Is socioeconomic position related to the prevalence of metabolic syndrome? 
Influence of social class across the life-course in a population-based study of older men

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Objective: To examine whether adult and childhood social class are related to metabolic syndrome (MetS) in later life, independent of adult behavioural factors.

Research design and methods: A population-based cross-sectional study comprised 3134 men aged 60-79.

Results: Adult and childhood social class were both inversely related to MetS. Mutual adjustment attenuated the relation of childhood social class; that of adult social class was little affected. However, the relation of adult social class was markedly attenuated by adjustment for smoking, physical activity, alcohol consumption. High waist circumference was independently associated with adult social class.

Conclusions: The adult social class-MetS association was largely explained by behavioural factors. Central adiposity, a MetS component, was associated with adult social class. Focussing on health behaviours and obesity, rather than specific efforts to reduce social inequalities in MetS, is likely to be particularly important in reducing social inequalities in coronary disease.
There has been increasing interest in the relationship between socioeconomic position and metabolic syndrome, which is postulated to form a direct pathway linking adverse social conditions and coronary heart disease (CHD), possibly working through neuroendocrine mechanisms causing obesity, dyslipidemia, hypertension and insulin resistance.\(^{(1,2)}\) However, the association between socioeconomic position and metabolic syndrome has not been completely consistent between studies,\(^{(1,3,4)}\) and the relationship is possibly confounded by behavioural factors, which are strongly related to metabolic syndrome, and to socioeconomic position.\(^{(3-6)}\) Additionally, few studies have explored the independent relationships of adult and early life social circumstances with metabolic syndrome.\(^{(4,7,8)}\) We have, therefore, examined whether adult and childhood social class are associated with metabolic syndrome in older men (60-79 years) independent of adult behavioural factors.

**RESEARCH DESIGN AND METHODS**

The British Regional Heart Study comprises a population-based cohort of men recruited in 1978-80 at 40-59 years from 24 British towns.\(^{(5)}\) In 1998-2000 all surviving subjects, now aged 60-79, were invited to a physical examination, and provided fasting blood samples used to measure metabolic parameters.\(^{(5)}\) 4252 men (77\%) attended the examination; 4094 men (74\%) had at least one measurement of biological factors.

Adult socioeconomic position was measured as social class based on longest-held occupation recorded at study entry (aged 40-59), using the Registrar General’s Classification; I (professionals, e.g. physicians, engineers), II (managerial, e.g. teachers, sales managers), IIInon-manual (semi-skilled non-manual, e.g. clerks, shop assistants), III manual (semi-skilled manual, e.g. bricklayers), IV (partly skilled, e.g. postmen) and V (unskilled, e.g. porters, labourers). Childhood social class, based on father’s longest-held occupation collected through questionnaires in 1992, was classified with Registrar General’s Classification 1931 (close to the mid-year of birth of study participants) into six social classes from I to V.\(^{(9)}\)

Questionnaires in 1998-2000 collected information on cigarette smoking, alcohol intake and physical activity.\(^{(5)}\) Metabolic syndrome, defined using National Cholesterol Education Programme/Adult Treatment Panel III criteria, included \(\geq 3\) of: 1) fasting plasma glucose \(\geq 110\) mg/dL, 2) serum triglycerides \(\geq 150\) mg/dL, 3) serum HDL-cholesterol \(\geq 40\) mg/dL, 4) blood pressure \(\geq 130/85\) mmHg /on anti-hypertensive treatment, 5) waist circumference \(>102\) cm.\(^{(10)}\) Insulin resistance was estimated using homeostasis model assessment (HOMA) as the product of fasting glucose and insulin divided by the constant 22.5.\(^{(11)}\)

Men with prevalent diabetes (doctor-diagnosed diabetes /fasting glucose \(\geq 7\) mmol/L; \(n=385\)), or men whose own (\(n=112,\) 3\%) or father’s (\(n=81,\) 2\%) occupation was in the armed forces were excluded from the analysis. Multiple logistic regression was carried out using SAS version 9.1.

**RESULTS**

Among 3134 men aged 60-79 without prevalent diabetes, 817 men (28\%) had metabolic syndrome. Both adult and childhood social class showed an inverse gradient in metabolic syndrome, with lower social classes having greater odds of metabolic syndrome (see table). When mutually adjusted, the association of childhood social class with metabolic syndrome was diminished, while the
association of adult social class was little altered. However, when adjusted for adult behavioural factors, the association of adult social class was markedly attenuated.

Manual social class both in childhood and adulthood was associated with the highest odds of metabolic syndrome compared with non-manual childhood and adult social class; this was appreciably reduced when adjusted for adult behavioural factors (see table). There was no evidence that the relation of childhood social class with metabolic syndrome was different in adult non-manual or manual social classes (P for interaction 0.17).

**Table**

Of the individual components of the metabolic syndrome, only high waist circumference was associated with adult social class independent of childhood social class and adult behavioural factors (adult social class V vs. I OR 1.71, 95%CI 1.02-2.88; P for trend=0.0006). Childhood social class was not independently associated with the individual components. The association of adult social class with HOMA (P for trend 0.02) was attenuated when adjusted for adult behavioural factors (P for trend 0.17). There was no evidence of a relationship between childhood social class and insulin resistance.

**CONCLUSIONS**

Although the metabolic syndrome has been proposed as a link between low socioeconomic position and CHD,(2) we did not find an independent association between social class (adult and childhood) and metabolic syndrome, and a stronger relationship of metabolic syndrome with adult risk factors than early life factors.(1,3,4,7) Since childhood social class is related to adult socioeconomic position and behavioural factors,(13) the effect of childhood social class could well have been mediated through adult social class and behavioural factors. However, it was not possible to fully disentangle this issue in our study.

This paper indicates the lack of an independent association between socioeconomic position and metabolic syndrome in a socioeconomically representative sample of British men. The results are, however, not directly generalisable to women, although other studies suggest a stronger association between social class and metabolic syndrome in women than men.(14,15) As with any study comprising older men, and because prevalent diabetes cases were excluded, the potential for healthy survivor bias exists. However, the high follow-up rate of this cohort population will have ensured that such bias is no more marked than would be the case in any other population of surviving older subjects.
ACKNOWLEDGEMENTS

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REFERENCES


### Table: Prevalence and odds ratios for metabolic syndrome in 3134 non-diabetic men aged 60-79 according to adult and childhood social class

<table>
<thead>
<tr>
<th>Adult social class</th>
<th>Metabolic syndrome n (%)</th>
<th>Age-adjusted odds ratio (95%CI)</th>
<th>Odds ratio (95%CI) adjusted for age and social class*</th>
<th>Odds ratio (95%CI) adjusted for age and adult behavioural factors†</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (n=324)</td>
<td>70 (23)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>II (n=900)</td>
<td>209 (24)</td>
<td>1.08 (0.80, 1.48)</td>
<td>1.06 (0.78, 1.45)</td>
<td>1.02 (0.74, 1.40)</td>
</tr>
<tr>
<td>III non-manual (n=339)</td>
<td>84 (27)</td>
<td>1.24 (0.86, 1.79)</td>
<td>1.19 (0.82, 1.73)</td>
<td>1.11 (0.76, 1.61)</td>
</tr>
<tr>
<td>III manual (n=1199)</td>
<td>348 (31)</td>
<td>1.47 (1.10, 1.98)</td>
<td>1.38 (1.02, 1.88)</td>
<td>1.27 (0.94, 1.73)</td>
</tr>
<tr>
<td>IV (n=280)</td>
<td>77 (29)</td>
<td>1.37 (0.94, 1.99)</td>
<td>1.26 (0.86, 1.86)</td>
<td>1.15 (0.78, 1.70)</td>
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<tr>
<td>V (n=92)</td>
<td>29 (33)</td>
<td>1.64 (0.98, 2.76)</td>
<td>1.50 (0.88, 2.54)</td>
<td>1.22 (0.71, 2.08)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.0005</td>
<td>0.008</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Manual (IIImanual, IV, V) vs. non-manual (I, II, IIInon-manual)</td>
<td>1.33 (1.13, 1.57)</td>
<td>1.27 (1.07, 1.50)</td>
<td>1.21 (1.02, 1.43)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Childhood social class</th>
<th>Metabolic syndrome n (%)</th>
<th>Age-adjusted odds ratio (95%CI)</th>
<th>Odds ratio (95%CI) adjusted for age and social class*</th>
<th>Odds ratio (95%CI) adjusted for age and adult behavioural factors†</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (n=144)</td>
<td>28 (21)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>II (n=480)</td>
<td>118 (26)</td>
<td>1.33 (0.84, 2.13)</td>
<td>1.26 (0.79, 2.01)</td>
<td>1.23 (0.77, 1.97)</td>
</tr>
<tr>
<td>III non-manual (n=372)</td>
<td>91 (26)</td>
<td>1.35 (0.83, 2.18)</td>
<td>1.27 (0.78, 2.05)</td>
<td>1.27 (0.78, 2.07)</td>
</tr>
<tr>
<td>III manual (n=1246)</td>
<td>321 (27)</td>
<td>1.44 (0.93, 2.22)</td>
<td>1.27 (0.82, 1.99)</td>
<td>1.28 (0.82, 1.99)</td>
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<tr>
<td>IV (n=508)</td>
<td>150 (32)</td>
<td>1.80 (1.14, 2.84)</td>
<td>1.55 (0.96, 2.48)</td>
<td>1.57 (0.99, 2.51)</td>
</tr>
<tr>
<td>V (n=384)</td>
<td>109 (30)</td>
<td>1.66 (1.03, 2.65)</td>
<td>1.40 (0.86, 2.28)</td>
<td>1.45 (0.90, 2.34)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.006</td>
<td>0.10</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Manual (IIImanual, IV, V) vs. non-manual (II, IIImanual, IV, V)</td>
<td>1.24 (1.04, 1.49)</td>
<td>1.13 (0.93, 1.37)</td>
<td>1.17 (0.97, 1.41)</td>
<td></td>
</tr>
</tbody>
</table>

*Adult and childhood social class adjusted for each other; †Adult behavioural factors included smoking, physical activity and alcohol consumption