Socio-economic position and health: what you observe depends on how you measure it

Sally Macintyre, Laura McKay, Geoff Der and Rosemary Hiscock

Abstract

Background A number of different socio-economic classifications have been used in relation to health in the United Kingdom. The aim of this study was to compare the predictive power of different socio-economic classifications in relation to a range of health measures.

Methods A postal questionnaire was sent to a random sample of adults in the West of Scotland (sampling from 1997 electoral roll, response rate 50 per cent achieved sample 2,867).

Results Associations between social position and health vary by socio-economic classification, health measure and gender. Limiting long-standing illness is more socially patterned than recent illness; income, Registrar General Social Class, housing tenure and car access are more predictive of health than the new National Statistics Socio Economic Classification; and men show steeper socio-economic gradients than women.

Conclusion Although there is a consistent picture of poorer health among more disadvantaged groups, however measured, in seeking to explain and reduce social inequalities in health we need to take a more differentiated approach that does not assume equivalence among social classifications and health measures.

Keywords: social classifications, inequalities in health, self-reported health, gender

Introduction

A new socio-economic classification (the National Statistics Socio Economic Classification; NS-SEC) has recently been introduced in the United Kingdom, and will replace previously used measures of occupational social class in all official analyses. There have been many analyses of morbidity and mortality in the United Kingdom using a previous classification, the Registrar General’s occupational social class scheme. The introduction of the new classification has generated discussion about the predictive power of different social classifications in relation to health. However, most of the published empirical analyses of NS-SEC have either compared a large range of social classifications in relation to a single health outcome, or a few social classifications in relation to a wide range of health outcomes.

The purpose of the present study is to address three questions: For any given health measure, how do different social classifications vary in predictive power? For any given social classification, how does its predictive power vary according to the health outcome examined? What is the predictive power of individually based measures as compared with household-based ones? To answer these questions we compare a large range of social classifications in relation to several health outcomes.

Background

In the United Kingdom there is a long tradition of classifying social groups so as to explore the relationship between social conditions and health. In the mid-nineteenth century Edwin Chadwick used three categories: gentry and professionals, farmers and tradesmen, and labourers and artisans. The first detailed analysis of occupational mortality rates examined men in several hundred occupations, using 1851 Census data for denominators. Occupational death rates have subsequently been reported around the time of every decennial Census.

A proposal to group occupations into a social class classification was made in 1887, and researchers started using various classifications of occupations in social or health surveys (for example, Charles Booth distinguished eight occupational groupings in his survey of Tower Hamlets in the 1880s). In 1913 the Registrar General also used an eightfold classification of fathers’ occupations to analyse infant mortality rates. He subsequently modified this classification to contain only five ranked occupational groups, and applied this to adult and infant mortality around the 1921 Census. Successive versions of this scheme (RGSC) were used to analyse mortality in the United Kingdom. It has been noted that the conceptual basis underlying this classification is unclear (apart from the fact that it reflects general social standing in the community, and sup-

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Journal of Public Health Medicine 25(4) © Faculty of Public Health 2003; all rights reserved.
posedly, from 1980, occupational skill), and that there is some circularity in the prediction of mortality, as occupational mortality rates were used as a way of calibrating the scale. 

Another occupational classification, Socio Economic Group (SEG), was introduced into official statistics in the United Kingdom in 1951. It aimed to bring together people with jobs of similar social and economic status by taking into account employment status, occupation and industry, although again there are complaints that it does not have an explicit conceptual basis. Both the RGSC and SEG are ordinal scales, the RGSC having six categories and the most commonly used SEG format having seven.

The Cambridge scale, introduced in 1980, is designed to measure the social distance between occupations. Based on asking a large number of people in different occupations about the occupations of five friends (and of their spouse), it generates a continuous hierarchical score for occupations.

In 1994 the Office of Population Censuses and Surveys (now Office for National Statistics) commissioned a review of its social classifications. The new measure, NS-SEC, is based on employment relations, labour market situations and work situation. It first distinguishes between employers, self-employed workers, employees and those not in the labour market; then it subdivides employers into those of large and small organizations, and employees into those in service relationships, intermediate and labour contracts.

NS-SEC is a categorical scale, its authors arguing that: 'the NS-SEC distinguishes more and less advantaged or privileged forms of employment relations, but both the employment status aspects of classification and the different mixes of employment relationships in each class mean that the NS-SEC classes cannot be arranged along a single continuum'. Despite this disclaimer the sevenfold, fivefold and threefold classifications are clearly based on some sort of hierarchy, as evidenced by the terminology used. The sevenfold classification, for example, is divided into: 1, higher managerial and professional occupations; 2, lower managerial and professional occupations; 3, intermediate occupations; 4, small employers and own account workers; 5, lower supervisory and technical occupations; 6, semi routine occupations; 7, routine occupations. The threefold classification (1, managerial and professional occupations; 2, intermediate occupations; 3, lower occupations) is even clearer in its hierarchical presentation and it is difficult to see why these should not be treated as ordinal scales.

For all these scales, individuals can be classified by their own current or past occupation, by the occupation of their spouse, or the highest of own or spouse’s (or by ‘head of household’, variously defined). There has been some debate about the merits of using own, spouse’s or highest occupation, although usually only in relation to women.

Other measures in common use in the United Kingdom are housing tenure and car access, often regarded as proxies for material deprivation. (There is no question on income in the UK Census.)

Several studies have recently examined the performance of these various occupational classifications and material assets indicators in predicting health. Chandola examined the performance of the Erikson–Goldthorpe scale (on which the NS-SEC is based), the RGSC and the Cambridge scale in predicting coronary heart disease (CHD), using data from the Health and Lifestyle Survey and its seven-year follow-up. He found that the Cambridge scale had the strongest association with CHD. Subsequently, he examined NS-SEC, RGSC, income and housing tenure as predictors of mortality in the British Household Panel Study, and found that NS-SEC did not significantly predict mortality, whereas the other measures of socio-economic status did.

Bartley et al. have analysed the predictive power of the Erikson–Goldthorpe schema and the Cambridge scale in relation to cardiovascular risk factors. They found the strength of the relationship between social position and cardiovascular risk factors to vary according to the definition of social position used; in particular, they found a closer relationship between most health behaviours and the Cambridge scale.

Craig compared the NS-SEC with the Cambridge scale and the RGSC in predicting self-assessed health, using the Scottish Health Survey. He suggested that NS-SEC is an alternative to the RGSC for measuring socio-economic inequalities in health, and that it is unlikely substantially to alter our understanding of the relationship between social class and health. NS-SEC and the Cambridge scale tended to be more strongly associated with self-assessed health than RGSC, although the differences varied by year of survey.

The aim of the present study is to build on these analyses of the relative predictive power of different socio-economic classifications, by using a wide range of measures of socio-economic position and of health. By grouping the socio-economic measures into as similar a number of categories as possible, and treating all health measures as dichotomies, we can examine for each health measure the relative predictive power of different socio-economic classifications, and for each socio-economic classification its relative predictive power for different measures of health.

**Design and methods**

**Design**

We used data from the Transport, Housing and Well-being study (THAW). This sought to unpack the social meaning and practical significance of housing tenure and car access variables commonly shown to be associated with health and longevity. It examined the psychological, social and physical mechanisms by which such assets might contribute to socio-economic variations in health.

In 1997 we drew a random sample of 6500 adults from the electoral roll in the eight local authority areas that make up the Glasgow and Clyde Valley Structure Plan area, in the West of...
Scotland. The estimated population in this area in 1998 was 1918380. It is a socially heterogeneous area, containing within it marked variations in social status and in health (in 1991 owner occupation varied from 73.8 per cent in Eastwood to 45.2 per cent in Glasgow City, and rates of reported limiting long-standing illnesses varied from 6.7 per cent in Eastwood to 13.5 per cent in Glasgow City). A postal questionnaire, with three follow-ups using Dillman’s total design method, achieved a response rate of 50 per cent, which is typical for this type of general population survey, giving 2867 completed responses for analysis. The age range of respondents was 17–102 years.

Measures

The questionnaire included questions on own, and partner’s if applicable, current occupation (or last occupation if not currently working). We coded these to RGSC, SEG, Cambridge scale and NS-SEC. We derived a variable for household social class using the highest of own or partner’s occupational social class. To obtain maximum comparability both internally and with other studies, we used the sixfold classification of RGSC, sevenfold classifications of SEG and NS-SEC, and grouped Cambridge scores and reported monthly household income into sextiles. Housing tenure and car access were measured as in the UK Census, and grouped into owner occupiers versus social renters (private renters are excluded from the analysis), and those with car access versus those with no car access.

We used five measures of health; self-assessed general health, limiting long-standing illness (LLSI), recent symptoms, anxiety and depression. Responses to a self assessment of health question were dichotomized into excellent or good versus fair or poor. The question on limiting long-standing illness was from the UK General Household Survey: ‘Do you have any long-standing illness, disability, or infirmity? And if so does this limit your activities in any way?’ Respondents were also asked whether or not they had experienced any of 20 common symptoms during the last month; totals of four or more were treated as high symptoms. Anxiety and depression were elicited using the Hospital Anxiety and Depression Scale (HADS), each subscale using a cut-off point of 11 or more to denote caseness.

Table 1 Percentage prevalence of dichotomized health outcomes

<table>
<thead>
<tr>
<th></th>
<th>General health (fair/poor)</th>
<th>Limiting long-standing illness</th>
<th>Symptoms (high (4+))</th>
<th>HADS anxiety (case)</th>
<th>HADS depression (case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>33.7</td>
<td>29.8</td>
<td>35.5</td>
<td>13.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Females</td>
<td>37.4</td>
<td>29.4</td>
<td>46.1</td>
<td>23.2</td>
<td>5.9</td>
</tr>
<tr>
<td>All</td>
<td>35.8</td>
<td>29.5</td>
<td>41.4</td>
<td>18.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Total (n)</td>
<td>1784</td>
<td>1710</td>
<td>1746</td>
<td>1685</td>
<td>1697</td>
</tr>
</tbody>
</table>

Analysis strategy

As we wished systematically to compare across socio-economic measures and health measures we excluded from the analysis any respondents with missing values on any of the independent variables (n = 490 for own RGSC and SEG, 423 for own NS-SEC, 430 for own CAM; 666 for income, 151 for tenure, and 98 for car access).

We used logistic regression in SPSS, controlling for age in all models. In models containing the whole sample, we tested for two-way interactions between age or gender and the socio-economic measures. We then ran the models separately for men and for women, and we summarize these in this paper. We first looked at the predictive power of the six- or sevenfold classifications based on own or household occupational social class or income for each health measure and for each sex. Then we dichotomized the household social class measures, splitting the categories at a point that would give us distributions of the sample as similar as possible to those for tenure and car access (see Table 3 below).

We use two measures of strength of association; the odds ratio of the bottom versus the top category and the $R^2$. Comparison of the extreme categories in terms of an odds ratio is a common way of illustrating the effect size of a predictor. However, this does not take into account how well the intermediate categories fit the data. To illustrate the predictive power of the classifications overall we give the generalized coefficient of determination ($R^2$) proposed by Nagelkerke. This is used in preference to the version proposed by Cox and Snell, which is dependent on the overall prevalence of the outcome and hence less useful for comparisons across outcomes with differing prevalence levels.

Results

Table 1 shows the prevalence of the five health measures. Levels of poor health are fairly high in this West of Scotland population, ranging from 41 per cent with four or more symptoms in the last month to 6 per cent cases of depression. (These high rates are consistent with those reported by other studies; e.g. Refs 30, 37 and 38).

The full models for five health measures, 11 social class/position categories, and for men and women separately are too extensive to present here. We therefore present summary tables...
only. In Table 2 we present the $R^2$ for the full models (i.e. logistic regression using all six or seven categories of the social class or income variable), and the odds ratio for the bottom versus the top categories. All the models presented are statistically significant at the $p < 0.05$ level, other than those marked in italics, for which $p \geq 0.05$.

First, the $R^2$ values are much higher for LLSI than for general health, which are in turn higher than those for symptoms, anxiety or depression. Second, these socio-economic measures explain more of the variance in men’s health than in women’s, particularly for general health, LLSI and symptoms. Third, although the amount of variance explained is in general very similar for household and individual measures, for some health measures and some socio-economic measures household classifications explain more variance, whereas for others individual measures have more explanatory power. Although the Cambridge Scale is designed to measure social status and relational aspects of social class, the household measure is not consistently more predictive than the individual measure. Fourth, household income tends to explain more of the variance than the occupation-based measures, this greater explanatory power being particularly marked for self-assessed health and LLSI.

The odds ratios show marked variations between socio-economic measures, health measures, and men and women. For example, the odds ratio of the lowest versus highest sextile of household income for LLSI among men is 9.3, compared with 3.7 for household NS-SEC and 2.8 for LLSI for women.

Table 3 shows the distribution of the sample across the dichotomized household social position measures. Table 4 gives results for models using these dichotomized independent variables.

The $R^2$ values are lower for the dichotomized social class and income models than they were for the models with six or seven categories, but not very much lower. Similarly, and as one would expect, the odds ratios for the lower compared with higher categories are lower in these dichotomized models; for example, for men the odds ratio for households headed with unskilled versus professional workers for self-assessed health is 5.7, compared with 2.7 for semi- and unskilled workers versus the rest.

In these dichotomized models income and tenure tend to have greater explanatory power and effect sizes than the occupationally based measures. Which of the four occupationally based measures has greatest explanatory power and effect size depends on the health measure. Finally, the strength of association between socio-economic and health measures tends to be greater for men than for women.

### Table 2

<table>
<thead>
<tr>
<th>General health</th>
<th>LLSI</th>
<th>Symptoms</th>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$ vs top</td>
<td>$R^2$ vs top</td>
<td>$R^2$ vs top</td>
<td>$R^2$ vs top</td>
<td>$R^2$ vs top</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household RGSC</td>
<td>0.166</td>
<td>5.7</td>
<td>0.215</td>
<td>6.8</td>
</tr>
<tr>
<td>Own RGSC</td>
<td>0.163</td>
<td>4.7</td>
<td>0.212</td>
<td>5.7</td>
</tr>
<tr>
<td>Household SEG</td>
<td>0.176</td>
<td>5.3</td>
<td>0.236</td>
<td>9.4</td>
</tr>
<tr>
<td>Own SEG</td>
<td>0.173</td>
<td>4.7</td>
<td>0.232</td>
<td>6.7</td>
</tr>
<tr>
<td>Household NS Sec</td>
<td>0.164</td>
<td>3.1</td>
<td>0.219</td>
<td>3.7</td>
</tr>
<tr>
<td>Own NS Sec</td>
<td>0.175</td>
<td>2.5</td>
<td>0.219</td>
<td>2.8</td>
</tr>
<tr>
<td>Household Cambridge</td>
<td>0.169</td>
<td>4.1</td>
<td>0.217</td>
<td>4.1</td>
</tr>
<tr>
<td>Own Cambridge</td>
<td>0.160</td>
<td>4.1</td>
<td>0.244</td>
<td>1.2</td>
</tr>
<tr>
<td>Household income</td>
<td>0.249</td>
<td>10.1</td>
<td>0.290</td>
<td>9.3</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household RGSC</td>
<td>0.082</td>
<td>9.1</td>
<td>0.104</td>
<td>2.3</td>
</tr>
<tr>
<td>Own RGSC</td>
<td>0.075</td>
<td>8.8</td>
<td>0.109</td>
<td>1.4</td>
</tr>
<tr>
<td>Household SEG</td>
<td>0.086</td>
<td>10.0</td>
<td>0.107</td>
<td>2.2</td>
</tr>
<tr>
<td>Own SEG</td>
<td>0.077</td>
<td>8.9</td>
<td>0.121</td>
<td>1.4</td>
</tr>
<tr>
<td>Household NS Sec</td>
<td>0.093</td>
<td>5.6</td>
<td>0.109</td>
<td>1.6</td>
</tr>
<tr>
<td>Own NS Sec</td>
<td>0.094</td>
<td>4.7</td>
<td>0.129</td>
<td>1.0</td>
</tr>
<tr>
<td>Household Cambridge</td>
<td>0.085</td>
<td>3.4</td>
<td>0.102</td>
<td>1.7</td>
</tr>
<tr>
<td>Own Cambridge</td>
<td>0.095</td>
<td>3.1</td>
<td>0.122</td>
<td>1.9</td>
</tr>
<tr>
<td>Household income</td>
<td>0.112</td>
<td>5.0</td>
<td>0.134</td>
<td>2.8</td>
</tr>
</tbody>
</table>

*Results for depression for men exclude the highest social class group, as no men in the highest group were cases. Comparisons here are between categories 6 or 7 and 2.

†Results for depression for women by household SEG and income exclude the highest category, as no women in the highest category were cases. All odds ratios are significant at <0.05, except those in italics, which are $p \geq 0.05$. All models control for age.
Discussion

Different measures of socio-economic status are often treated as though they are broadly interchangeable and as if they all measure similar underlying constructs of social or material advantage. The question that is then sometimes raised is: "Which of these classifications "best" measures socio-economic gradients in health?" This implies that there is a universal relationship between socio-economic position and health, and often
that the ‘best’ measure is the one that produces the strongest association between socio-economic position and health. Commonly these classifications are used as surrogates for somewhat different concepts from those that they measure at face value; for example, car ownership or housing tenure are often treated as proxies for income or social status; and occupational social class is treated as variously a proxy for income, wealth, education, social status, position in the labour market, culture or placement in a social hierarchy.

On average, home owners may be more wealthy than social renters, and those in top jobs are likely to have more income and prestige than those of the bottom. However, the extent of these associations may vary (by historical period, gender, etc.) and we have shown elsewhere from the THAW data that one cannot assume that occupational social class, deprivation of area of residence, income, housing tenure and car access are equivalent measures all tapping the same thing.39

There is sometimes a similar tendency fallaciously to assume equivalence in relation to health measures. Investigators wanting to examine the relationship between socio-economic position and health need to decide which health measure to use. The decision taken is often a pragmatic one based on ease of measurement and known associations with other measures (for example, self-assessed health is commonly used in surveys, both because it is easy to gather this information40 and because it has been observed to be predictive of mortality41). It may then be assumed that any relationships between the chosen health measure and socio-economic position are generalizable to other health measures, not only in direction but also in magnitude. However, different health measures may be only weakly associated with each other and may differ in their associations with social characteristics such as gender, socio-economic position or age.41

We have shown here that the picture one observes of socio-economic variations in health depends on the measurement of socio-economic status, of health, and on gender. If one wishes to demonstrate strong associations between socio-economic status and health, it would be better to use limiting long-standing illness, men, income and household rather than individual measures of social position, and older measures of occupational social class such as RGSC, SEG or income rather than newer measures such as the Cambridge scale or NS-SEC. The fact that one would observe much weaker associations (including some that are not statistically significant) if one looked at depression, or women, or used individual social class measures, does not mean that ‘really’ social class is not as important for health as is sometimes claimed, or would be evidenced from using long-standing illness among men. Rather, it shows that there is not a single picture of the strength of association between SES and health, and one would perhaps be foolish to expect one.

This is not just an arcane methodological point; rather we think it underlines the argument that how one measures socio-economic position and how one measures health should relate to one’s underlying theory about the mechanisms linking them. We would argue that one needs to get as close as possible to the hypothesized causal link in choosing any measures. For example, if one hypothesizes that disposable income allows one to purchase health-promoting goods and services that improve one’s diet and exercise behaviour and reduce coronary heart disease risk, one should test this by measuring available disposable income, diet and exercise, and coronary heart disease risk, not by measuring housing tenure and self-assessed health. If one hypothesizes that work conditions and exposures have direct impacts on stress then one should measure these exposures and expressed stress, recurrent symptoms, and anxiety or depression, not grade of employment or car access and limiting long-standing illness.

Thus our results, although showing a consistent and marked pattern of association between socio-economic position and health, also suggest a need for more differentiated and specific models of the relationship between socio-economic position and health. We would predict that similarly differentiated patterns would be observed in other studies that are capable of comparing across health outcomes and socio-economic variables.

Acknowledgements

The THAW study was funded under the UK Economic and Social Research Council’s Health Variations Programme (Grant No. L128 25 1017). We are grateful to Professor Ade Kearns and Anne Ellaway who were co-grant holders, and to survey staff and participants. We are also grateful to Kate Hunt for helpful comments on an earlier draft. S.M., L.M. and G.D. are employed by the UK Medical Research Council, as was R.H. at the time the study was conducted.

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Accepted on 28 July 2003