

Collective resources or local social inequalities? Examining the social determinants of mental health in rural areas

Mylène Riva*, Clare Bamba, Sarah Curtis and Lise Gauvin

Mylène Riva, Department of Geography, Institute of Hazard and Risk Research, Wolfson Research Institute, Durham University, United Kingdom.

Clare Bamba, Department of Geography, Wolfson Research Institute, Durham University, United Kingdom.

Sarah Curtis, Department of Geography, Institute of Hazard and Risk Research, Wolfson Research Institute, Durham University, United Kingdom.

Lise Gauvin, Département de Médecine Sociale et Préventive, Université de Montréal; CRCHUM - Centre de Recherche du Centre Hospitalier de l'Université de Montréal, Canada.

***Corresponding author:**

Mylène Riva

Durham University
Department of Geography
Science Laboratories, South Road
Durham, DH1 3LE
United Kingdom
Email: mylene.riva@durham.ac.uk
Tel: +44 (0)191-334-3498; Fax: +44(0)191-334-1801

Running head: Rural mental health inequalities

ABSTRACT

Background: In England, although some studies report better health among rural populations, few have examined social inequalities in health within rural areas and how they compare to inequalities observed in urban settings. The objectives of this study are to examine 1) whether living in rural, in more affluent and in more socially cohesive areas is associated with better mental health; and 2) whether being in employment is more protective for mental health in rural than in urban areas. **Methods:** Data on common mental disorders (CMD) and socio-demographic characteristics of 12962 adults are from the Health Survey for England. Individuals resided in 892 areas categorised as urban or rural. Area deprivation is measured using the employment deprivation domain from the 2004 Index of Multiple Deprivation. Area social cohesion is derived from individuals' perceptions using econometric procedures. Data are analysed using multilevel logistic models. **Results:** Living in rural areas is significantly associated with lower risk of reporting CMD (OR: 0.81; 95%CI: 0.71-0.92), independently of individuals' characteristics, and of area deprivation and social cohesion. The mental health advantage of being in employment is more important in rural areas (OR: 0.74; 95%CI: 0.58-0.95) than in urban settings, and is as important as in deprived areas. **Conclusion:** Living in rural areas is associated with better overall mental health. Yet inequalities in mental health between people in the workforce and those who are not are more important in rural settings. More studies are needed to understand the patterning of social inequalities in health in rural communities.

Keywords: Rural health; mental health; employment; small-area analysis.

INTRODUCTION

In the UK, social inequalities in health in rural communities have received less attention than urban health inequalities. This can be partly explained by the considerable inequalities in health observed between more deprived and affluent areas within the same city. Additionally, health in the countryside appears to be better: premature mortality and illnesses are less prevalent, [1, 2] rural dwellers are more likely to enjoy better mental health on some measures [3] and less (or equally) likely to rate their health as fair or poor. [4, 5] Despite this ‘rural health advantage’, widening of inequalities health are observed in rural areas of England [6] and of Scotland [7], and some studies report significant social inequalities in health between individuals living in rural areas.[5] For mortality from suicide [8, 9] and from unintentional injury, [10] the prevalence is relatively higher in rural areas. These studies are indicative of health differences between rural and urban areas in the UK, but do not inform on whether there are social inequalities in health *within* rural areas and whether they are of similar magnitude to those observed in urban areas. Contributing to this evidence base has the potential to influence social policy for targeting actions towards sub-groups of the population and areas which may benefit more from health service and labour market interventions.

Stafford and Marmot have proposed two frameworks to understand how area-level conditions may interact with individuals’ socioeconomic circumstances to influence health: the ‘collective resources’ and the ‘local social inequality’ models.[11] Although the authors focussed on socioeconomic conditions at the area and individual levels, it is possible to adapt these frameworks to examine how living in rural environments in England may differently affect the health of people with differing socioeconomic status.

The collective resources model suggests that people living in areas characterised by more and better social and material collective resources enjoy better health than other groups living elsewhere.[11] These collective resources, e.g. higher quality services and amenities, wealth, employment opportunities, social support, provide opportunities for people to live healthy lives and may be especially important for poorer people as they may be more reliant on local resources and services. Over and above individuals' characteristics, area-level deprivation and social cohesion have been reported as important determinants of various health outcomes [12], including mental health.[13, 14] In England, rural areas are, on average, less deprived and may be more socially cohesive than urban areas.[15] These 'collective resources' might explain the health advantage observed in rural areas.

Disparities between an individual's socioeconomic position and the socioeconomic conditions of their local area may interact to influence health, as suggested by the local social inequality model.[11] Poorer individuals living in wealthy areas with high-quality collective resources may have worse health than poorer individuals living in more deprived communities because, for example, of limitations in purchasing goods, participating in community life, and 'unhealthy' effects of comparing oneself to neighbours.[11] In contrast, more well-off individuals living in deprived areas may enjoy better health than their counterparts living in more affluent areas. In rural England, the socioeconomic profile of rural populations is heterogeneous, often characterised by wealthier individuals living in close proximity to people struggling to make ends meet.[16] The overall rural health advantage may mask more local social inequalities in health.

Testing these frameworks empirically, Stafford and Marmot observed that individual employment grade and neighbourhood deprivation were directly associated with ill-health,

but the interaction between individual poverty/wealth with area deprivation/affluence was not significant. The authors [11] call for *'larger studies to investigate whether the health of those in higher socioeconomic positions is 'protected' from the health-damaging effect of living in more deprived areas'* (p.363). To date no studies have addressed this research question (although some studies report interaction between area deprivation and economic inactivity at the individual level in influencing mental health outcomes [17, 18]), and none have examined whether higher socioeconomic status is more protective for health in rural vs. urban areas.

The aim of the study is to test the collective resources and the local social inequality models for their relevance to understand urban/rural inequalities in mental health England. Mental health problems are an important public health burden associated with reduced physical and social functioning, social exclusion and loss of productivity.[19] We first examine whether living in rural, in more affluent and in more socially cohesive areas is associated with better mental health outcomes. Second, we examine whether being in employment (an important social determinant of health, including mental health outcomes [20]) is more protective for mental health in rural areas, i.e. where quality job opportunities are more limited than in urban areas. The influence of rurality on mental health is hypothesised to be explained in terms of the interplay between both models, independently of individual's socio-demographic characteristics.

METHODS

Individual sample and data

Individual data are from the *Health Survey for England* (HSE), an annual representative cross-sectional survey of the English population.[21] Our use of the HSE data was reviewed and approved by the UK National Centre for Social Research, which linked individual data for the years 2001 to 2003 to small area information (these years correspond most closely to the years for which area data on deprivation were collated). The 2001-2003 pooled individual sample was limited to working age adults (18 to 64 years of age), producing an overall study sample of 22850 respondents.

In the HSE, mental health is assessed using the well validated 12-item General Health Questionnaire (GHQ-12). GHQ-12 scores were dichotomised by contrasting respondents having a score of 3 or more, i.e. reporting signs of common mental disorders (CMD) - anxiety and/or depression, [3, 22] vs. those who did not.

Because of greater population heterogeneity characterising rural communities,[16] adjusting for the composition of areas, i.e. individuals' characteristics, is important. Individual socio-demographic characteristics considered were age (in 10-year age groups), sex, household income (adjusted for the number of persons in the household), work status, i.e. being in employment vs. unemployed, retired, or other economically inactive, having access to a car, self-reported ethnic group (being British, Scottish, Irish, Welsh vs. other ethnic group). Models were also adjusted for social support from family and friends, as this has been identified as an important determinant of mental health [23].

Area sample and data

Areas were defined using Middle Layer Super Output Areas (MSOAs) which are aggregates of Super Output Areas.[24] Compared to electoral wards, MSOAs are more consistent in geographical extent and population (e.g. MSOAs contain between 5000 and 7200 people, whereas the population of electoral wards vary from fewer than 100 to more than 30,000 residents).[24] Individuals from our sample resided in 3131 MSOAs.

Rurality was defined using the Department for Environment, Food, and Rural Affairs 2001 classification.[25] Urban areas were classified as those encompassing settlements ≥ 10000 residents and rural areas are those comprising < 10000 residents and include small towns and fringe, villages, hamlets, and isolated dwellings. Because of small sample size, it was impossible to distinguish between different types of rural areas.

Deprivation was measured using the ‘employment deprivation domain’ of the 2004 Index of Multiple Deprivation,[26] which indicates the level of economic inactivity at the area-level; it is conceptualised as ‘*the involuntary exclusion of the working age population from the world of work*’ (p.21). Six indicators compose this domain, combining information on unemployment, incapacity benefit, and welfare programs. This domain was selected because interpreting the influence on health of a single dimension of deprivation is more meaningful; it also relates more directly to the individual-level variable of work status on which this study focuses. To protect confidentiality of the HSE respondents to whom the data would be linked, MSOA data on deprivation (as released to us by the UK National Centre for Social Research) were classified into deciles. To account for small number of MSOAs in some deciles,

MSOAs were categorised as being in the lower (1 to 3), middle (4 to 7) and higher (8 to 10) deciles of employment deprivation.

In the HSE, respondents report on four items relating to the social context of their local area: neighbours looking after each other, perceived trust, helpfulness and fairness of neighbours. Data on perceptions, adjusted for selected individuals characteristics, were aggregated at the MSOA level by means of econometrics, which is a specific type of multilevel analysis.[27-29] (see Appendix 1 for detailed information on the econometric procedure). The third-level Bayesian estimates from this model correspond to the unbiased estimation of social cohesion at the area level, from which inter-observers (level-2) and inter-items (level-1) variances are removed. Social cohesion was categorised in tertiles.

In comparison to urban areas, rural communities are significantly ($p < 0.001$) less likely to be characterised by employment deprivation ($\beta = -0.27$; $Se = 0.034$) and more likely to be characterised by higher levels of social cohesion ($\beta = 0.28$; $Se = 0.033$).

Statistical analysis

Data were analysed using logistic multilevel models. The collective resource model was first tested by examining the direct association between living in rural (vs. urban) areas and CMD. Then, association between area deprivation and social cohesion were modelled to examine whether more favourable material and social conditions of local areas were associated with mental health. To test the local social inequality model, the second multilevel model built on the previous one to examine whether being in work is more protective for mental health in rural communities, and also in more deprived areas; these associations were modelled as

cross-level interactions. Both models were adjusted for individuals' characteristics.

RESULTS

The HSE sample design resulted in a sample of individuals which was not stratified within MSOAs; the numbers of individuals within each MSOA ranged from 1 to 51 (mean=8; median=7). For some MSOAs estimates might have been less reliable due to small individual sample size. Hence analyses were conducted on a sub-sample for which there was a minimum of 10 respondents per MSOA. This considerably reduced the sample size but provided a more robust sample of 12 962 individuals living in one of 892 MSOAs (analyses on the full sample were also conducted; strength and significance of associations were similar). Description of the full and reduced individual and area samples is presented in Table 1. In the reduced sample, 22.3% people lived in rural areas (77.7% in urban areas). The proportion of people in employment is 73.9% in rural and 70.5% in urban areas. Of people in employment, 33.6%, 42.4%, and 24.1% lived in respectively lower, middle and higher deciles of area-level employment deprivation.

The unconditional model revealed significant between-area variation in the likelihood of reporting CMD. Across all areas, the average probability of people reporting CMD was 18.5%. Yet the plausible value range [30] indicates that in some areas only 11.3% of people reported CMD whereas in others this proportion reached 28.7% ($\chi^2(df:891) = 1047; p < 0.001$).

There were significant socio-demographic inequalities in CMD between respondents (Table 2). Women were more likely than men to report CMD whereas adults aged between 55 and 64 were less likely to report CMD in comparison to younger adults. Having a good social support, being in employment and higher household income were significantly associated with lower odds of reporting CMD. The mental health advantage associated with being in

employment was significantly more important than higher household income ($p < 0.001$).

Controlling for individual characteristics of respondents did not explain all of the variation in CMD between areas which, although attenuated, remained significant.

Testing the collective resources model showed that living in rural areas was significantly associated with lower likelihood of reporting mental health problems (OR: 0.81; 95%CI: 0.72-0.92; results not shown), independently of individuals' characteristics. This association remained significant when the model was adjusted for area-level deprivation and social cohesion; the fully adjusted collective resources model is presented in Table 2. Among this sample, living in rural areas was significantly associated with a lower likelihood of reporting CMD. The association of CMD with employment deprivation in the local area was not statistically significant but living in areas characterised by average, but not high, social cohesion was associated with lower odds of mental health problems.

Results for the local social inequality model are shown in Figure 1. Being in employment was significantly more protective for CMD in rural areas than in urban settings (OR: 0.74; 95%CI: 0.58-0.95), and in areas characterised by middle (OR: 0.74; 95%CI: 0.56-0.91) and higher levels (OR: 0.67; 95%CI: 0.51-0.87) of employment deprivation in comparison to less deprived areas. Inequalities in CMD between those in employment and those unemployed and economically inactive appeared more marked in rural and in more deprived areas, as indicated by a steeper 'gradient' in these areas between individuals of contrasting economic status. The mental health advantage associated with being in employment was similar for rural dwellers as for people in the most deprived areas compared with other parts of the country as a whole. Adjusting the model for these cross-level interactions did not however explain all of the variation in mental health between areas.

DISCUSSION

The aim of the study was to test the collective resources and the local social inequality models for their relevance to understand urban/rural inequalities in mental health in England and to examine the mental health advantage associated with being in employment in rural areas. Results show that, although rural context has a direct and positive influence on mental health, inequalities in mental health associated with being in the workforce are more important in rural communities than in urban settings.

As observed elsewhere, in comparison to urban settings living in rural areas is associated with better mental health, independently of individuals' socioeconomic conditions.[3] Health inequalities between rural and urban areas may reflect differences in social and material conditions of local areas, an argument consistent with the collective resources model. But the relationship of deprivation to CMD was non-significant, while living in more socially cohesive areas was associated with lower likelihood of reporting mental health problems. Our findings extend other research conducted in the UK reporting worse mental health outcomes in deprived localities, but only in economically inactive individuals [17, 18], and with better mental health outcomes in neighbourhoods with higher levels of social capital.[31] Yet area deprivation and social cohesion did not 'explain away' the effect of rurality on CMD which remained significant, suggesting an independent influence of rural environments on population mental health.

The significant influence on mental health of the interaction between rural context and work status at the individual level supports the local social inequality model. The lower risk of CMD associated with being in employment is more important for rural than urban dwellers,

suggesting that social inequalities in mental health associated with work status are more important in rural communities. In addition, being employed is as protective for mental health in rural areas as it is in the most deprived areas of the country as a whole. Being in employment may provide more material resources to individuals, e.g. disposable income, and sense of purpose and meaning associated with work, and protection from stressors in the local environment. This may be especially important in rural areas where employment opportunities and quality jobs are few. A psychosocial explanation would suggest that economically active individuals living in communities with struggling labour markets compare themselves positively to their neighbours excluded from the labour force, and this has a beneficial influence on their mental health. The cross-sectional nature of the data means that another possible interpretation is that in rural areas (as well as the most deprived areas nationally) people with mental health problems are especially likely to become unemployed, which would be consistent with greater precarity of employment in economically marginal areas.

Considering interactions between socioeconomic characteristics at the individual-level and the rural context may account for the relative wealth and health advantage of rural populations. Longitudinal and quasi-experimental studies (e.g. evaluation of naturally occurring experiment such as regeneration schemes) are needed to understand and ascribe causation about how rurality and deprivation at the individual and area levels interact to influence health and health inequalities in the English countryside. In conjunction, efforts are needed to improve methodologies and validity of measurements of social and economic conditions in rural settings. More in-depth studies should be conducted to understand the pathways through which the collective resources and local social inequalities influence mental health.

Results reported should be interpreted in light of some limitations. As noted above, the cross-sectional design of the study prevents analysing processes of causation linking area contexts to health, and health selection into un/employment cannot be ruled out. In rural areas, there is a problem of hidden unemployment as rural people may not identify themselves as unemployed and there are marked seasonal variations in employment.[32] Numbers of people in employment may have been overestimated in the HSE sample. A dichotomous definition of rurality, contrasting urban and rural settings may mask significant variation in health associated with specific rural contexts. Larger studies investigating the complex process linking place to health in rural settings are needed.

Implications for public health research and policy

There is a strong theoretical basis for expecting area regeneration programmes which increase economic activity to be beneficial for health.[33] Yet, there is little evidence to suggest that in practice, regeneration and job creation improve physical or mental health outcomes.[34, 35] Although tackling unemployment and economic inactivity in urban deprived areas has been the focus of regeneration initiatives (as reviewed in [36]), it has received less attention in rural areas. Similarly, whilst there is a large body of research which suggests that work is generally good for health,[37] the type and quality of work is an important mediator of this relationship.[38] Low skill, low pay, high stress, insecure jobs may actually be worse for health than economic inactivity.[39] These types of jobs may be more characteristic of rural labour markets. Future studies are needed to understand the patterning of employment and health in rural areas, but also in contrasting rural labour markets. Evaluation of interventions to tackle unemployment in rural settings and their impact on population health are wanting.

Appendix 1: Ecometrics procedures

In the Health Survey for England, the social context of local areas is explored by asking respondents to report on the following four items (possible answers in bracket): (1) This area is a place where neighbours look after each other (strongly agree, agree, disagree, strongly disagree); (2) generally speaking, would you say that most people can be trusted or you can't be too careful in dealing with people (can be trusted, can't be too careful, don't know); (3) Would you say that most of the time people try to be helpful or just look out for themselves (try to be helpful, look out for themselves, don't know); (4) Do you think most people would take advantage of you if they got the chance or would they try to be fair (take advantage, try to be fair, don't know). It was hypothesised that the four items are indicators of a latent construct of social cohesion in the local areas.

In a 3-level multilevel, items (level-1; n=104,233) were conceptualised as being nested within respondents (level-2; n=12,920), who in turn were nested within MSOAs (level-3; n=892). The latent construct of social cohesion and observations on the four items were dichotomised (and reverse coded where appropriate) to capture their presence/absence in the latent construct (people answering 'don't know' were excluded), and were modelled simultaneously as level-1 predictors. The item 'most people try to be helpful' was selected as the reference category because it corresponds best to the latent construct of social cohesion.

The model was then adjusted for the following characteristics of individuals (level-2 predictors) which may influence the perceptions one holds about the context of their local area (potential reporting bias): age, sex, household income, employment status, self-reported ethnic group, self-rated health, and years lived in current local area. No variables were specified at the area-level.

The modelling equation is as follow:

Level-1 Model: $\text{Prob}(Y=1 | \beta) = P$

$$\log\left[\frac{P}{1-P}\right] = P_0 + P_1 * (\text{neighbours look after each other}) + P_2 * (\text{most people can be trusted}) + P_3 * (\text{most people would take advantage})$$

Level-2 Model: $P_0 = \beta_{00} + \beta_{01} * (\text{sex}) + \beta_{02} * (\text{age}) + \beta_{03} * (\text{household income}) + \beta_{04} * (\text{employed}) + \beta_{05} * (\text{self-reported ethnic group}) + \beta_{06} * (\text{more than 5 years of residence in local area}) + \beta_{07} * (\text{good/very good self-rated health}) + r_0$

$$P_1 = \beta_{10}; P_2 = \beta_{20}; P_3 = \beta_{30}$$

Level-3 Model: $\beta_{00} = \gamma_{000} + \mu_{00}$

$$\beta_{01} = \gamma_{010} \dots \beta_{07} = \gamma_{070}$$

$$\beta_{10} = \gamma_{100} \dots \beta_{30} = \gamma_{300}$$

The third-level Bayesian estimates from these models correspond to the unbiased estimation of social cohesion at the area level, from which inter-observers and inter-item variances are removed. Bayesian estimates were categorised in tertiles of social cohesion.

The econometric approach also allows determining the reliability of the area-level measure, which is calculated as the ratio of the ‘true’ score variance to the observed score variance in the sample area mean, with values ranging from 0 to 1.[28] The reliability score is indicative

of the average degree of ‘consensus’ on perceptions among respondents living within the same MSOA. It will be high (close to 1) when: 1) the area means vary considerably across areas or 2) the sample size per area is large. The reliability of our measure of social cohesion at the MSOA-level was 0.451. This somewhat low reliability could be explain by small sample size in some MSOAs (range=9 to 46; mean=14; median=13) (e.g. Raudenbush and Sampson have established that a sample size of 25-30 will maximise area reliability).[27]

Another reason could be that the items used to measure the social cohesion of local area in the HSE, and the limited responses possible to determine these items (on 3 out of the 4 items, respondents had the choice between only two possible answers), might have influence the reliability score.

Acknowledgements

The authors would like to thank people at the National Centre for Social Research for their help in building the database and one anonymous referee for the helpful comments. An earlier version of this paper was presented at the 12th International Congress of the International Federation of Psychiatric Epidemiology, Vienna, Austria 16th-19th April 2009. LG holds a Canadian Institutes of Health Research/Centre de recherche en prévention de l'obésité, Applied Public Health Chair on Neighborhoods, Lifestyle, and Healthy Body Weight.

Conflict of interest

None declared.

Keypoints

1. Living in rural areas is associated with overall better mental health, independently of individuals' characteristics, and deprivation and social cohesion at the area level.
2. Inequalities in mental health between people in the workforce and those who are not are more important in rural settings. Being in employment is as 'protective' for mental health in rural areas as it is in deprived areas across England.
3. Longitudinal and quasi-experimental studies are needed to understand and ascribe causation about how rurality and deprivation at the individual and area levels interact to influence health and health inequalities in the English countryside.
4. Further studies of the health impacts of interventions to address unemployment and economic inactivity in rural areas seem to be justified by our results.

References

1. Connolly S, O'Reilly D, Rosato M. Increasing inequalities in health: Is it an artefact caused by the selective movement of people? *Soc Sci Med* 2007;64:2008-15.
2. Levin KA. Urban-rural differences in self-reported limiting long-term illness in Scotland. *J Public Health Med* 2003;25:295-302.
3. Weich S, Twigg L, Lewis G. Rural/non-rural differences in rates of common mental disorders in Britain - Prospective multilevel cohort study. *Br J Psychiatry* 2006;188:51-57.
4. Kelleher CC, Friel S, Gabhainn SN, Tay JB. Socio-demographic predictors of self-rated health in the Republic of Ireland: findings from the National Survey on Lifestyle, Attitudes and Nutrition, SLAN. *Soc Sci Med* 2003;57:477-86.
5. Riva M, Curtis S, Gauvin L, Fagg J. Unravelling the extent of inequalities in health across urban and rural areas: Evidence from a national sample in England. *Soc Sci Med* 2009;68:654-63.
6. Leyland AH. Increasing inequalities in premature mortality in Great Britain. *J Epidemiol Community Health* 2004;58:296-302.
7. Levin KA, Leyland AH. A comparison of health inequalities in urban and rural Scotland. *Soc Sci Med* 2006;62:1457-64.
8. Levin KA, Leyland AH. Urban/rural inequalities in suicide in Scotland, 1981-1999. *Soc Sci Med* 2005;60:2877-90.
9. Middleton N, Sterne JAC, Gunnell D. The geography of despair among 15-44-year-old men in England and Wales: putting suicide on the map. *J Epidemiol Community Health* 2006;60:1040-47.

10. Boland M, Staines A, Fitzpatrick P, Scallan E. Urban-rural variation in mortality and hospital admission rates for unintentional injury in Ireland. *Injury Prevention* 2005;11:38-42.
11. Stafford M, Marmot M. Neighbourhood deprivation and health: does it affect us all equally? *Int J Epidemiol* 2003;32:357-66.
12. Riva M, Gauvin L, Barnett TA. Toward the next generation of research into small area effects on health: A synthesis of multilevel investigations published since July 1998. *J Epidemiol Community Health* 2007;61:853-861.
13. Kim D. Blues from the neighborhood? Neighborhood characteristics and depression. *Epidemiol Rev* 2008;30:101-117.
14. Mair C, Diez-Roux AV, Galea S. Are neighbourhood characteristics associated with depressive symptoms? A review of evidence. *J Epidemiol Community Health* 2008;62:940-946
15. Commission for Rural Communities. State of the countryside Update. Rural analysis of the Index of Multiple Deprivation 2007; 2008.
16. Haynes R, Gale S. Deprivation and poor health in rural areas: inequalities hidden by averages. *Health Place* 2000;6:275-85.
17. Fone D, Dunstan F, Williams G, Lloyd K, Palmer S. Places, people and mental health: A multilevel analysis of economic inactivity. *Soc Sci Med* 2007;64:633-45.
18. Weich S, Twigg L, Holt G, Lewis G, Jones K. 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.
19. World Health Organization. Prevention of mental disorders: effective interventions and policy options - summary report; 2004. Report No.: ISBN 92 4 159215 X.
20. The Marmot Review. Fair society, healthy lives. 2010.

21. Prior G, Deverill C, Malbut K, Primatesta P. Health Survey for England 2001: methodology and documentation. London: The Stationery Office 2003.
22. Goldberg DP, Williams P. The user's guide to the General Health Questionnaire. Windsor, United Kingdom; 1988.
23. Fuhrer R, Stansfeld SA, Chemali J, Shipley MJ. Gender, social relations and mental health: prospective findings from an occupational cohort (Whitehall II study). *Soc Sci Med* 1999; 48: 77-87.
24. Office of National Statistics. Beginners' guide to UK geography - Super Output Areas (SOAs). 2006.
25. Bibby P, Shepherd J. Developing a New Classification of Urban and Rural Areas for Policy Purposes - the Methodology: Department for Environment, Food, and Rural Affairs; 2001.
26. Noble M, Wright G, Dibben C, et al. Indices of Deprivation 2004: Report to the Office of the Deputy Prime Minister: London: Neighbourhood Renewal Unit; 2004.
27. Gauvin L, Richard L, Craig CL, et al. From walkability to active living potential - An "ecometric" validation study. *Am J Prev Med* 2005;28:126-33.
28. Mujahid MS, Diez Roux AV, Morenoff JD, Raghunathan T. Assessing the measurement properties of neighborhood scales: from psychometrics to ecometrics. *Am J Epidemiol* 2007;165:858-67.
29. Raudenbush SW, Sampson RJ. Ecometrics: Toward a science of assessing ecological settings, with application to the systematic social observation of neighborhoods. *Sociol Methodology* 1999;29:1-41.
30. Raudenbush S, Bryk A. Hierarchical linear models: applications and data analysis methods 2ed. Newbury Park, CA: Sage 2002.

31. Stafford M, De Silva M, Stansfeld S, Marmot M. Neighbourhood social capital and common mental disorder: Testing the link in a general population sample. *Health Place* 2008;14:394-405.
32. Commission for Rural Communities. Rural disadvantage: Reviewing the evidence; 2006.
33. Curtis S, Cave B, Coutts A. Is urban regeneration good for health? Perceptions and theories of the health impacts of urban change. *Environ Plann C Gov Policy* 2002;20:517-34.
34. Thomson H, Atkinson R, Petticrew M, Kearns A. Do urban regeneration programmes improve public health and reduce health inequalities? A synthesis of the evidence from UK policy and practice (1980-2004). *J Epidemiol Community Health* 2006;60:108-15
35. Rogers A, Huxley P, Evans S, Gately C. More than jobs and houses: mental health, quality of life and the perceptions of locality in an area undergoing urban regeneration. *Soc Psychiatry Psychiatr Epidemiol* 2008;43:364-72
36. Sanderson I. Worklessness in deprived neighbourhoods: A review of evidence. London: Department for Communities and Local Government; 2006.
37. Waddell G, Burton A. Is work good for your health and wellbeing? London: The Stationary Office; 2006.
38. Black C. Working for a Healthier tomorrow. London: The Stationary Office; 2008.
39. Broom D, D'Sousa R, Strazdins L, Butterworth P, Parslow R, Rodgers B. The lesser evil: Bad jobs or unemployment? A survey of mid-aged Australians. *Soc Sci Med* 2006;63:575-86.

Table 1. Characteristics (reduced and full samples) of individuals participating in the Health Survey for England between 2001 and 2003 and of the Middle Layer Super Output Areas (MSOAs) within which they were living.

	Reduced sample		Full sample	
	(n=12962)		(n=22850)	
	N	%	N	%
Individual-level characteristics				
Presence of common mental disorders				
No	10435	80.5	18257	79.9
Yes	2375	18.3	4297	18.8
Missing	152	1.2	296	1.3
Sex				
Men	5896	45.5	10269	44.9
Women	7066	54.5	12581	55.1
Age (years)				
18-24	2256	17.4	4036	17.7
25-34	2424	18.7	4312	18.9
35-44	3111	24.0	5512	24.1
45-54	2712	20.9	4634	20.3
55-64	2459	19.0	4356	19.1
Self-reported ethnic group				
British, Scottish, Irish, Welsh	11734	90.5	20298	88.8
Other	1215	9.4	253	11.1
Missing	13	0.1	21	0.1
Having access to a car				
Yes	11216	86.5	19446	85.1

No	1742	13.4	3396	14.9
Missing	4	0.03	8	0.04
Social support from family and friend^a				
Good	8018	61.9	14006	61.3
Medium	3250	25.1	5739	25.1
Low	1582	12.2	2895	12.7
Missing	112	0.9	210	0.9
Economic status				
In employment	9225	71.2	16139	70.7
Unemployed, retired, other economically inactive ^b	3723	28.7	6682	29.3
Missing	14	0.1	29	0.1
McClemens household score for equivalised income	Mean	SD	Mean	SD
	1.27	0.42	1.25	0.41
		Reduced sample	Full sample	
Area Characteristics		(n=862)	(n=3131)	
Rurality				
Urban	708	79.4	2592	82.8
Rural	184	20.6	539	17.2
Employment deprivation				
Lower deciles	269	30.2	885	28.3
Middle deciles	374	41.9	1268	40.5
Higher deciles	249	27.9	978	31.2

^aSocial support was assessed using the following questions: “There are people I know amongst my family or friends who: do things to make me happy; make me feel loved; can be relied on no matter what; would see that I am taken care of if I needed to be; who accept me just as I am; make me feel an important part of their lives, give me support and encouragement”.

^bIn the sample, 5.1% were unemployed, 5.5% were retired, and 18.1% were categorised as ‘other economically inactive’; this comprised people going to school full time, waiting to take up paid work already obtained, looking for paid work or a Government training scheme, intending to look for work but prevented by temporary sickness or injury, permanently unable to work because of long-term sickness or disability, looking after the home or family.[21]

Table 2. Results of multilevel models testing the collective resource model to explain variation in common mental disorders among 12962 working age adults residing in 892 local areas.

	OR	95%CI
Intercept	0.88	0.69 - 1.12
Individual characteristics		
Sex		
Men	1.00	
Women	1.41	1.28 - 1.56
Age		
18-24	1.00	
25-34	0.86	0.73 - 1.00
35-44	0.97	0.84 - 1.12
45-54	1.00	0.86 - 1.16
55-64	0.62	0.52 - 0.74
Self reported ethnic group		
Other	1.00	
British, Scottish, Irish, Welsh	1.08	0.92 - 1.26
Having access to a car		
No	1.00	
Yes	0.88	0.77 - 1.01
In employment		
No	1.00	
Yes	0.53	0.48 - 0.58
Household income		
Lower tertile	1.00	

Middle tertile	0.87	0.77 - 0.98
Higher tertile	0.86	0.76 - 0.98
Social support from family/friends		
Low	1.00	
Medium	0.61	0.53 - 0.70
Good	0.35	0.30 - 0.39
Area characteristics		
Rurality		
Urban	1.00	
Rural	0.84	0.74 - 0.96
Employment deprivation (deciles)		
High deprivation	1.00	
Middle deprivation	0.98	0.87 - 1.10
Low deprivation	0.94	0.82 - 1.08
Social cohesion (tertiles)		
Low	1.00	
Middle	0.88	0.78 - 0.99
High	0.93	0.82 - 1.06
Between-area variation		
Variance component (p-value)	0.05	(0.038)
