RESEARCH REPORT

# Neighbourhood socioeconomic status, health and working conditions of school teachers

**Marianna Virtanen, Mika Kivimäki, Marko Elovainio, Anne Linna, Jaana Pentti, Jussi Vahtera**

*J Epidemiol Community Health* 2007;**61**:326–330. doi: 10.1136/jech.2006.052878

See end of article for authors' affiliations

Correspondence to: Dr M Virtanen, Finnish Institute of Occupational Health, Department of Psychology, Topeliuksenkatu 41 aA, FIN-00250 Helsinki, Finland; marianna.virtanen@ttl.fi

Accepted 2 July 2006

**Objective:** To investigate the associations of workplace neighbourhood socioeconomic status with health behaviours, health and working conditions among school teachers.
**Method:** The survey responses and employer records of 1862 teachers were linked to census data on school neighbourhood socioeconomic status. In the multilevel analysis, adjustments were made for demographics, work factors and the socioeconomic status of the teacher's own residential area.
**Setting:** 226 public schools in Finland.
**Results:** Teachers working in schools from neighbourhoods with the lowest socioeconomic status reported heavy alcohol consumption (OR 2.25; 95% CI 1.32 to 3.83) and higher probability of doctor-diagnosed mental disorders (OR 1.47; 95% CI 1.02 to 2.12) more often than teachers working in schools located in the wealthiest neighbourhoods. After controlling for the socioeconomic status of the teacher's own residential area, only heavy alcohol consumption remained statistically significant. Teachers working in schools with lower socioeconomic status also reported lower frequency of workplace meetings, lower participation in occupational training, lower teaching efficacy and higher mental workload.
**Conclusions:** School neighbourhood socioeconomic status is associated with working conditions and health of school teachers. The association with health is partially explained by the socioeconomic status of the teachers' own residential neighbourhoods. An independent association was found between low socioeconomic status of school neighbourhoods and heavy alcohol use among teachers.

There is accumulating evidence on the effects of residential area on a person's health.[1 2] Living in neighbourhoods characterised by poor socioeconomic conditions has been shown to be associated with increased morbidity, mortality and health-risk behaviour.[1–11] In addition, neighbourhood deprivation has been found to be associated with increased prevalence of mental health problems, behavioural problems and physical abuse among children and adolescents.[12–15] In terms of effective public health policy, it is important to focus interventions not only on individuals but also on the environment where people live. Among the mechanisms that have been suggested to link neighbourhood characteristics to health outcomes are the stressors to which people are exposed, the resources available to deal with them and the patterns of social interaction.[1 2 16 17]

Although there is growing interest in the relationship between neighbourhood characteristics and the health of residents, no study has been published to date on the health and working conditions of people who work and interact with residents of specific neighbourhoods. Teachers, kindergarten personnel, healthcare personnel and social workers are typical examples of employees whose work is restricted to a specific neighbourhood and who interact with the people living there. Owing to the social and psychological problems of children and families in deprived neighbourhoods,[12–15] teachers in these neighbourhoods may be exposed to less favourable working conditions and therefore may have health problems themselves. We used the ''10 Town Study'' on Finnish local government personnel and data from Statistics Finland on neighbourhood socioeconomic status to determine the associations between workplace neighbourhood socioeconomic status, health risk behaviours, health and working conditions among comprehensive school teachers. In addition to the traditional possible confounding factors, such as age and sex, we controlled for the socioeconomic status of the teacher's own residential neighbourhood in the analyses.

## METHODS

### Participants

Data were obtained from the 10 Town Study, which is an ongoing research project on health of local government personnel.[18] In 2000–1, we sent a questionnaire to all employees of the 10 towns (response rate 67%). Of the respondents, 1862 teachers (1471 women and 391 men) from 226 comprehensive schools participated in this study. The study was approved by the ethics committee of the Finnish Institute of Occupational Health, Helsinki, Finland.

### School neighbourhood socioeconomic status

In total, 622 neighbourhoods in the study towns were identified. We obtained information on the socioeconomic status of the neighbourhoods of the 10 towns from nationwide registers of Statistics Finland (official Finnish government statistics). These registers covered the entire population permanently inhabiting Finland on 31 December 2000 and included neighbourhood data on mean monthly income. According to the mean income of the residents, the 622 study neighbourhoods were divided into quartiles (averaging 155 neighbourhoods in each quartile).

In Finland, the lower level of comprehensive schooling is responsible for the education of children aged 7–12 years and practically all of this education is provided by municipal schools. In this study, the average number of neighbourhoods for a single school was 2.75. Information about which specific neighbourhood each of the participating schools was responsible for was obtained from the school authority, or, in two schools, derived from the city map. In cases where the school district included more than one neighbourhood, the indicators of neighbourhood socioeconomic status were weighted by the number of children aged 7–12 years in the areas in question.

**Abbreviation:** GEE, generalised estimating equation

### Socioeconomic status of the teacher's residential neighbourhoods

We obtained information on the teacher's residence (postal zip code) from the employers' registers. These data were linked to the Statistics Finland socioeconomic indicator (average monthly income) for each postal zip code. Residence socioeconomic status was then divided into quartiles, as for the school neighbourhood socioeconomic status.

### Health-risk behaviours

Alcohol use was obtained from the questionnaire by asking about the participants' habitual frequency of use and amount of beer, wine and spirits consumed. This information was transformed into grams of alcohol per week. A cut-off point for heavy drinking was >275 g/week.[18] Smoking (yes/no) and number of cigarettes smoked daily were assessed by the questionnaire. Body mass index (kg/m$^2$) was based on the respondents' report of height and weight, and a cut-off point for obesity was ⩾30 kg/m$^2$.[19]

### Health indicators

Doctor-diagnosed chronic disease was derived from survey responses to a list of 15 common diseases (eg, asthma, rheumatoid arthritis, diabetes, cardiovascular diseases, depression and other mental disorders).[20] Respondents with at least one chronic disease were defined as cases. From this measure, we derived a separate measure for cardiovascular diseases (four items), musculoskeletal diseases (four items) and mental disorders (two items).

### Working conditions

Teachers' perception of management at their workplaces was assessed by the Moorman Scale of Relational Justice.[21] The six-item scale indicates the quality of interpersonal behaviour of the supervisor, the degree of attention of the supervisor to the employee's rights, and the truthfulness and trustfulness of the supervisor in dealing with the employees (eg, ''Your supervisor is able to suppress personal biases''). Responses were given on a five-point scale from 1 (strongly disagree) to 5 (strongly agree) (Cronbach's $\alpha = 0.92$).

Workplace meeting frequency was obtained from the survey by the question: ''During the past 12 months, have you had workplace meetings at your workplace?'', ranging from 1 (not at all) to 6 (every week).

Participation in occupational training was based on a single-item question derived from the Statistics Finland standard survey: ''During the past two years, have you had sufficient occupational in-service training?'', ranging from 1 (I have not had training) to 5 (training has been completely sufficient).[22]

Perceived teaching efficacy was obtained from the Statistics Finland standard survey, and it was assessed whether the teacher thought that his/her teaching efficacy had been changed during the past 12 months, from 1 (clearly decreased) to 5 (clearly increased).[22]

Mental workload was assessed by a single question, ''Is your work psychologically strenuous?'' from the Statistics Finland standard survey on a scale ranging from 1 (very easy) to 4 (very hard).[22]

### Other factors

Information on workplace, occupation, demographic characteristics and work factors were taken from the employers' registers. Demographic characteristics and work factors included age, sex, type of class (ordinary or special), type of employment contract (permanent or temporary) and the postal zip code of the teacher's residence.

### Statistical analyses

In accordance with the prerequisites for multilevel analyses, our dataset included people (teachers) nested within schools in neighbourhoods with various socioeconomic statuses. Using the multilevel analysis, we were able to include both individual- and neighbourhood-level predictors in the models. We used generalised estimating equations (GEEs) random effects model to compare neighbourhoods with three levels of socioeconomic status. For continuous variables, we used generalised linear models with GEEs and expressed the results as means and their standard errors. For binary variables, we used logistic regression models with GEE estimation. Firstly, we adjusted the models for age, sex, type of class and type of job contract, then, to control the potential confounding effect by the socioeconomic status of the teacher's own residential area, we adjusted the models for that variable. For the analyses, we used the SAS V.9.1 program package.

## RESULTS

Table 1 presents the descriptive statistics of the participants, of whom 79% were women and 21% were men. In the schools located in neighbourhoods with a high socioeconomic status, the teachers were more often women and came from the oldest age group. Of the participants, 77% had a permanent job and 23% were employed on a fixed-term job contract. Teachers in the highest and lowest socioeconomic neighbourhoods were more often permanently employed. A total of 93% were ordinary class teachers and 7% were special class teachers, teaching, for example, pupils with learning difficulties or behavioural problems. Of the respondents, special class teachers worked more often in schools in wealthy neighbourhoods. In addition 40% of the teachers themselves lived in a neighbourhood with the highest socioeconomic status, and only 9% lived in an area of low socioeconomic status. A strong association could be seen between the socioeconomic status of the teacher's workplace and that of the teacher's own residence.

Table 2 shows the association between school neighbourhood socioeconomic status and the teachers' health-risk behaviours. Teachers working in schools in the poorest neighbourhoods had a 2.3-fold risk of heavy alcohol use compared with their counterparts working in schools in the wealthiest neighbourhoods. This effect remained after controlling for the socioeconomic status of the teacher's own residential area. No statistically significant association was found between school neighbourhood socioeconomic status, smoking and obesity. However, we found some evidence that among smokers, the number of cigarettes consumed daily was lower among teachers working in high socioeconomic neighbourhoods (fully adjusted mean 8.6 cigarettes/day in the highest, 11.1 in the second, 10.9 in the third and 11.3 in the lowest socioeconomic groups; $p = 0.01$, 0.09 and 0.08, respectively).

Table 3 presents the relationship between school neighbourhood socioeconomic status and chronic diseases. The teachers working in neighbourhoods with a low socioeconomic status had a 1.4 times greater risk of any chronic disease, a 1.2 times greater risk of cardiovascular disease, a 1.3 times greater risk of musculoskeletal disease and a 1.5 times greater risk of mental disorder (of these, only mental disorder reached statistical significance). The association with mental disorder attenuated after adjustment for the socioeconomic status of the teacher's own residential neighbourhood.

Table 4 shows the association between school neighbourhood socioeconomic status and working conditions reported by the teachers. The teachers working in neighbourhoods with low socioeconomic status reported the lowest frequency of workplace meetings. The highest socioeconomic group, by contrast,

**Table 1** Characteristics of study participants by school neighbourhood socioeconomic status

| | All | School neighbourhood socioeconomic status | | | |
|---|---|---|---|---|---|
| | | Highest | Second | Third | Lowest |
| Sex | | | | | |
| Women | 1471 (79) | 374 (83) | 443 (80) | 346 (76) | 308 (77) |
| Men | 391 (21) | 75 (17) | 114 (21) | 109 (24) | 93 (23) |
| Age (years) | | | | | |
| 21–30 | 260 (14) | 62 (14) | 80 (14) | 67 (15) | 51 (13) |
| 31–35 | 239 (13) | 56 (13) | 66 (12) | 63 (14) | 54 (14) |
| 36–40 | 244 (13) | 49 (11) | 89 (16) | 48 (11) | 58 (15) |
| 41–45 | 283 (15) | 80 (18) | 85 (15) | 60 (13) | 58 (15) |
| 46–50 | 275 (15) | 58 (13) | 88 (16) | 66 (15) | 63 (16) |
| 51–55 | 322 (17) | 68 (15) | 84 (15) | 95 (21) | 75 (19) |
| 56–62 | 239 (13) | 76 (17) | 65 (12) | 56 (12) | 42 (11) |
| Type of employment contract | | | | | |
| Permanent | 1432 (77) | 355 (79) | 412 (74) | 345 (76) | 320 (80) |
| Temporary | 430 (23) | 94 (21) | 145 (26) | 110 (24) | 81 (20) |
| Type of school class | | | | | |
| Ordinary class | 1730 (93) | 411 (92) | 512 (92) | 426 (94) | 381 (95) |
| Special class | 132 (7) | 38 (9) | 45 (8) | 29 (6) | 20 (5) |
| Socioeconomic status of the teacher's residential neighbourhood | | | | | |
| Highest | 718 (39) | 358 (80) | 203 (36) | 105 (23) | 52 (13) |
| Second | 655 (35) | 60 (13) | 219 (39) | 211 (46) | 165 (41) |
| Third | 325 (18) | 25 (6) | 89 (16) | 100 (22) | 111 (28) |
| Lowest | 164 (9) | 6 (1) | 46 (8) | 39 (9) | 73 (18) |

Values are expressed as n (%).

reported higher participation in occupational training, higher teaching efficacy and lower mental workload than the other three socioeconomic groups. No difference was found in management perceptions between the groups.

## DISCUSSION

We found that teachers working in schools in the poorest neighbourhoods had higher alcohol use and a higher probability of reporting a doctor-diagnosed mental disorder than teachers working in the wealthiest neighbourhoods. They also reported the lowest meeting frequency at their workplaces. Teachers from the wealthiest neighbourhoods, by contrast, participated in occupational training more often, perceived their teaching efficacy as better and had lower mental workload than teachers in other socioeconomic groups.

This is the first study to investigate the association between socioeconomic status of a school neighbourhood and the health of teachers working in these schools. Our findings agree with the results of earlier research suggesting that neighbourhood context is an important factor in the development of chronic diseases[1–3 5–7 9–10] and health-risk behaviours.[1 2 4 6 8 11] However, earlier studies have focused on the residents of neighbourhoods, whereas our study was concerned with the neighbourhood as a working environment. Despite the difference in study focus, some similarities may exist in the reasoning behind the possible causal links between neighbourhood characteristics and health.

Heavy alcohol use and self-reported doctor-diagnosed mental disorders were more prevalent among teachers working in the poorest neighbourhoods compared with those working in the wealthiest neighbourhoods. We did not find a neighbourhood effect on the prevalence of smoking, although smoking has been associated with low neighbourhood socioeconomic status in earlier studies.[4 6 8 11] On the basis of our findings, it seems likely that school neighbourhood may influence the number of cigarettes smoked rather than per se smoking status.[11] A higher risk of mental disorders for teachers working in the poorest neighbourhoods attenuated after controlling for the socioeconomic status of the area in which the teachers themselves lived. This indicates that the contribution of the residential neighbourhood to mental health factors is stronger than that of the work neighbourhood. However, heavy drinking seems to be independently associated with low socioeconomic status of school neighbourhoods. The reasons for this finding may be related to more hazardous working environments, which we were not able to thoroughly assess in this study.

Mechanisms that link neighbourhood characteristics with individual health may be related to the neighbourhood infrastructure (eg, availability of healthy food, and recreation spaces and their security) and environmental factors, such as violent victimisation and other forms of social interaction.[1 2 17] In the school context, we found that the measures of school functioning—that is, work group meeting frequency and participation in occupational training—were poorer in schools

**Table 2** Association between school neighbourhood socioeconomic status and health-risk behaviours among teachers

| School neighbourhood socioeconomic status | Heavy alcohol use | | | Smoking | | | Obesity | | |
|---|---|---|---|---|---|---|---|---|---|
| | N/n of cases | Model I* OR (95% CI) | Model II† OR (95% CI) | N/n of cases | Model I* OR (95% CI) | Model II† OR (95% CI) | N/n of cases | Model I* OR (95% CI) | Model II† OR (95% CI) |
| Highest | 444/24 | 1 | | 431/30 | 1 | | 443/124 | 1 | |
| Second | 554/45 | 1.48 (0.91 to 2.40) | 1.30 (0.79 to 2.14) | 536/56 | 1.41 (0.89 to 2.23) | 1.36 (0.80 to 2.31) | 546/158 | 1.07 (0.81 to 1.41) | 1.03 (0.77 to 1.38) |
| Third | 454/46 | 1.73 (0.97 to 3.07) | 1.48 (0.82 to 2.66) | 443/43 | 1.32 (0.87 to 2.00) | 1.24 (0.76 to 2.04) | 446/149 | 1.25 (0.94 to 1.66) | 1.20 (0.87 to 1.66) |
| Lowest | 401/49 | 2.25 (1.32 to 3.83) | 1.82 (1.04 to 3.18) | 389/30 | 1.02 (0.64 to 1.63) | 0.98 (0.57 to 1.68) | 396/123 | 1.17 (0.88 to 1.54) | 1.08 (0.77 to 1.52) |

*Adjusted for sex, age, type of class and type of employment contract.
†Adjusted for Model I and socioeconomic status of the teacher's residential area.

**Table 3** Association between school neighbourhood socioeconomic status and chronic diseases among teachers

| School neighbourhood socioeconomic status | Total/number of cases | Model I* OR (95% CI) | Model II† OR (95% CI) | Total/number of cases | Model I* OR (95% CI) | Model II† OR (95% CI) |
|---|---|---|---|---|---|---|
| | Any chronic disease | | | Cardiovascular disease | | |
| Highest | 429/256 | 1 | 1 | 420/51 | 1 | 1 |
| Second | 539/310 | 0.98 (0.75 to 1.27) | 0.91 (0.69 to 1.21) | 524/67 | 1.14 (0.77 to 1.70) | 1.05 (0.69 to 1.60) |
| Third | 439/259 | 1.04 (0.75 to 1.44) | 0.95 (0.67 to 1.34) | 431/53 | 1.00 (0.64 to 1.56) | 0.89 (0.57 to 1.41) |
| Lowest | 387/251 | 1.36 (0.98 to 1.87) | 1.25 (0.87 to 1.79) | 382/52 | 1.18 (0.79 to 1.76) | 1.05 (0.66 to 1.67) |
| | Musculoskeletal disease | | | Mental disorder | | |
| Highest | 420/112 | 1 | 1 | 428/61 | 1 | 1 |
| Second | 526/138 | 1.00 (0.77 to 1.30) | 0.94 (0.71 to 1.24) | 524/75 | 1.05 (0.73 to 1.51) | 0.96 (0.67 to 1.39) |
| Third | 432/131 | 1.21 (0.89 to 1.63) | 1.11 (0.81 to 1.53) | 429/57 | 1.03 (0.68 to 1.54) | 0.91 (0.58 to 1.45) |
| Lowest | 380/120 | 1.33 (0.99 to 1.79) | 1.21 (0.85 to 1.72) | 382/69 | 1.47 (1.02 to 2.12) | 1.28 (0.83 to 1.97) |

*Adjusted for sex, age, type of class and type of job contract.
†Adjusted for model I and socioeconomic status of the teacher's residential area.

with low neighbourhood socioeconomic status. Teachers in those schools also reported lower teaching efficacy than did their colleagues in wealthier socioeconomic neighbourhoods. These aspects may be related, in addition to health of the teachers, to poorer material resources in these schools. However, only the schools in the wealthiest neighbourhoods seem to differ from other schools; except for workplace meeting frequency, we did not find the association to be linear. It seems that in Finland there are no ''twilight schools'' with enormous disadvantages in resources and working conditions.

Owing to our cross-sectional study design, the possibility of reverse causation and selection bias cannot be ruled out. Teachers with health problems or an unhealthy lifestyle may be selected to schools located in the poorest neighbourhoods. Although the direction of causality remains to be examined, our results suggest that in addition to area segregation by residents, there is area segregation by teachers providing basic education for children. Among the potential explanations for the neighbourhood environment effects on health are the services provided, publicly or privately, to support people in their daily lives.[1] In schools located in the poorest neighbourhoods, the health problems of teachers and the behavioural problems of children may affect their work performance. Future research is needed to confirm the hypothesis that the health of people working among the residents of low-socioeconomic status neighbourhoods may have an effect on the resources available for the residents, as in this case, in the form of municipal-funded education.

The methodological advances of our study were the large number of school neighbourhoods and the high participation rate of the schools; all public comprehensive schools of the 10 towns participated in the study. Another advantage was the use of comprehensive, national, register-based statistics for neighbourhood socioeconomic status obtained from Statistics Finland. These data are reliable, routinely collected each year and cover the total Finnish population. As Statistics Finland data for neighbourhood socioeconomic status and employers' registers for occupational factors, demographic factors, workplaces and postal zip codes were used, the study was not subject to common method variance bias. We adjusted all models for demographic background and the socioeconomic status of the

## What is already known

- Low-neighbourhood socioeconomic status is associated with morbidity and mortality among residents.
- It is not known whether neighbourhood socioeconomic status is also associated with the health and working conditions of teachers who work in these neighbourhoods.

## What this paper adds

- Teachers working in schools located in the poorest neighbourhoods report higher probability of heavy alcohol use and mental disorders than teachers working in the wealthiest neighbourhoods.
- Lower socioeconomic status of the school neighbourhoods is also associated with poorer psychosocial working conditions and lower teaching efficacy reported by the teachers.
- With regard to policies aimed at improving the health of school teachers and reducing area-related socioeconomic inequalities, environmental factors in addition to individual factors should be considered.

**Table 4** Association between school neighbourhood socioeconomic status and working conditions among teachers

| School neighbourhood socioeconomic status | Management | | Workplace meeting frequency | | Participation in occupational training | | Perceived teaching efficacy | | Mental workload | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean* (SE) | p Value† | Mean* (SE) | p Value† | Mean* (SE) | p Value† | Mean* (SE) | p Value† | Mean* (SE) | p Value† |
| Highest | 3.95 (0.09) | | 5.21 (0.11) | | 3.51 (0.09) | | 3.29 (0.05) | | 3.24 (0.04) | |
| Second | 3.90 (0.08) | 0.645 | 5.09 (0.10) | 0.352 | 3.22 (0.09) | 0.007 | 3.14 (0.04) | 0.001 | 3.36 (0.04) | 0.003 |
| Third | 3.86 (0.08) | 0.467 | 4.94 (0.14) | 0.083 | 3.21 (0.09) | 0.006 | 3.14 (0.05) | 0.007 | 3.35 (0.04) | 0.011 |
| Lowest | 3.94 (0.10) | 0.953 | 4.84 (0.14) | 0.018 | 3.20 (0.10) | 0.006 | 3.12 (0.05) | 0.002 | 3.35 (0.05) | 0.020 |

*Adjusted for sex, age, type of class, type of employment contract and socioeconomic status of the teacher's residential area.
†p Value for difference when compared with the highest school neighbourhood socioeconomic status.

teachers own residential area to minimise the possibility of confounding. In Finland, about 98% of comprehensive school education is municipal-funded and is organised by the municipalities. Of the pupils attending comprehensive school, about 5–10% attend school outside their own neighbourhoods. Thus, confounding by education in private schools or in schools outside pupil's own neighbourhood is an unlikely explanation for our findings.

In summary, this study showed that teachers working in neighbourhoods with a low socioeconomic status have more mental health problems and health-risk behaviours and a poorer psychosocial work environment more often than teachers working in the wealthiest neighbourhoods. Our findings suggest that improving environmental factors may be important for improving the health of school teachers.


## Authors' affiliations

**Marianna Virtanen, Mika Kivimäki, Anne Linna, Jaana Pentti, Jussi Vahtera,** Finnish Institute of Occupational Health, Topeliuksenkatu, Helsinki, Finland
**Mika Kivimäki,** Department of Epidemiology and Public Health, University College London Medical School, London, UK
**Marko Elovainio,** National Research and Development Centre for Welfare and Health, Helsinki, Finland


Funding: This study was supported by the Academy of Finland (projects 117604 and 105195) and the Finnish Work Environment Fund.

Competing interests: None.

Contributors: MV is the guarantor for the paper, and with MK, ME, AL, JP and JV designed the hypothesis, analysed the data and wrote the paper.

## REFERENCES


1 **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.
2 **Diez-Roux A**. Investigating neighbourhood and area effects on health. *Am J Public Health* 2001;**91**:1783–9.
3 **Kammerling RM**, O'Connor S. Unemployment rate as a predictor of rate of psychiatric admission. *BMJ* 1993;**307**:1536–9.
4 **Kleinschmidt I**, Hills M, Elliot P. Smoking behaviour can be predicted by neighbourhood deprivation measures. *J Epidemiol Community Health* 1995;**49**(Suppl 2):S72–7.
5 **Eachus J**, Williams M, Chan P, *et al*. Deprivation and cause specific morbidity: evidence from the Somerset and Avon survey of health. *BMJ* 1996;**312**:287–92.
6 **Diez-Roux AV**, Nieto J, Muntaner C, *et al*. Neighbourhood environments and coronary heart disease: a multilevel analysis. *Am J Epidemiol* 1997;**146**:48–63.
7 **Yen IH**, Kaplan GA. Neighbourhood social environment and risk of death: multilevel evidence from the Alameda County Study. *Am J Epidemiol* 1999;**149**:898–907.
8 **Sundquist J**, Malmström M, Johansson SE. Cardiovascular risk factors and the neighbourhood environment: a multilevel analysis. *Int J Epidemiol* 1999;**28**:841–5.
9 **Bosma H**, van de Mheen HD, Borsboom GJJM, *et al*. Neighbourhood socioeconomic status and all-cause mortality. *Am J Epidemiol* 2001;**153**:363–71.
10 **Lawlor DA**, Davey Smith G, Patel R, *et al*. Life-course socioeconomic position, area deprivation and coronary heart disease: findings from the British Women's Heart and Health Study. *Am J Public Health* 2005;**95**:91–7.
11 **Chuang Y**, Cubbin C, Ahn D, *et al*. Effects of neighbourhood socioeconomic status and convenience store concentration on individual level smoking. *J Epidemiol Community Health* 2005;**59**:568–73.
12 **Leventhal T**, Brooks-Gunn J. The neighbourhoods they live in: the effects of neighbourhood residence on child and adolescent outcome. *Psychol Bull* 2000;**126**:309–37.
13 **Sampson RJ**, Raudenbush SW, Earls F. Neighbourhoods and violent crime: a multilevel study of collective efficacy. *Science* 1997;**277**:918–24.
14 **Kalff AC**, Kroes M, Vles JSH, *et al*. Neighbourhood level and individual level SES effects on child problem behaviour: a multilevel analysis. *J Epidemiol Community Health* 2001;**55**:246–50.
15 **Reijneveld SA**, Brugman E, Verhulst FC, *et al*. Area deprivation and child psychosocial problems. A national cross-sectional study among school-aged children. *Soc Psychiatry Psychiatr Epidemiol* 2005;**40**:18–23.
16 **Thomas Kingsley G**. Housing, health, and the neighbourhood context. *Am J Prev Med* 2003;**24**:6–7.
17 **Morland K**, Wing S, Diez Roux A, *et al*. Neighbourhood characteristics associated with the location of food stores and food service places. *Am J Prev Med* 2002;**22**:23–9.
18 **Vahtera J**, Poikolainen K, Kivimäki M, *et al*. Alcohol intake and sickness absence: a curvilinear relation. *Am J Epidemiol* 2002;**156**:969–76.
19 **Paffenbarger RS**, Hyde RT, Wing AL, *et al*. The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *N Engl J Med* 1993;**328**:538–45.
20 **Koskenvuo M**, Kaprio J, Rose RJ, *et al*. Hostility as a risk factor for mortality and ischemic heart disease in men. *Psychosom Med* 1988;**50**:330–40.
21 **Moorman RH**. Relationship between organizational justice and organizational citizenship behaviors: do fairness perception influence employee citizenship? *J Appl Psychol* 1991;**76**:845–55.
22 **Lehto AM**. *Työelämän laatu ja tasa-arvo tuotannossa [The quality of working life and equality in production]* (in Finnish). Helsinki, Finland: Statistics Finland, 1991.