in health widened in more deprived areas. In the most deprived areas, 12.3% of those in high grades reported poor health compared with 35.9% of those in clerical/support grades. In less-deprived areas the differences were smaller, with corresponding figures of 8.8% and 19.7%, although the interaction terms were not statistically significant (Wald test for interaction $P = 0.5$). Similarly, the difference in poor mental health rates between high and low grades appeared wider in more-deprived neighbourhoods, but once again this was not statistically significant ($P = 0.3$). One objective health outcome was also investigated. Waist/hip ratio increased with increasing neighbourhood deprivation and decreasing individual SES. Differences between high and low grades were wider in more deprived neighbourhoods, with the interaction reaching borderline significance ($P = 0.06$).

Neighbourhood problems increased with increasing Townsend deprivation for low and high grade civil servants. As Figure 1 shows, there was some suggestion that this increase was larger for lower grades, although the interaction was not statistically significant ($P = 0.3$). This could indicate greater exposure or vulnerability to problems in the local area amongst lower grade participants. Another explanation is heterogeneity within the neighbourhood; low grade participants may be living in the less well-off parts of neighbourhoods, a possibility which is explored in the next section. Being short of money was not associated with Townsend deprivation except in the low grades: low grade participants living in more-deprived areas had more financial problems (Figure 2; test for interaction $P = 0.001$). Thus there

Table 2 General and mental health of participants at Phase 5 of the Whitehall Study by individual employment grade and neighbourhood deprivation, adjusted for age and sex

	Odds ratio (95% CI)
Poor self-rated health	
High employment grade	1
Middle grade	1.56 (1.30–1.88)
Low grade	2.56 (2.00–3.28)
Per 1 SD increase in Townsend index	1.22 (1.13–1.32)
Poor mental health	
High grade	1
Middle grade	1.49 (1.23–1.80)
Low grade	2.06 (1.58–2.70)
Per 1 SD increase in Townsend index	1.14 (1.04–1.24)
	Mean (SE) difference
Waist/hip ratio[a]	
High grade	0
Middle grade	0.008 (0.002)
Low grade	0.021 (0.003)
Per 1 SD increase in Townsend index	0.004 (0.001)

[a] Grade gradient and effect of neighbourhood deprivation on waist/hip ratio are same for men and women.

Table 3 Multiplicative effects of individual employment grade and neighbourhood deprivation at Phase 5 of the Whitehall Study

	Adjusted for age and sex Townsend deprivation index				Adjusted for age and sex and neighbourhood problems Townsend deprivation index		
	Least deprived (10th centile)	Middle (median)	Most deprived (90th centile)	Test for interaction	Least deprived (median)	Middle (90th centile)	Most deprived
% with poor self-rated health							
High grade	8.8%	9.9%	12.3%	$P = 0.5$	7.1%	7.8%	9.1%
Middle grade	12.3%	15.2%	22.2%		9.0%	10.4%	13.4%
Low grade	19.7%	24.4%	35.9%		13.3%	15.0%	18.7%
% with poor mental health							
High grade	10.1%	10.4%	10.9%	$P = 0.3$	8.8%	8.8%	8.8%
Middle grade	12.9%	15.1%	20.1%		10.9%	12.0%	14.4%
Low grade	17.2%	20.3%	27.4%		13.8%	15.3%	18.3%
Mean waist/hip ratio							
Men				$P = 0.06$[a]			
High grade	0.918	0.919	0.921		0.918	0.919	0.920
Middle grade	0.921	0.926	0.935		0.921	0.926	0.934
Low grade	0.930	0.937	0.950		0.930	0.937	0.949
Women							
High grade	0.786	0.787	0.789		0.785	0.789	0.798
Middle grade	0.789	0.794	0.802		0.786	0.793	0.804
Low grade	0.798	0.805	0.818		0.788	0.801	0.816

[a] Waist/hip ratio is modelled for men and women together. There was no interaction between employment grade and sex or between Townsend deprivation and sex.

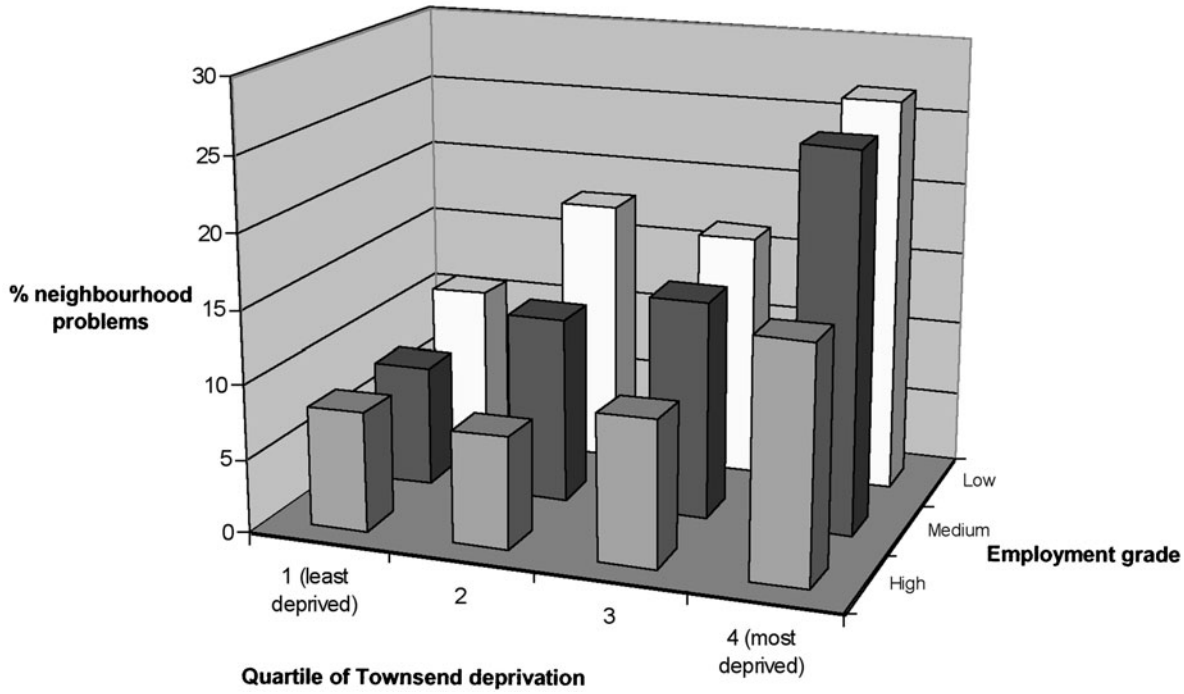

Figure 1 Neighbourhood problems by area deprivation and individual socioeconomic position reported by participants in the Whitehall II study

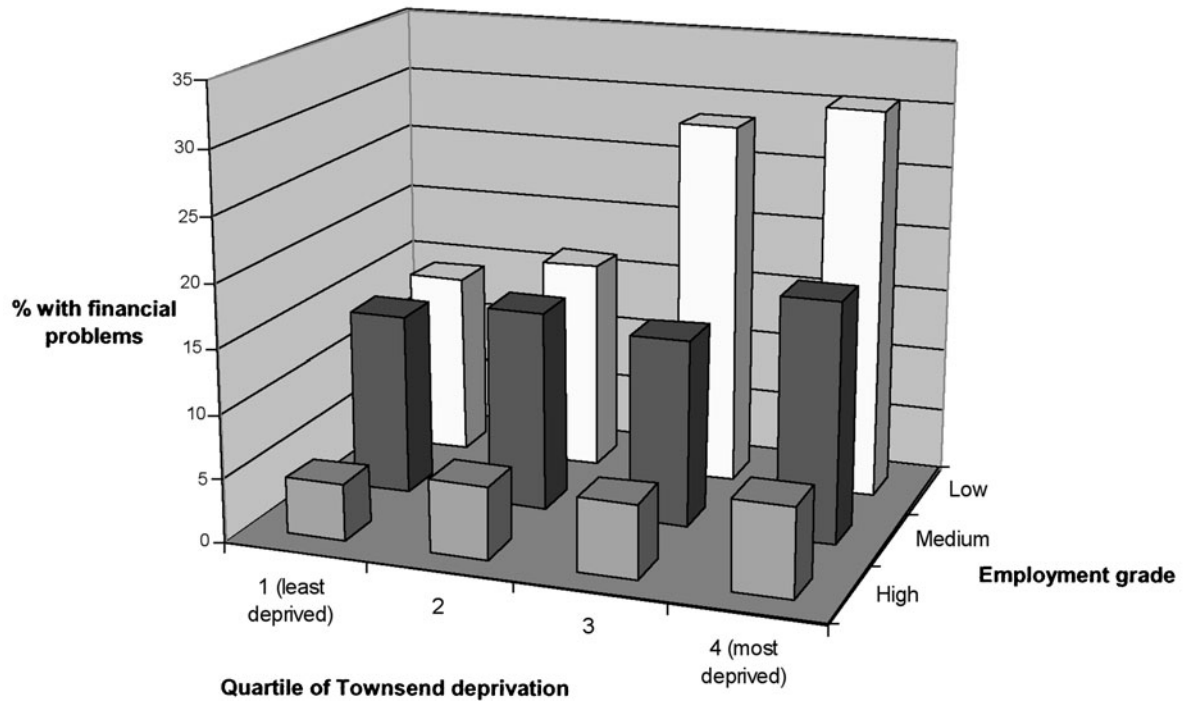

Figure 2 Financial problems by area deprivation and individual socioeconomic position reported by participants in the Whitehall II study

was no support for the hypothesis that poorer people living in rich areas face a higher cost of living and can afford fewer things, although it is possible that we have failed to control adequately for individual socioeconomic position with the measures included here. Amongst the medium and low grades, those living in more deprived areas were more likely to be dissatisfied with their standard of living (Figure 3; test for interaction $P = 0.006$). The variation in position on the ladder across quintiles of area deprivation was fairly small, but nevertheless we found a statistically significant interaction ($P < 0.001$) between

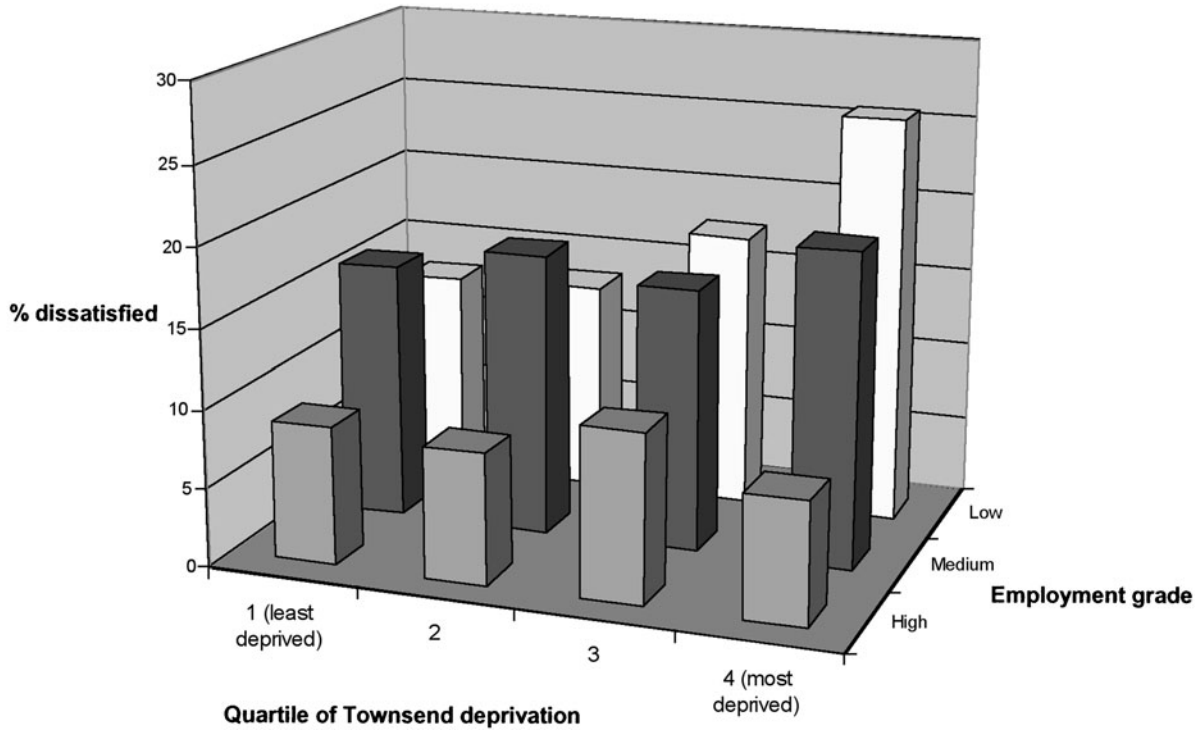

Figure 3 Dissatisfaction with standard of living by area deprivation and individual socioeconomic position reported by participants in the Whitehall II study

employment grade and area deprivation (Figure 4). Amongst the lower grades, position on the ladder decreased with increasing deprivation. Low-grade participants placed themselves an average (SE) of 2.1 (0.07) rungs below high-grade participants. For each 1 standard deviation (SD) increase in Townsend deprivation, low-grade participants placed themselves 0.1 (SE 0.06) rungs lower. For high-grade participants this association was reversed, with those living in the most deprived areas rating themselves as slightly higher on the ladder. For each 1 SD increase in Townsend deprivation, high-grade participants placed themselves 0.07 (SE 0.03) rungs higher. These relationships showed the same patterns for male and female civil servants.

Heterogeneity within the neighbourhood and the possibility that, for a given ward, high-grade participants live in better parts of wards than low-grade participants was investigated using data for enumeration districts. There is an average of 12 enumeration districts within a ward. Table 4 shows levels of owner-occupancy, public housing renting, and male unemployment for high-grade and low-grade participants living in the most deprived wards (columns 2 and 3) and low-grade and high-grade participants living in the least deprived wards (columns 4 and 5). In the most deprived wards (here taken to be the top quartile of Townsend deprivation), high-grade participants were more likely to be living in enumeration districts which had below average deprivation for the ward compared with low-grade participants. For example, 76.0% of high-grade participants compared with 45.0% of low-grade participants were living in enumeration districts which had above-average owner-occupancy rates compared with the rest of the ward. Those in the high grades were more likely to be living in parts of the ward with below-average public housing and unemployment. This supports the suggestion that high-grade participants in the most deprived wards tend to live in the better parts of the ward. It was less clear whether low-grade participants living in the least-deprived wards (the bottom quartile of Townsend deprivation) were in less-desirable parts of the ward. In the least-deprived wards, 40.4% of low-grade participants compared with 36.2% of high-grade participants were living in parts of the ward with below average owner-occupancy. Nevertheless, for high-grade participants living in the most deprived wards, levels of owner-occupancy in the more immediate vicinity (the enumeration district) were lower than the overall average (56.8% compared with 77.2% for all enumeration districts in the study) and levels of public housing renting and unemployment were higher than average for all enumeration districts. Whether electoral wards (larger areas) or enumeration districts (smaller areas) were considered, it was possible to identify some high-grade participants living in more deprived residential conditions and some low-grade participants living in less-deprived conditions.

Table 3 (last 3 columns) shows physical and mental health by individual and neighbourhood SES, after controlling for neighbourhood problems (estimated at the level of no neighbourhood problems), age and sex. Whilst those in the lower grades continued to have a greater risk of poor self-rated and mental health, the differences between high and low grades were more similar across different levels of neighbourhood deprivation once neighbourhood problems are included in the model. For example, 18.7% of low-grade participants compared with 9.1% of high-grade participants living in the most deprived areas rated their health as poor, after controlling for neighbourhood problems. These figures were 35.9% and 12.3% before adding neighbourhood problems to the model. This indicates that

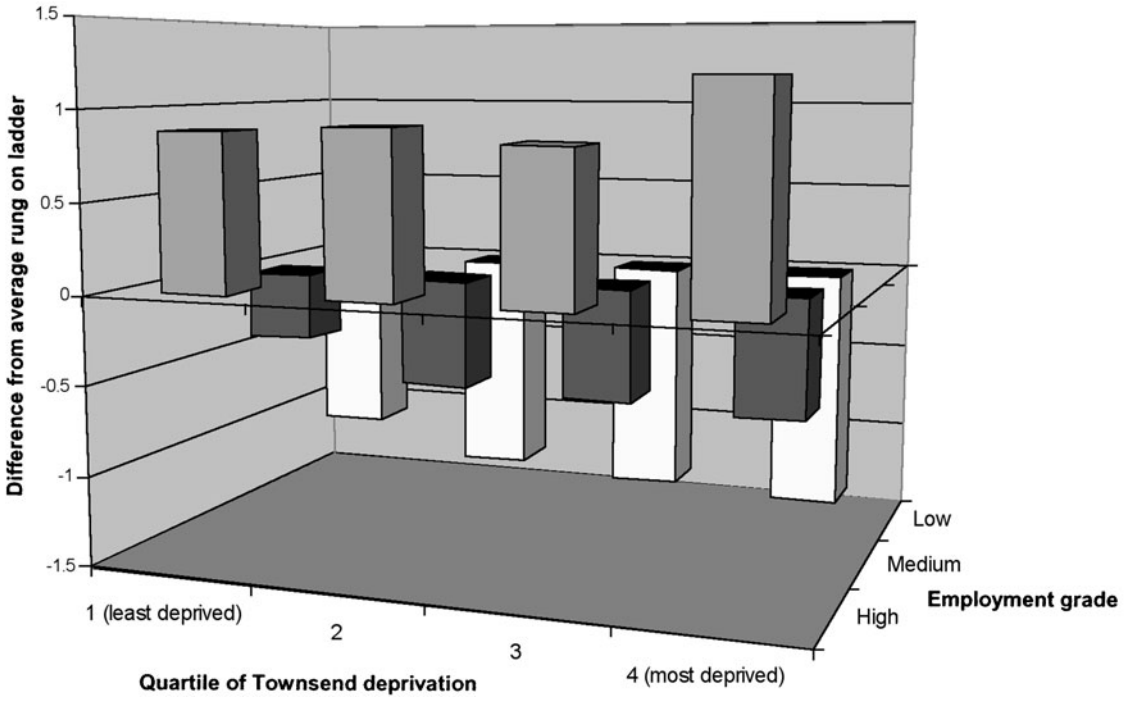

Figure 4 Self-reported position on ladder by area deprivation and individual socioeconomic position reported by participants in the Whitehall II study

Table 4 Investigating within-ward heterogeneity based on 1991 census data

	Most deprived wards		Least deprived wards		
	High-grade participants n = 353	Low-grade participants n = 347	Low-grade participants n = 104	High-grade participants n = 776	**Participants in all areas n = 5539**
% owner-occupiers in ED; mean (SD)	56.8	46.8	90.0	89.1	77.2 (20.2)
% participants living in above average owner-occupancy for ward	76.0	45.0			
% participants living in below average owner-occupancy for ward			40.4	36.2	
% renting public housing; mean (SD)	20.8	39.5	5.1	4.3	12.0 (18.0)
% participants living in below average PH renting for ward	70.5	48.7			
% participants living in above average PH renting for ward			44.2	40.7	
% of men unemployed; mean (SD)	9.2	13.1	4.3	3.6	6.2 (4.2)
% participants living in below average unemployment for ward	68.3	50.7			
% participants living in above average unemployment for ward			55.8	48.2	

problems in the neighbourhood account for much of the higher prevalence of poor general self-rated and mental health among poorer individuals living in poorer areas. The addition of neighbourhood problems to the model did not explain the interactions in waist/hip ratio between individual and area deprivation.

Discussion

Individual and area deprivation were independently associated with poor self-rated health, poor mental health, and high waist/hip ratio. Health differences between high- and low-grade civil servants may be larger in more deprived areas, although interaction tests were not statistically significant. Larger studies would be useful for investigating whether those in higher socioeconomic positions are protected from the health-damaging aspects of deprived neighbourhoods.

These analyses can be considered as a test of one component of the relative deprivation hypothesis. According to this hypothesis, one's socio-economic position relative to others is important for health and being lower down the social scale can have negative material and psychosocial consequences.[35] One important question here is who others compare themselves to. If people in the same residential area are a relevant comparison group, we would

expect poorer people living in more wealthy areas to have poorer health, greater financial stress, or a lower perception of themselves on the ladder. Our findings do not support this hypothesis at the neighbourhood level; low grades living in less-deprived areas rated themselves higher up the ladder than low grades in more deprived areas. However, at the opposite end of the socioeconomic spectrum we found that perceived position in the ladder of society increased with increasing area deprivation for high-grade participants. An individual's response to a discrepancy between their own socioeconomic position and others around them may be qualitatively different according to whether the discrepancy is positive or negative. Relevant comparison groups may also be different for those in high versus low socioeconomic positions. It was not possible to use these data to investigate whether the tendency to draw influence from social contact in the neighbourhood varied by employment grade.

Our findings are consistent with a collective resources model. Neighbourhood deprivation was associated with all three health outcomes over and above individual socioeconomic position. Neighbourhood problems mediated these associations. The large difference in health status between low-grade participants living in high- and low-deprivation neighbourhoods was substantially reduced when information on neighbourhood problems was added to the regression model, indicating that collective resources are poorer in more-deprived neighbourhoods and are on the pathway linking neighbourhood deprivation to health. Our interpretation of the neighbourhood problems item is that it indicates something about how much of an impact the neighbourhood environment has on participant's daily living. For a given level of area deprivation, those in high grades reported fewer problems with the neighbourhood than those in lower grades. Assuming homogeneity within the neighbourhood, this suggests that the impact of neighbourhood deprivation is greater for those in lower socioeconomic positions (although we do note that interactions were not formally significant). Another study in London neighbourhoods found that neighbourhood problems increased with neighbourhood deprivation, especially for lower-status individuals.[36] In this study, a wider number of neighbourhood problems were measured, including traffic and road safety, litter, fumes, and vandalism. A differential vulnerability to living in a deprived area may be due to greater exposure to the local area. For example, poorer people in Glasgow were found to walk around their neighbourhood more than richer people.[37] Poorer people may be more dependent on locally provided facilities and services. Individual resources held by richer individuals may protect them from the neighbourhood stressors in a deprived area. Additionally, living in a deprived area may exacerbate the effect of stressors at the individual level or resources at the individual level may be rendered less beneficial in the context of a deprived area. Results from a study in Nevada suggested that financial strain had a larger impact on health in lower-status neighbourhoods and that the protective effect of frequent social interaction was present in high-status neighbourhoods but not in low-status ones.[38]

Another explanation for the more-frequent reporting of neighbourhood problems by poorer people is heterogeneity within the neighbourhood, here defined by electoral ward boundaries. Inspection of smaller spatial units showed that high-grade participants tend to live in the less-deprived parts of those deprived wards. This is likely to go some way towards explaining why, for a given level of Townsend deprivation, they report fewer neighbourhood problems than those in the lower grades. The value of investigating neighbourhood characteristics when neighbourhoods are diverse has been questioned.[39,40] However, we find that there is enough variation between areas to investigate context and that it was possible to identify some high-grade participants who lived in more-deprived residential conditions and some low-grade participants in less-deprived conditions.

Increasingly, people are spatially segregated along socioeconomic lines[41] so those of high SES living in more-deprived places and those of low SES living in less-deprived places are atypical. Area of residence may provide additional information on social position, connoting an aspect of status that is not captured by traditional occupation-based socioeconomic measures. Supplementary data on socioeconomic position, such as level of assets and educational attainment, were available. There was some attenuation of the effects of neighbourhood deprivation (of about 10% for depression, for example), but an effect of area deprivation over and above individual status remained (data not shown).

There are some methodological limitations with this work. Market forces dictate that poor people are less able to afford to live in affluent areas. This reduces the power to detect a statistically significant interaction between individual and area deprivation on health because of the small number of poor people in affluent areas and rich people in poor areas. On the other hand, the Townsend index was based on data from the 1991 census, some 6–8 years prior to the measurement of health status. More up-to-date data on neighbourhood deprivation may be expected to show a stronger relationship with perceived health.

These data are cross-sectional so we cannot exclude the possibility that poor health leads people to move to more-deprived areas. However, when the analysis was limited to participants who had not moved since the previous phase (about 5 years earlier), there was negligible change in the estimates. This suggests that the movement of less-healthy participants to more-deprived areas is not driving the associations presented here. Finally, these models have been laid out as competing but it is possible that elements of both are present. If the health-enhancing effect of living in a rich neighbourhood were present but smaller for poorer individuals then it could be that collective resources are good for health and, at the same time, living among relatively wealthy neighbours is detrimental to health.

The effects on general and mental health of living in a deprived area appear to be larger for lower-status individuals. Additionally, low-status individuals living in deprived areas report more neighbourhood problems than high-status people living in similar areas. At the other end of the socioeconomic spectrum, high-status people living in deprived areas rated themselves as higher up the ladder of society than high-status people living in less-deprived areas. Both these mechanisms could explain larger health differences between rich and poor individuals in deprived areas. These findings suggest that initiatives to tackle health inequalities will need to address an individual's socioeconomic situation but should also consider the way in which the residential environment magnifies the effect of personal poverty.

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KEY MESSAGES

- Few studies have investigated whether the health effects of neighbourhood deprivation are the same for individuals occupying low and high socioeconomic positions.
- We find that collective resources in the neighbourhood (indicated by lower neighbourhood deprivation) are associated with better health. The effect may be larger for poorer people.
- Poorer people living in more affluent neighbourhoods do not report more financial problems, less satisfaction with their standard of living or perceive themselves to be lower down the ladder of society—being less well-off than your neighbours does not appear to have negative health implications.
- Richer people living in more deprived neighbourhoods perceived themselves to be higher up the ladder of society than those living in more affluent neighbourhoods.

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