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 social class and childhood social class are related to metabolic syndrome in later life, independent of adult behavioral factors.

RESEARCH DESIGN AND METHODS — This was a population-based cross-sectional study comprising 2,968 men aged 60–79 years.

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

CONCLUSIONS — The association between adult social class and metabolic syndrome was largely explained by behavioral factors. In addition, central adiposity, a component of metabolic syndrome, was associated with adult social class. Focusing on healthier behaviors and obesity, rather than specific efforts to reduce social inequalities surrounding metabolic syndrome, is likely to be particularly important in reducing social inequalities that affect people with coronary disease.

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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 behavioral 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 may be associated with metabolic syndrome in older men (aged 60–79 years) independently of adult behavioral factors.

RESEARCH DESIGN AND METHODS — The British Regional Heart Study comprises a population-based cohort of men recruited in 1978–1780 at age 40–59 years from 24 British towns (5). In 1998–2000, all surviving subjects, now aged 60–79 years, were invited to attend a physical examination and provide fasting blood samples used to measure metabolic parameters (5). Of these men, 4,252 (77%) attended the examination and 4,094 (74%) provided at least one measurement of biological factors.

Adult socioeconomic position was measured as social class based on the longest-held occupation recorded at study entry (aged 40–59 years), using the Registrar General's classification: I (professional, e.g., physicians, engineers), II (managerial, e.g., teachers, sales managers), III-nonmanual (semi-skilled nonmanual, 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, laborers). Childhood social class, based on the father's longest-held occupation collected through questionnaires in 1992, was organized with the Registrar General's classification of 1931 (which approximates the study participants' mid–year of birth) 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, required participants to meet at least three of the following requirements: *1*) fasting plasma glucose $\geq$110 mg/dl, 2) serum triglycerides $\geq$150 mg/dl, *3*) serum HDL cholesterol $<$40 mg/dl, *4*) blood pressure $\geq$130/85 mmHg or antihypertensive treatment, and *5*) waist circumference $>$102 cm (10). Insulin resistance was estimated, using homeostasis model assessment, as the product of fasting glucose and insulin divided by the constant 22.5 (11).

Men with prevalent diabetes (doctor-diagnosed diabetes or fasting glucose $\geq$7 mmol/l; $n = 385$) and men whose own ($n = 112$) or whose father's ($n = 81$) occupation was in the armed forces were excluded from the analysis. Multiple lo-

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Table 1—*Prevalence of and ORs for metabolic syndrome according to adult and childhood social class (3,134 nondiabetic men aged 60–79 years)*

	n	Metabolic syndrome	Adjustment for age	Adjustment for age and social class*	Adjustment for age and adult behavioral factors†
Adult social class					
I	305	70 (23)	1.00	1.00	1.00
II	857	209 (24)	1.08 (0.80–1.48)	1.06 (0.78–1.45)	1.02 (0.74–1.40)
III-nonmanual	311	84 (27)	1.24 (0.86–1.79)	1.19 (0.82–1.73)	1.11 (0.76–1.61)
III-manual	1,141	348 (31)	1.47 (1.10–1.98)	1.38 (1.02–1.88)	1.27 (0.94–1.73)
IV	266	77 (29)	1.37 (0.94–1.99)	1.26 (0.86–1.86)	1.15 (0.78–1.70)
V	88	29 (33)	1.64 (0.98–2.76)	1.50 (0.88–2.54)	1.22 (0.71–2.08)
P for trend	—	—	0.0005	0.008	0.06
Manual (III-manual, IV, V) vs. nonmanual (I, II, III-nonmanual)	—	—	1.33 (1.13–1.57)	1.27 (1.07–1.50)	1.21 (1.02–1.43)
Childhood social class					
I	136	28 (21)	1.00	1.00	1.00
II	460	118 (26)	1.33 (0.84–2.13)	1.26 (0.79–2.01)	1.23 (0.77–1.97)
III-nonmanual	352	91 (26)	1.35 (0.83–2.18)	1.27 (0.78–2.05)	1.27 (0.78–2.07)
III-manual	1,184	321 (27)	1.44 (0.93–2.22)	1.27 (0.82–1.99)	1.28 (0.82–1.99)
IV	473	150 (32)	1.80 (1.14–2.84)	1.55 (0.96–2.48)	1.57 (0.99–2.51)
V	363	109 (30)	1.66 (1.03–2.65)	1.40 (0.86–2.28)	1.45 (0.90–2.34)
P for trend	—	—	0.006	0.10	0.05
Manual (III-manual, IV, V) vs. nonmanual (I, II, III-nonmanual)	—	—	1.24 (1.04–1.49)	1.13 (0.93–1.37)	1.17 (0.97–1.41)
Adult and childhood social class					
Childhood and adult non-manual social class	635	156 (25)	1.00	—	1.00
Childhood nonmanual and adult manual social class	230	58 (25)	1.04 (0.73–1.47)	—	0.94 (0.66–1.35)
Childhood manual and adult nonmanual social class	817	205 (25)	1.03 (0.81–1.31)	—	0.99 (0.78–1.28)
Childhood manual and adult manual social class	1,240	391 (32)	1.41 (1.14–1.76)	—	1.26 (1.00–1.58)
P for trend	—	—	0.001	—	0.03

Data are *n* (%) or OR (95% CI) unless otherwise indicated. *Adult and childhood social class adjusted for each other. †Adult behavioral factors included smoking, physical activity, and alcohol consumption.

gistic regression was carried out using SAS version 9.1.

RESULTS — Among 2,968 men aged 60–79 years without prevalent diabetes, 817 men (28%) had metabolic syndrome. Both adult and childhood social class showed an inverse relationship with metabolic syndrome, as lower social classes had greater odds of metabolic syndrome (Table1). When mutually adjusted, the association of childhood social class with metabolic syndrome was diminished, whereas the association of adult social class was little altered. However, when adjusted for adult behavioral factors, the association of adult social class was markedly attenuated. Manual social class both in childhood and in adulthood was associated with the highest odds of metabolic syndrome compared with nonmanual social class both in childhood and in adulthood; this was appreciably reduced when adjusted for adult behavioral factors (Table 1). There was no evidence that the relation between childhood social class and metabolic syndrome was different in adult nonmanual or manual social class ($P = 0.17$ for interaction).

Of the individual components of the metabolic syndrome, only high waist circumference was associated with adult social class independently of childhood social class and adult behavioral 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 homeostasis model assessment (*P* for trend = 0.02) was attenuated when adjusted for adult behavioral factors (*P* for trend = 0.17). There was no evidence of a relationship between childhood social class and insulin resistance.

CONCLUSIONS — Although 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 (either in adulthood or childhood) and metabolic syndrome in older British men. Adult behavioral factors (physical activity, smoking, and alcohol consumption) were responsible for the relationship between adult social class and metabolic syndrome. There was some increased risk of metabolic syndrome in men of manual social class both in childhood and in adulthood that was to a large extent explained by adult behavioral factors. There was no evidence of an independent association of adult/childhood social class with insulin resistance. Adult social class was strongly related to high waist circumference, a component of metabolic syndrome. It is therefore likely that the role of metabolic syndrome in social inequalities among people with CHD is largely due to behavioral factors and central adiposity/obesity, which are important coronary risk factors in their own right (12). Focusing efforts on understanding and reducing levels of behavioral factors and obesity could be particularly important in reducing social inequalities in CHD.

Although these findings are consistent with some previous studies, other studies have reported an independent association between social class (in both adult and childhood) and metabolic syndrome, as well as a stronger relationship of metabolic syndrome with adult risk factors than with early life factors (1,3,4,7). Since childhood social class is related to adult socioeconomic position and behavioral factors (13), the effect of childhood social class could well have been mediated through adult social class and behavioral 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, however, are not directly generalizable to women, although other studies suggest a stronger association between social class and metabolic syndrome in women than in men (14,15). As with any study group 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 has ensured that such bias is no more marked than would be the case in any other population of surviving older subjects.

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