Changes in diet and coronary heart disease mortality among social classes in Great Britain

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ABSTRACT Coronary heart disease (CHD) mortality has declined in Britain since the early 1970s and followed a reduction in dietary fat intake in the population. We attempted to determine whether there have been changes in dietary fat intakes by social classes and to see whether they correspond to social class changes in CHD mortality, where the greatest reduction has been in the upper social class groups. Dietary fat intake was specially obtained by social class on a household basis from the National Food Survey (NFS) for 1974 and 1981. The decline in saturated fat intake and increase in polyunsaturated fat is shown to have occurred in each social class group, although it was not possible to examine the data separately for men and women. In contrast, the decline in the proportion of current smokers between 1974 and 1980 (from the General Household Survey) was greatest in the higher social classes.

Rates of CHD mortality showed the greatest decline among men in social classes I & II over the period 1969/73 to 1979/83. However, despite some problems in the interpretation of the data collected by the NFS, this study shows that recent social class trends in dietary fat intakes are unlikely to account for the differential changes in CHD mortality. Changes in the prevalence of smoking among social classes are more consistent with the change in CHD mortality.

Coronary heart disease (CHD) mortality has declined in Britain since the early 1970s and appears to have followed a reduction in dietary fat intake in the population.1-3 The importance of changes in dietary fat intakes in explaining the declining rate of CHD mortality in Britain is suggested by comparisons with the United States, Australia and New Zealand, which experienced an earlier and more extensive decline in both saturated fat intake and CHD mortality,4,5 as well as by a large number of other studies examining the relationship between dietary fats and CHD.6 However, other changes, such as a reduction in the prevalence of cigarette smoking, better control of hypertension and changes in the medical care of those with CHD, have also been identified as possible contributory factors.2,4,6

Despite the general decline in CHD mortality in Britain there is evidence that the social class gradient has increased.7 This study was designed to see if there is a relationship between changes in diet and CHD mortality within social classes. The hypothesis was that the social classes with the greatest decline in CHD mortality would also have the greatest reduction in saturated fat intake, which is regarded as the main dietary risk factor for CHD through its effect on plasma cholesterol levels and low density lipoprotein. Changes in polyunsaturated fats are also of interest, since polyunsaturated and to a lesser extent monounsaturated fats are regarded as lowering plasma cholesterol when substituted for other fats, and may also have an independent protective effect. In this paper we compare changes in dietary fat intakes among social classes with changes in the prevalence of cigarette smoking, the other major behavioural risk factor.

Methods

Data from three sources were employed to compare social class changes in dietary fat intakes, cigarette smoking and CHD mortality. This requires that differences between these data sets are taken into account in the analysis and interpretation of trends.

Mortality

Mortality data by social class are available for Great Britain around 1971, based on data for all deaths in England and Wales 1970-72 and Scotland 1969-73; and around 1981, based on all deaths in 1979, 1980, 1982 and 1983 (satisfactory death data by social class
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were not available for 1981). For 1971 and 1981,
denominator data on social class were obtained from a
10% random sample of the census population. Deaths
for CHD (410–414) and all cause mortality were coded
according to the 8th Revision of the International
Classification of Diseases in the earlier period, and the
9th Revision in the later period. Following previous
practice, standardised mortality ratios (SMR) were
calculated by social class (grouped as described below)
for each period; although these SMRs are not strictly
comparable since they are based on different
weightings, in practice this difference should not have
been of importance.

Social class was assigned using the 1970 and 1980
occupational classifications. Revisions introduced in
the 1980 classification meant that about 10% of men
were not allocated to the same class as in 1970. There
is also concern that the problem of numerator
denominator biases due to less complete occupational
data recorded at death may have increased. The use of
three broad social class groups (I & II, III, IV & V)
should reduce, although not entirely remove, the effect
of changes in the classification, while providing more
detail on the social class distribution of mortality than
a broader non-manual/manual split. SMRs for
CHD and all cause mortality were calculated for the
three social class groups using Great Britain 1979–83
as the standard.

DIETARY INTAKE

Data on dietary intake were obtained from the
National Food Survey (NFS), which is an annual
survey of the nutrient content of British diets set up in
1940. The NFS sample aims to achieve an even
coverage of Wales, Scotland and each region of
England, as well as being representative of rural/urban
differences and seasonal patterns. The "housewife"
(the person, woman or man, principally responsible
for domestic arrangements) in sample households is
asked to keep a record for seven days of the
description, quantity and cost (if any) of all food items
entering the home for human consumption, apart
from sweets, chocolates and alcohol, and to note the
members of the household and visitors present at each
meal. Meals eaten outside the home by household
members are not included, although ice cream, fish
and chips and other take away meals are included if
brought home to eat. Over the period 1975–81 the
number of meals eaten outside the home increased
from an average of 3.01 to 3.25 per person per week,
although this was offset by an increase in meals served
to visitors.

The NFS provides data on average daily intakes per
person. This is based on the average for the household
and does not allow the dietary intakes of men and
women to be distinguished. NFS households are
routinely assigned to the Registrar General's social
class categories, based on the occupation of the
household head, although no information has been
published on the dietary intakes of social classes since
1969.

Special tabulations of NFS data were obtained
giving the average daily intakes per person of fats (g)
and energy (kcal) by social class for Great Britain in
1974 and 1981. The year 1974 was selected as being the
date when new nutrient conversion factors were
introduced. In both 1974 and 1981, households in the
NFS were assigned to a social class group using the
Registrar General's 1970 occupational classification,
although no distinction was made between III non-
manual and III manual.

This analysis of dietary intakes is restricted to
households in which the "housewife" was aged 25–64
and to three combined social classes (I & II, III, IV & V).
This gave a sample of 14 255 people in 4238
households in Great Britain in 1981, and 15 892 people
in 4520 households in 1974. Age standardised
consumption ratios were calculated for comparison
with SMRs. Age standardised rates are also presented
to illustrate the magnitude of the changes observed
in polyunsaturated and saturated fat and energy intakes
for each social class group. Standardisation is based
on four age of "housewife" groups (25–64 years), with
NFS data for 1981 employed as the standard.

CIGARETTE SMOKING

Changes in the prevalence of smoking among social
groups is examined, based on self reported
information recorded in the General Household
Survey (GHS). This is an annual survey of a national
sample of about 14 500 persons aged 16 and over in
Great Britain. No information was published on
cigarette smoking in the 1981 GHS. Changes in
smoking were therefore analysed for the period 1974
to 1980. The year 1980 has the advantage that
respondents were classified into socio-economic
groups based on the 1971 classification and are
therefore directly comparable with the 1974 data.
Socio-economic groups are not identical with the
Registrar General's social classes, although the
differences are small, and the only marked
divergence is the classification of some occupations allocated to
social class II into socio-economic group 3.

The published GHS tabulations do not provide data
necessary to standardise smoking by age. However,
there was little difference in the age distribution of
socio-economic groups apart from a slightly higher
proportion of groups 4 & 5 in the age range 65 years
and over. Since the prevalence of smoking is
relatively low in this age group, the main effect would
be to reduce the overall prevalence of smoking slightly
in groups 4 & 5.
Results

Mortality rates

The SMR for coronary heart disease in Britain showed a substantial decline among men aged 25–64 years in social class I & II over the period 1969/73 to 1979/83. The decline was rather smaller in social class III (non-manual and manual), while among men in class IV & V it actually increased (table 1). In contrast, men in each social group experienced a decline in SMR for all cause mortality, although the decline was rather less for IV & V than for the other social classes.

Table 1 Standardised mortality ratios (SMR) for coronary heart disease (CHD) and all cause mortality for social class groups, Great Britain 1969–73 and 1979–83. (Great Britain 1979–83 used as standard)

<table>
<thead>
<tr>
<th>Social Class</th>
<th>SMR CHD</th>
<th>SMR All Cause Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1969/73</td>
<td>1979/83</td>
</tr>
<tr>
<td>(a) Men aged 25–64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I &amp; II</td>
<td>94</td>
<td>80</td>
</tr>
<tr>
<td>III</td>
<td>112</td>
<td>108</td>
</tr>
<tr>
<td>IV &amp; V</td>
<td>113</td>
<td>121</td>
</tr>
<tr>
<td>(b) Women aged 25–54 classified by husbands’ occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I &amp; II</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>III</td>
<td>138</td>
<td>113</td>
</tr>
<tr>
<td>IV &amp; V</td>
<td>178</td>
<td>169</td>
</tr>
</tbody>
</table>

For women, classified by their husbands’ occupation, there was no systematic pattern of change in CHD mortality by social class such as was seen in men (table 1). For all cause mortality the SMRs among women showed a similar absolute change among the three social class groups.

The notable feature of the changes in mortality rates over the period 1969/73 to 1979/83 is thus the considerable deterioration of the position of men in social class group IV & V for CHD mortality. There also continues to be a strong inverse social class gradient for both CHD and all cause mortality, with this being greater for women than men.

Table 2 Standardised consumption ratios for social class groups, Great Britain 1974 and 1981. Age standardisation is based on age of “housewife” in range 25–64 years. National Food Survey (1981) used as standard

<table>
<thead>
<tr>
<th>Social Class</th>
<th>Saturated fat</th>
<th>Polyunsaturated fat</th>
<th>Monounsaturated fat</th>
<th>Total fat</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>110</td>
<td>100</td>
<td>-10</td>
<td>92</td>
<td>96</td>
</tr>
<tr>
<td>III</td>
<td>111</td>
<td>101</td>
<td>-10</td>
<td>93</td>
<td>102</td>
</tr>
<tr>
<td>IV &amp; V</td>
<td>111</td>
<td>99</td>
<td>-12</td>
<td>96</td>
<td>102</td>
</tr>
</tbody>
</table>

FAT INTAKE

Standardised consumption ratios (table 2) based on data collected in the NFS show that both saturated and monounsaturated fat intakes declined in each social class group over the period 1974–81 whereas polyunsaturated fat intakes increased. The net effect was a slight decline in total fat and energy intake in each social class.

Table 3 Comparisons of average daily intakes for social class groups in Great Britain 1974 and 1981 based on age standardised consumption rates. Age standardisation is based on age of “housewife” in range 25–64 years. National Food Survey (1981) used as standard

<table>
<thead>
<tr>
<th>Social Class</th>
<th>P/S ratio</th>
<th>Saturated as % total fat</th>
<th>Saturated as % energy*</th>
<th>Total fat as % energy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>0.21</td>
<td>0.24</td>
<td>48.0</td>
<td>44.4</td>
</tr>
<tr>
<td>III</td>
<td>0.21</td>
<td>0.25</td>
<td>47.5</td>
<td>43.8</td>
</tr>
<tr>
<td>IV &amp; V</td>
<td>0.22</td>
<td>0.26</td>
<td>47.2</td>
<td>43.6</td>
</tr>
</tbody>
</table>

* Based on 1g dietary fat = 9 kcal

See note table 2.

The increase in polyunsaturated fat intake and decline in saturated fats. These changes also mean that saturated fats formed a smaller proportion of the total fat consumed by each social class group in 1981. However, in view of the considerable decline in energy intakes since 1974 (table 2), the proportion of total energy derived either from saturated fat or from total fats showed only a small change in each social group.

Average daily intakes per person recorded in the NFS are based on the average for the household unit and are therefore influenced by the size and composition of households, and especially by the presence of children whose food requirements are generally less than for adults. Table 4 shows the increase in polyunsaturated fat intake and decline in saturated fats. These changes also mean that saturated fats formed a smaller proportion of the total fat consumed by each social class group in 1981. However, in view of the considerable decline in energy intakes since 1974 (table 2), the proportion of total energy derived either from saturated fat or from total fats showed only a small change in each social group.

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Changes in diet and coronary heart disease mortality
differences in mean household size between social
classes after standardising for the age of the
"housewife". In absolute terms, households were
smallest in social class group I & II and largest in IV
and V in both 1974 and 1981. The larger mean
household size for social class group IV & V is likely to
reduce average individual daily intakes. However, the change in household size over this period was similar
for social class groups I & II and IV & V and only
slightly greater for social class III. This suggests that
the relative changes in recorded dietary intakes for
social classes in unlikely to have been substantially
influenced by changes in household size.

Table 4 Standardised mean household size for social class
groups, Great Britain 1974 and 1981. Age standardisation
based on age of "housewife" in range 25-64 years. National
food survey (1981) used as standard

<table>
<thead>
<tr>
<th></th>
<th>1974</th>
<th>1981</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>104</td>
<td>98</td>
<td>-6</td>
</tr>
<tr>
<td>III</td>
<td>110</td>
<td>101</td>
<td>-9</td>
</tr>
<tr>
<td>IV &amp; V</td>
<td>112</td>
<td>106</td>
<td>-6</td>
</tr>
</tbody>
</table>

CIGARETTE SMOKING
Data collected in the GHS show that the percentage of
people reported to be current smokers declined in each
socio-economic group between 1974 and 1980. However,
this decline was greatest among the higher
socio-economic groups (table 5). These changes
produced a considerable widening of the social
differential for men, with the reduction in the
prevalence of smoking being much less in groups 5 & 6
than in the other groups. The changes were much
smaller for women.

Discussion
Our analysis indicates that the decline in CHD
mortality among men in Britain over the period
1969/73 to 1979/83 appears to have been greatest in
social class I & II and confirms previous reports
suggesting an increasing social class differential in
SMRs for coronary heart disease among men. There
of course remains the possibility that the apparent
change to some extent reflects changes in the social
class classification, or a differential certification or
diagnosis of CHD mortality among social class
groups. It is interesting to note that among women
there was no systematic change in SMRs for coronary
heart disease by social class, the greatest absolute
decline in CHD mortality occurring in social class III;
the data are however more difficult to interpret than
those for men because they are based on the husbands'
occupation for married women only. The reasons for
the differences in trends between men and women by
social class and for the greater social class variation
among women compared with men remain unclear.13

The NFS data on dietary intake, based on the
average for the household, indicate that the general
changes in fat and energy intakes over the period
1974–81 have occurred in each of the three social class
groups, with the result that saturated-fat now forms a
rather smaller proportion of total fat in each social
class and the P/S ratio has increased. This analysis thus
provides no support for the hypothesis that the
differential changes in SMRs for coronary heart
disease among social classes are associated with recent
changes in dietary fat intakes. The method of
recording, however, precludes distinguishing between
the dietary intakes of men and women.

In contrast to the lack of a clear social class
differential for changes in dietary intake, the decline in
the prevalence of cigarette smokers among men over
the period 1974–80 was greatest among men in
socio-economic groups 1 & 2 and smallest in SEG 4 &
5, although the changes for women showed a less
marked class gradient. This suggests than changes in
smoking may have played a greater role in increasing
the social class differentials in CHD mortality among
men than recent changes in dietary fat intakes.

The present analysis is based on correlations at a
population rather than an individual level and as such
the findings must be treated with caution. However,
they are consistent with individual based studies. For
example, Mann et al14 found that the mean cholesterol
concentrations in British men and women aged 25–59
in 1986 were almost identical to those found 12 years
earlier.15 This fits with the pattern of a fairly consistent

Table 5 Percentage of population over 16 years who are current cigarette smokers, by socio-economic group, and change between 1974 and 1980. Source OPCS General Household Survey, 1980.

<table>
<thead>
<tr>
<th>Socio-economic groupsa</th>
<th>Men</th>
<th></th>
<th></th>
<th>Women</th>
<th></th>
<th></th>
<th>All persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>42</td>
<td>32</td>
<td>-10</td>
<td>35</td>
<td>30</td>
<td>-5</td>
<td>39</td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>53</td>
<td>44</td>
<td>-9</td>
<td>42</td>
<td>39</td>
<td>-3</td>
<td>47</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>57</td>
<td>51</td>
<td>-6</td>
<td>43</td>
<td>39</td>
<td>-4</td>
<td>49</td>
</tr>
</tbody>
</table>

a Socio-economic groups are similar to but not identical with the Registrar General's social classes
level of total fat intake over the period 1974–81, with only a modest decline in saturated fat intakes as shown by this analysis of NFS data (table 3); equations developed in controlled clinical trials suggest that much larger changes in dietary fat intake are required to have an important impact on the plasma cholesterol response.16

Although this paper has focused on social class trends, the NFS data suggests that the absolute intakes of saturated and total fat was fairly similar for the three combined social classes, while recognising that the larger household size and greater numbers of children in social classes IV & V may have served to reduce their average consumption figures compared with social classes I & II. This pattern of a relatively small social class differential in absolute intakes of dietary fat accords with the findings of the Whitehall study of men in four Civil Service grades17 and the British Regional Heart Study of men aged 40–59 years,18 neither of which provided evidence of higher serum cholesterol levels among manual occupational groups. Instead the major risk factor contributing to the higher rate of CHD mortality among the manual occupational groups was identified as being their higher prevalence of cigarette smoking, as well as the effects of differences in blood pressure levels, weight for height and leisure time physical activity.

Studies examining the distribution of risk factors for CHD mortality are often cross sectional or involve a fairly limited follow up period. However, a considerable lag may be required for a dietary change to have its impact on CHD mortality. This is suggested by the limited success of relatively short term dietary interventions in reducing CHD mortality,19 as well as the findings of some correlational studies indicating that geographical areas which currently have the highest fat intakes do not necessarily exhibit the highest rates of CHD mortality.20 As Rose and Marmot note21 when accounting for the relatively small contribution of cholesterol levels in explaining the higher CHD mortality rates among the lower employment grades in the Civil Service, it may be that the social class pattern of adult disease is an outcome of earlier differences in childhood nutrition. This view is echoed by Barker and Osmond22 who found that geographical differences in the distribution of ischaemic heart disease mortality in England and Wales in 1968–78 were strongly correlated with both neonatal and postneonatal mortality in 1921–25, suggesting that poor nutrition in early life increases susceptibility to the effects of an affluent diet. There is thus a need for cross sectional studies to be complemented by longitudinal data on the dietary intakes of social classes, and for the collection of more directly comparable data on diet, smoking and CHD by social class, in order to examine the interaction between dietary fats and other risk factors, including smoking and the possible effects of stress, in producing relatively high rates of CHD among semiskilled and unskilled workers.

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