Neighbourhood socioeconomic context and self reported health and smoking: a secondary analysis of data on seven cities

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Objective: Many studies have shown that poor health status and harmful health behaviour occur more frequently in deprived neighbourhoods. Most studies show modest associations between area level socioeconomic factors, the neighbourhood context, and health outcomes. However, estimates for the contextual effects vary. It is unclear if this variation is attributable to differences in methodology. This study examines whether contextual neighbourhood differences in health outcomes really vary between cities or that differences in methodology may account for these differences.

Design: Secondary analysis of data from health interview surveys in seven large Dutch cities in the 1990s comprising 23 269 residents of 484 neighbourhoods, using multilevel logistic models.

Setting: General population aged 16 and over.

Main outcome measures: Self reported health, smoking of cigarettes.

Main results: The socioeconomic context of neighborhoods is associated with health outcomes in all large Dutch cities. The strength of the association varies between cities, but variation is much smaller in the age group 25–64. Furthermore, neighbourhood differences vary in size between native and other residents. Contextual neighbourhood differences are about two times larger for self reported health than for the smoking of cigarettes, but for native Dutch people they are of similar size.

Conclusions: A comparatively large improvement in health may be gained in deprived neighbourhoods, because of the poorer health status to which the context of these neighbourhoods also contributes. Health promoting interventions should be aimed at the residents and at the context of deprived neighbourhoods, taking differences between ethnic groups and age groups into account.
be taken in response to conditions that are specific for a
given city).11
Data from seven cities met these criteria and were made
available by the Municipal Health Services concerned. Details
of these surveys as well as some characteristics of these cities
are presented in table 1. The quality of each survey was
assessed by the following criteria (between parentheses the
number of points for quality, leading to a quality score):
• response (60% and over: 1 point; lower: none);
• method of data collection (uniform strategy regarding all
respondents: 1 point; otherwise: none);
• selectiveness of non-response (shown to be lacking
regarding age and gender: 1 point; otherwise: none).
After restriction to the relevant age range (16 and over) and
to records providing all relevant variables (background charac-
teristics and self reported health and/or smoking), the analy-
sis concerned 23 269 people in 484 neighbourhoods in seven
cities.

Health outcomes concerned self reported health and smok-
ing of cigarettes; in the analysis both were dichotomised, and
poor health and smoking of cigarettes were predicted in the
models. Self reported health concerned three different types of
questions. The appendix contains a description of the wording
of all questions and the method of dichotomisation. Edu-
cational level concerned the highest degree earned, in four
levels: primary school, lower secondary school, higher second-
ary school, post-secondary education.

Area data
Area data concerned the socioeconomic position of the neigh-
bourhood in 1995. Measures were: general practitioner (GP)
depression score, mean income per earner (further: “mean
income”), and proportion of residents aged 16–64 who were
dependent on social benefits (further: “social benefits”).
The GP depression score was computed as the sum of the
standardised scores of each neighbourhood regarding degree of
urbanisation, proportion of ethnic minorities, “mean income”
and “social benefits”. Regarding the 5% of the popula-
tion that lives in areas with the highest scores, Dutch GPs
receive an additional fee for each patient,11 comparable to the
UK Jarman system.11 For this study, I computed a depression
score per neighbourhood although the original score concerns
postcode sectors. The reason for choosing neighbourhoods is
that postcode sectors have a logistic origin—that is, adequate
post delivery—and were designed at a national level. In
contrast, neighbourhoods consist of areas with similar
housings, often delineated by natural boundaries. Because
of this, they are socio-culturally rather homogenous. In the plan-
nings of health and other local services, neighbourhoods are
usually the lowest level that is considered; these neigh-
bourhoods are often used as equivalents for local communities.
I used a cut off that identifies those 5% of the Dutch popula-
tion that lives in the most deprived areas according to the GP score.
Regarding the analyses on self reported health, 19% of the
respondents lived in such areas; regarding the analyses on
smoking this concerned 18%. Similar percentages apply to the
cities the respondents resided in, which reflects the fact that
GP deprived areas are mostly located in the big cities.

The two other neighbourhood measures, “mean income”
and “social benefits”, were divided in tertiles in such a way
that each category comprised one third of all respondents. All
neighbourhood measures were based on data from Statistics
Netherlands.11

Analysis
The analyses were performed using multilevel logistic
modelling,11 because of the hierarchical nature of the data.
Characteristics of areas and communities have a potential
impact on all residents, whereas an individual characteristic of
a resident only affects that individual. This implies that the
individual responses may cluster by neighbourhood—that is,
their variability attributable to neighbourhood characteristics
may be smaller than their variability attributable to individual
characteristics. Random variables at both levels were modelled
to take this into account.

Firstly, I computed differences in health outcomes for each
separate neighbourhood measure regarding all cities com-
bined, after adjustment for age, gender, and their interactions.
Secondly, I did the same after additional adjustment for indi-
vidual educational level. In these models, I also included
dummies for each city (using Amsterdam, the biggest city, as
reference) to adjust for the methodological differences (as
shown in table 1) that would probably affect the overall preva-
lence of poor self reported health and smoking. To the models
regarding self reported health, I added a dummy regarding its
operationalisation (SF-3611 or other11) because in one survey
(from Utrecht), two operationalisations had been used.

Next, I repeated both analyses with the aforementioned
models to which the interaction between neighbourhood measures and (dummies for) each city had been added. These
analyses yielded odds ratios for less favoured neighbourhoods
in a city compared with the most favoured ones in that city,
because of the aforementioned inclusion of a dummy for each
city. In these models, the statistical significance of differences
by neighbourhood SE position between cities was assessed on
the basis of the differences in deviations between models with
and without the interaction between neighbourhood measure
and city.17

Table 1: Details of the surveys included in the analysis and characteristics of the cities concerned

<table>
<thead>
<tr>
<th>City</th>
<th>City size*</th>
<th>Period</th>
<th>Method‡</th>
<th>Age</th>
<th>Nat§</th>
<th>N†</th>
<th>Response</th>
<th>Sel. response‡</th>
<th>Quality</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>722</td>
<td>87</td>
<td>1992 '93</td>
<td>door</td>
<td>3</td>
<td>16+</td>
<td>all</td>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotterdam</td>
<td>598</td>
<td>70</td>
<td>1995 '95</td>
<td>mail</td>
<td>3</td>
<td>16–74</td>
<td>Dutch</td>
<td>gender, age, ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Hague</td>
<td>443</td>
<td>36</td>
<td>1999 '99</td>
<td>tel/mail</td>
<td>3/1</td>
<td>16+</td>
<td>all</td>
<td>ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utrecht</td>
<td>236</td>
<td>84</td>
<td>1995 '00</td>
<td>mail/tel</td>
<td>3</td>
<td>1+</td>
<td>all</td>
<td>gender, age, efn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eindhoven</td>
<td>197</td>
<td>93</td>
<td>1998 '99</td>
<td>mail</td>
<td>3</td>
<td>15–75</td>
<td>all</td>
<td>gender, age, efn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tilburg</td>
<td>171</td>
<td>62</td>
<td>1999 '99</td>
<td>mail</td>
<td>2</td>
<td>16–70</td>
<td>Dutch</td>
<td>unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groningen</td>
<td>164</td>
<td>52</td>
<td>1998 '98</td>
<td>mail</td>
<td>2</td>
<td>20+</td>
<td>all</td>
<td>gender, age</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Number of residents of the city in 1995 (in thousands), and number of populated neighbourhoods in the same year in the analyses. Total number of respondents in survey; in the next tables, numbers only concern people age 16 and over on whom data were available regarding the relevant outcomes and background characteristics. §Method of data collection and maximum number of calls per person: “Door” = face to face at home, “tel” = by telephone, “mail” = by mailed questionnaire. ¶Presence of selective (non)response regarding various characteristics; “ms” = marital status, efn = ethnic background.

References
11. Reijneveld SA. Self reported health concerns self-rated health, see Appendix. a Self reported health concerns self-rated health, see Appendix. b Self reported health concerns self-rated health, see Appendix.

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### Table 2
Odds ratios (95% confidence intervals, CI) for poor self reported health after adjustment for city, age, gender, and their interactions, and after additional adjustment for educational level (484 neighbourhoods in seven cities)

<table>
<thead>
<tr>
<th></th>
<th>All respondents aged 16 and over (n=22725)</th>
<th>Respondents aged 25–64 (n=14615)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjustment for city, age, gender, and their interactions</td>
<td>Idem + educational level</td>
</tr>
<tr>
<td></td>
<td>OR  95% CI</td>
<td>OR  95% CI</td>
</tr>
<tr>
<td>GP deprivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>1.60 (1.47 to 1.75)</td>
<td>1.32 (1.21 to 1.44)</td>
</tr>
<tr>
<td>yes</td>
<td>1.05 (0.93 to 1.18)</td>
<td>0.82 (0.70 to 0.96)</td>
</tr>
<tr>
<td>Area level random variance (SE)*</td>
<td>0.10.52 (0.0338)</td>
<td>0.0829 (0.0340)</td>
</tr>
<tr>
<td>City differences ($\chi^2$; df)†</td>
<td>4.2 (5 df)</td>
<td>10.8 (5 df)</td>
</tr>
<tr>
<td>Mean income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>favourable</td>
<td>1.53 (1.42 to 1.66)</td>
<td>1.31 (1.21 to 1.42)</td>
</tr>
<tr>
<td>medium</td>
<td>0.93 (0.81 to 1.06)</td>
<td>0.75 (0.64 to 0.88)</td>
</tr>
<tr>
<td>unfavourable</td>
<td>1.69 (1.50 to 1.90)</td>
<td>1.47 (1.30 to 1.66)</td>
</tr>
<tr>
<td>Area level random variance (SE)*</td>
<td>0.0964 (0.0333)</td>
<td>0.0770 (0.0338)</td>
</tr>
<tr>
<td>City differences ($\chi^2$; df)†</td>
<td>179.5 (12 df)</td>
<td>166.6 (12 df)</td>
</tr>
<tr>
<td>Proportion on social benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>favourable</td>
<td>1.43 (1.32 to 1.55)</td>
<td>1.25 (1.15 to 1.35)</td>
</tr>
<tr>
<td>medium</td>
<td>1.95 (1.80 to 2.11)</td>
<td>1.52 (1.40 to 1.65)</td>
</tr>
<tr>
<td>unfavourable</td>
<td>1.95 (1.80 to 2.11)</td>
<td>1.52 (1.40 to 1.65)</td>
</tr>
<tr>
<td>Area level random variance (SE)*</td>
<td>0.0898 (0.0332)</td>
<td>0.0763 (0.0337)</td>
</tr>
<tr>
<td>City differences ($\chi^2$; df)†</td>
<td>103.9 (12 df)</td>
<td>121.4 (12 df)</td>
</tr>
</tbody>
</table>

*Area level concerns neighbourhoods; random variance at individual level was fixed at “1” (assuming a strictly binomial variance); random variance at city level was captured by a dummy for each city. †Difference in deviance between a model containing an interaction of the neighbourhood measure and a model without ($\chi^2$ value and degrees of freedom; statistical significance ($p<0.05$) is indicated in bold).

### Figure 1
Odds ratios and 95% confidence intervals by city for poor self reported health in neighbourhoods with medium and unfavourable mean income. All respondents aged 16 and over (left) and respondents aged 25–64 (right), both after adjustment for age, gender, and their interactions (upper), and after additional adjustment for educational level (lower).
All analyses were repeated for three subgroups. The first group concerned surveys with a quality score of 2 or 3, to examine the impact of the quality of the data collection on the results. The second group consisted of respondents aged 25–64, for two reasons. Among the age group 16–24 adjustment for individual SES by means of educational level may be incomplete, as many in this age group are still studying. Among the age group 65 and over, educational level may also have a different meaning because of cohort effects regarding educational attainment. Furthermore, some neighbourhood measures, such as unemployment, do not apply to this age group. The third group concerned native Dutch respondents because the various cities strongly differed in the proportion of non-native Dutch people in their population and these people were represented in the surveys with a quality score of 2 or 3. Consequently, the analysis of these people was repeated with the same data collection quality score.
surveys in a highly varying degree. Data on country of birth were only available for five cities. Results on this subgroup were therefore compared with those on all respondents from these five cities. As the latter results hardly differed from those that included all seven cities, I do not separately report them. Finally, I examined whether the use of a different cut off point for self rated health in the survey on the Hague (that used marks to rate the own health) would yield different results. This seemed not to be the case, results are therefore not presented.

All analyses were performed with MLwiN, using a predictive quasi-likelihood procedure in combination with a first order Taylor expansion series and assuming the random variation at the individual level to be binomially distributed. Random variation was further assessed at the neighbourhood level (because of the inclusion of separate dummies for each city, random effects were not assessed further at that third level).

RESULTS

Self reported health

Respondents from the less favoured neighbourhoods report poor health more often than the other respondents. Adjustment for the educational level of respondents reduces the additional risks (that is, the degree in which the ORs exceed 1) by almost one half (42%–47%) (table 2).

In all cities respondents report a poor health more frequently in less favoured neighbourhoods but the size of the neighbourhood differences in health varies between cities. Furthermore, the degree as to which adjustment for educational level reduces differences between more and less favoured neighbourhoods also varies by city and by area measure, from 22% to 72%. Only for Tilburg, the ORs for neighbourhoods with a lower “mean income” become higher after this adjustment. Regarding the measures “mean income” and “social benefits”, neighbourhood differences vary between cities in a rather similar way and both with statistical significance, compare table 2. Results by city for “mean income” are shown in figure 1. After adjustment for educational level neighbourhood level SE differences are smallest in Amsterdam (the biggest city), followed by Tilburg (the smallest city). On the other hand, neighbourhood differences are biggest in Rotterdam regarding the neighbourhood measures that show statistically significant city differences, but the further picture shows a large variety.

All analyses were repeated for three subgroups, respondents from surveys with the highest quality scores (2 or 3), respondents aged 25–64 and native Dutch respondents. Results regarding the first subgroup are similar to those on the total group, and are therefore not separately reported. Neighbourhood level SE differences are somewhat larger for respondents aged 25–64, however, whereas adjustment for educational level reduces the excess risks in deprived neighbourhoods to a similar degree as for all respondents (39%–46%). Moreover, for the age group 25–64 the variation by city largely decreases (table 2, final columns, and fig 2). Finally, neighbourhood level SE differences are smaller for native respondents than for the total group, but individual educational level explains a similar proportion of the neighbourhood differences (41%–47%; table 3). Variation by city in neighbourhood level SE differences decreases then. Like for all respondents, neighbourhood level SE differences are somewhat larger for native respondents aged 25–64 than for all respondents in that age group, and variation by city is somewhat smaller.

Smoking of cigarettes

The proportion of cigarette smokers is higher among residents of less favoured neighbourhoods. Neighbourhood level SE
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Key points

- Poor health status and harmful health behaviour occur more frequently in deprived neighbourhoods.
- The available evidence shows associations of varying strength between the socioeconomic context of neighbourhoods and health outcomes.
- This secondary analysis shows that these associations are similar across seven cities if analyses are restricted to the age group 25–64.
- Health promoting interventions should be aimed at the residents and at the context of deprived neighbourhoods.

Assessment by city shows that the proportion of smokers is higher in deprived neighbourhoods in all cities, though again to a varying degree. The degree to which adjustment for educational level reduces these differences also varies by city and by area measure; especially in Amsterdam, Groningen, and Utrecht some reductions are complete. On average, neighbourhood differences are again comparatively large for Rotterdam, and for Eindhoven. Results by city for “mean income” are shown in fig 2.

Regarding analyses on subgroups, results resemble those on self rated health regarding respondents from surveys with the highest quality scores and respondents aged 25–64. For the first subgroup, results were similar to those on all respondents. For the second subgroup, neighbourhood level SE differences are slightly larger; adjustment for educational level reduces the excess risks in deprived neighbourhoods by 42%–54%, and the variation by city largely decreases (table 4, final columns). In contrast, differences by neighbourhood deprivation are somewhat larger for native Dutch respondents (the third subgroup), whereas the reduction of the neighbourhood differences by adjustment for educational level is smaller (26%–45%; not shown). As a result, neighbourhood level SE differences after adjustment for educational level are almost the same regarding self reported health and the smoking of cigarettes for all native Dutch respondents and for those aged 25–64. In all cases, city differences are much smaller for native respondents of all ages than for all respondents.

DISCUSSION

Neighbourhood level SE differences in health outcomes exist in all large Dutch cities. Differences vary between cities, both after adjustment for differences in age and gender and after additional adjustment for individual educational level. However, this city level variation is much smaller if only the age group 25–64 is taken into account. Contextual neighbourhood differences are about two times larger for self reported health than for smoking of cigarettes. The country of birth of respondents also influences the size of neighbourhood differences in health outcomes. In native Dutch people, neighbourhood differences are smaller for self reported health, but larger for smoking. For the latter outcome, educational level also explains less of the neighbourhood differences. As a result, contextual differences are of almost equal size for poor self reported health and smoking among native Dutch respondents.

Methodology

Methodological factors may have influenced the results of this study in several ways. Firstly, it concerns a secondary analysis of available surveys in which the method and quality of the data collection procedures differed. The results of this study show the importance of differentiating between age groups and between ethnic groups. Other methodological factors, such as the use of different operationalisations of self reported health and selective non-response, may also have led to results that vary by city, even though a restriction of the analyses to the higher quality surveys yielded similar results. The stratified sampling in the Amsterdam survey (table 1) was controlled for by including both stratification variables (boroughs and age groups) in more detailed categories in all models. This stratification is therefore unlikely to have influenced findings, though it gives comparatively much weight to the elderly population in that survey.

Secondly, the method of analysis may have influenced my findings concerning the neighbourhood measures used. Regarding neighbourhood data, I used the best databases available for the Netherlands; data are either based on the municipal population registers or on taxation data. However, regarding GP deprivation, I recomputed the score for neighbourhood instead of postcode sectors. Bias because of this is thus very unlikely as previous analyses have shown results on the size of neighbourhood differences to be very similar for both geographical classifications.

Thirdly, the method of analysis may have influenced my findings. The statistical significance of differences between cities was measured by a comparison of the deviances of subsequent models. This measure has been shown to be somewhat unreliable in multilevel models. A better alternative is not available, but after restriction to the age group 25–64, differences in deviance between models with and without interactions of cities with neighbourhood measures were

Policy implications

- Health problems in deprived neighbourhoods are so large that specific policies are called for. These policies should first of all aim at improving factors that intermediate the association between deprivation and health status, such as adverse physical and social environments and lifestyles, and a poor delivery of services. Secondly, they should aim at providing additional care to combat the consequences of deprivation. Finally, they should tackle socioeconomic deprivation in itself. For the short-term and middle term, policies aiming at the first two solutions are (comparatively) easiest to implement, though in practice implementation will still be hard.
- Both local and national governments should be involved in making such policies, as they both have competences regarding relevant policy areas, but implementation should occur locally.
- The national government should provide financial support for additional care, for instance by general practitioners, and for other interventions aiming at deprived neighbourhoods, and should facilitate local solutions. In the Netherlands, the government has established a separate urban policy for this purpose.
- Local government should create specific policies to improve the health status of deprived neighbourhoods, also using them as a setting to contact various deprived groups, and should redistribute financial means to these areas. In the Netherlands, municipal health services can strongly support such policies by providing health promoting and coordinating activities, and acting as health advocates for deprived areas. Similar community based health authorities could play a pivotal part in other countries.
- Many health problems in deprived neighbourhoods can only be tackled with the additional support of other policy sectors, such as housing, urban development, and employment. Such intersectoral policies should further be developed.

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mostly small and could thus have been affected by such an unreliability. Furthermore, incomplete adjustment for individual SES may have influenced all results on the size of the contextual effects. Previous analyses have shown that remaining neighbourhood differences become smaller if individual SES is adjusted for by the use of several measures instead of only one.22 This probably applies to this study too, implying an overestimation of the contextual effects. Finally, for each outcome, I computed associations for three independent variables. Some authors would therefore prefer an adjustment for multiple comparisons, leading to even lower statistical significance.

Fit with previous studies and explanations

In a review of studies on differences in health outcomes by neighbourhood socioeconomic level, Picket and Pearl concluded that these differences are mostly of a rather modest size, though most studies show at least some statistically significant differences. The results of the studies as reviewed by Picket and Pearl varied quite a lot, similar to the variation between cities that I found. Picket and Pearl consider heterogeneity of study designs to be the most probable explanation for this variation. The results of this study show that this is indeed a possible explanation, as variation between cities largely decreases if the analyses are restricted to the age group 25–64. This decrease occurs both without and with adjustment for educational level. It can therefore not be explained by incomplete adjustment for educational level in the lower and higher age groups, but indicates that neighbourhood SES position affects people from these age groups differently. For example, students starting out on their own may choose a living address mostly independent of the SE position of a neighbourhood. To a lesser degree, the same holds for ethnic background.

The results of this study further show that contextual factors in deprived neighbourhoods may contribute to the poorer health status in those neighbourhoods. Various area bound factors may explain this contribution, as summarised by Macintyre and coworkers.27 They divided such area bound factors into five groups: physical features, quality of the domestic and working environment, the provision of various services, socio-cultural features, and the reputation of the domestic and working environment, the provision of various factors into five groups: physical features, quality of the environment, socio-cultural features, and reputation of the domestic and working environment.27 Factors from each group may contribute to a poorer health in deprived neighbourhoods, such as a higher level of environmental pollution, or a poorer provision of health services. Available research shows that Dutch cities differ regarding these factors indeed.28 An important result of this study is, however, that the effect of these contextual factors seems to be limited, especially if one examines the same age group in each city. The inclusion of varying age groups may thus explain the somewhat contradictory previous results regarding neighbourhood level SES differences in Dutch big cities, with much larger contextual effects for Rotterdam than for Amsterdam.22,23,38 In this analysis contextual effects also remain larger regarding Rotterdam, however, which may indicate real differences between these cities.

In summary, this study shows that residents of deprived (urban) neighbourhoods more often report poor health and to smoke cigarettes. This implies that in such neighbourhoods, a comparatively large gain in health may be obtained. Contextual factors seem to contribute to the unfavourable health situation in these neighbourhoods; the degree as to which varies relatively by city. These contextual effects provide an additional reason to stimulate health promoting interventions in these neighbourhoods. Such interventions may, for example, aim at the reduction of environmental pollution,22,23 and of the health care in such neighbourhoods,22,38 or at strengthening the social structure of the communities concerned.22,38 To reach this aim, intersectoral policies are needed.22 Results further show that regarding reported health special attention should be paid to

the non-native people in such neighbourhoods.22 In the Netherlands, some of these, especially those from Turkey and Morocco, have indeed been shown to have a mostly lower educational level and poor health status, but often a comparatively favourable health behaviour.22 Regarding the latter, it might be hypothesised that their uptake of harmful behaviour is still lagging behind, temporarily causing different SE gradients. This has been shown for other population groups as well.27 Additional study is needed to determine whether a similar variation between cities in the size of the contextual neighbourhood differences also exists in other countries and to find routes to tackle the causes. Preferably, such studies should include surveys of high quality and similar methodology—that is, without selective non-response, with similar outcome measures, and conducted in the same period. Notwithstanding, the neighbourhood level SE differences as observed offer a great opportunity to improve the health of urban residents.

APPENDIX

WORDING AND DICHTOMISATION OF ALL QUESTIONS

Self reported health

How is your health in general? Is it: very good; good; fair; sometimes good, sometimes poor; poor19

Dichotomisation in the analyses was: fair to poor versus (very) good.

General health, SF-36

In general, would you say your health is: excellent; very good; good; fair; poor;17,18

Dichotomisation in the analyses was: fair or poor versus excellent or (very) good.

Health mark

Which mark (from 1, poorest, to 10, best) would you give to your health? . . .

Dichotomisation in the analyses was: 1–6 versus 7–10.

Smoking of cigarettes

Do you smoke cigarettes at least sometimes (self made or from a packet)? yes/no. If yes, how many a day?

Dichotomisation in the analyses was: at least one cigarette/day versus less.

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Conflicts of interest: none.

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