Disparities in vegetable and fruit consumption: European cases from the north to the south

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Abstract

Objective: To present disparities in consumption of vegetables and fruits in Europe and to discuss how educational level, region and level of consumption influence the variation.

Design: A review of selected studies from 1985 to 1997.

Setting/subjects: 33 studies (13 dietary surveys, nine household budget surveys and 11 health behaviour surveys) representing 15 European countries were selected based on criteria developed as part of the study. Association between educational level and consumption of vegetables and fruits was registered for each study and common conclusions were identified.

Results: In the majority of the studies, with the exception of a few in southern and eastern Europe, consumption of vegetables and fruits was more common among those with higher education. The results suggest that in regions where consumption of vegetables and fruits is more common, the lower social classes tend to consume more of these than the higher social classes.

Conclusions: The differences in the patterns of disparities in vegetable and fruit consumption between regions, as well as within populations, need to be considered when efforts to improve nutrition and health are planned.

Keywords

Vegetables
Fruits
Disparities
Socio-economic factors
Europe
Review

Health inequalities have been well documented in European countries¹⁻³. Earlier studies have shown that those who are poorer, have lower educational levels and lower status jobs are also disadvantaged in health and life expectancy⁴⁻⁵. In some countries, including the United Kingdom, differences in mortality have shown a tendency to increase since the 1980s¹. A recent international comparison showed that relative socio-economic differences in morbidity and mortality were larger in Scandinavian countries and the Netherlands than in Germany, Switzerland and Spain⁶⁻⁷. Variations in health inequalities between different countries have often been explained by differences in welfare policies and living standards⁸. However, other explanations may also be relevant. The international comparison on variations in education-related inequalities in self-reported morbidity showed unexpectedly that inequalities were not smaller in the northern countries despite their more egalitarian social policies⁹.

Reasons for health inequalities are less well understood because they are complex phenomena affected by economic, cultural and personal factors. The level of inequality in material resources within a society has often been presented as a major cause of health inequality¹⁰⁻¹¹. It is argued that the living and working conditions of those belonging to lower social groups expose them to greater health hazards. In addition to the structural explanations, inequalities have been attributed to cultural, behavioural and psychosocial factors⁹⁻¹⁴. The Black report divided possible explanations for health inequalities into four main groups: artefact of measurement; theories of natural and social selection; materialist/structural explanations; and cultural/behavioural explanations¹². Those belonging to disadvantaged social groups have been said to have riskier behaviour and less interest in their future health than those belonging to more advantaged social groups. In order to distinguish themselves, social groups may behave according to their own conceptions of what is suitable and appropriate for their group¹⁵.

The roles played by food behaviour and lifestyle in developing health inequality is not yet well understood¹. Studies have shown that people from higher social classes in general have more health-conscious behaviours than those from lower social classes²⁻¹¹,¹⁶,¹⁷. Cross-sectional studies in some European countries have shown that
those belonging to higher social class groups tend to have
healthier diets and consume more fruits and vegetables, but
differences are not as clear at the nutrient level\textsuperscript{15,16,18–20}. A few studies have suggested that the differences have been
caused by different energy needs, cultural and social factors\textsuperscript{1,16,21}. Davey Smith and Brunner\textsuperscript{1} have presented
micronutrient and antioxidant intakes as most likely nutritional influences on health inequalities. Fruits and
vegetables, which are important sources of these nutrients, are central in the prevention of non-communicable
diseases, such as cardiovascular diseases and cancer\textsuperscript{22,23}. These food groups have also been the focus of more
detailed analyses\textsuperscript{24,25} and intervention campaigns such as ‘five a day’ in the United States\textsuperscript{20} and ‘6 a day’ in
Denmark\textsuperscript{27}.

Food balance sheet data and dietary studies show that the
consumption of fruits and vegetables is at a higher level in
southern European countries compared with other regions\textsuperscript{28,29}. The lowest levels are found in eastern
European countries, followed by northern countries. Fruit
and vegetable consumption is usually higher among
women than men\textsuperscript{30–32} and among older people compared
with younger\textsuperscript{24,29,31,33}. Persons of low social status tend to
have the lowest intakes\textsuperscript{2,16,25,29,33,34}.

The data for this paper were collected as part of a EU
Concerted Action project ‘Compatibility of the household
and individual nutrition surveys in Europe and disparities
in food habits’ with participants from Belgium, Denmark,
Estonia, Finland, Germany, Greece, Lithuania, Norway,
Spain, Sweden and the United Kingdom\textsuperscript{35}. In this review
we present the disparities in consumption of vegetables
and fruits we identified and discuss how educational level,
region and level of consumption influence the variation.
We pose the question whether those with higher education
across Europe have healthier food habits, i.e. eat more fruit
and vegetables.

Methods

Identification of studies

The methods have been described in detail elsewhere\textsuperscript{35}. Relevant studies were identified by consulting researchers
and performing literature searches through various electron-
ic databases (including Medline, Social Science Citation
Index and the ‘Documentation Centre Socio-Economic
Inequalities in Health’ at Erasmus University in Rotterdam).
This resulted in a bibliography with 165 references on
disparities in food habits published 1987–97. To narrow the
scope and enable a meaningful comparison of various
European studies we developed a definition for disparities
in food habits and criteria for study selection.

Disparities in food habits are defined as the difference in
food consumption based on education and/or occupation
among adult men and women. For a study to be included it
had to fulfil the following criteria.

\begin{itemize}
  \item The period of data collection had to be 1985–97.
  \item The subjects had to be adults (18–65 years).
  \item Obligatory variables were: education and/or occupation,
age, gender, food groups/items. Education and occupa-
tion preferably reported as at least three groups. Focus
on five food groups: fruits, vegetables, fats and oils
(excluding potatoes), meat and dairy.
\end{itemize}

The food groupings were largely based on the system used
in comparative food availability studies\textsuperscript{36,37}. The fruit
group was defined as fresh and processed (e.g. dried, frozen,
canned, preserved, fruit juices) fruits and berries. The
vegetable group contained fresh and processed (e.g.
frozen, canned, olives, pickles) vegetables (excluding
potatoes) and pulses. However, we were somewhat
flexible with these criteria because we relied on such a
variety of studies (exceptions are indicated in the results).
For example, health behaviour studies usually present the
proportion of those with daily intake or low/high use. In
addition, since the majority of the studies were published
regrouping was not always possible. Education was
selected to be the main measure of socio-economic status
because it has some advantages compared to occupation
and income; education forms an ordinal scale and under-
goes minor changes over adult life\textsuperscript{38}. Education could be
reported as number of school years or educational levels.
Occupation or income was used if information on
education was missing. Studies that could provide informa-
tion on food habits for at least three different educational/
occupational groups were accepted.

Forty-seven potential studies were identified based on
the bibliography and information from researchers. The
number of studies to be included in the review decreased
to 33 because results for consecutive years for some
repeated studies were combined and one qualitative study
was left out. Because the method used affects the results,
the studies were grouped into three groups based on their
types of methods and data: 13 dietary surveys, nine
household budget surveys, and 11 health behaviour
surveys (Table 1). The studies covered 15 countries
representing all four regions of Europe: north, west, east
and south. The majority of the studies included information
on food consumption based on education, but two studies
only gave results based on occupation and one based on
social class. Most of the studies were based on random
national samples, but it was not a criterion for choosing the
studies. Therefore, one German dietary survey was limited
to men in one smaller region and for Spain, dietary surveys
from three regions were included. Among the included
health behaviour surveys, one of the Lithuanian studies and
two Danish studies were also limited to specific regions.

Systematic analysis

In the systematic analysis each study was taken at face
value and for each of these the association between high
education (or occupation/social class if education was not

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available) and consumption of fruits and vegetables was registered. The strength of the association was determined based on the reported information on statistical significance (P values, 0.05, 0.01 or 0.001 were considered statistically significant) and if the data showed a successive increase or decrease from low to high education, i.e. ‘systematic trend’. The association between high education and consumption was classified as strong positive association (statistically significant and systematic trend), positive association (systematic trend or statistically significant difference), NS (no association), negative association (systematic trend or statistically significant difference) or strong negative association (statistically significant and systematic trend). The results are summarised in maps presenting the relationships between high education and consumption of vegetables and fruits. In the maps ‘strong association’ stands for a statistically significant difference and ‘systematic trend’ for both men and women. ‘Association’ is indicated when this difference is found for only one gender group or when there is either a ‘systematic trend’ or statistically significant difference.

**Results**

In the majority of the studies, with the exception of a few in southern and eastern Europe, consumption of both vegetables and fruits was more common among those with higher education (Table 2).

For vegetables there was a strong positive association in studies from Finland, Sweden, Lithuania, Denmark, Germany, the Netherlands, Switzerland and Spain (Fig. 1). Positive association was in addition found in studies in Estonia, the United Kingdom, Germany, and Poland. Negative association (i.e. those with lower education consume more vegetables) was found in a few studies in Hungary, Spain and Greece. Some of the studies in Norway, Lithuania, Denmark, the Netherlands, Poland, Belgium and Spain showed no clear association.
Table 2 Consumption of vegetables and fruits in low and high educational groups and association between high education and consumption (▲▲▲, strong positive association (statistically significant and systematic trend); ▲▲, positive association (systematic trend); ▲, positive association (statistically significant difference); ▼▼▼, strong negative association (statistically significant and systematic trend); ▼▼, negative association (systematic trend); ▼, negative association (statistically significant difference); NS, no association)

<table>
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* Units: g/10 MJ.
† Fresh.
‡ Includes potatoes.
§ Per person.
¶ Proportion of those with low use.
¶¶ Proportion of persons eating >5 pieces of fruit a week.

** Proportion of those with low use of fresh in winter and spring.
†† Proportion of those with daily intake of raw.
§§ Proportion of those with daily intake of cooked.
§§§ Proportion of those with daily intake.
\\ Proportion of persons eating raw or cooked vegetables every day.
\\\\ Proportion of persons eating >5 pieces of fruit a week.
Fruit consumption had a strong positive association with education in studies in Norway, Finland, Estonia, Lithuania, Denmark, Germany, the Netherlands and Switzerland (Fig. 2). In addition, positive association was found in studies in the United Kingdom, the Netherlands, Poland, Spain and Greece. Negative association was only found in two Spanish studies. Studies in Sweden, Estonia, Lithuania, Denmark, Poland, Belgium, Hungary, Spain and Greece showed no association.

The association varied between men and women in about a third of the studies which reported results separately for both genders (Table 2). There was no clear pattern in the variation.

Both Finnish dietary and health behaviour data showed strong positive association for both vegetables and fruits (Table 2). In Denmark, dietary surveys showed clearer association than the health behaviours survey data, whereas for the Netherlands, the health behaviour survey data showed a stronger positive association than the dietary survey data. The dietary survey data for different regions in Spain showed variation from positive to negative association. Also, household budget survey data from Spain showed variation. Information on statistical significance was not reported in most of the household budget survey data. Therefore, our results for the household budget surveys showed a weaker association between education and consumption compared with the other types of studies.

The regional pattern for vegetable consumption indicates that high educational level is associated with higher vegetable consumption especially in the northern and western European countries (Fig. 1). It was only studies in Spain, Greece, Poland and Hungary that indicated that those with lower education consumed more vegetables. The regional pattern for fruits is fairly similar to that of
vegetables (Fig. 2). In most countries there is a positive or no clear association between high education and fruit consumption. It was only two Spanish studies that showed a negative association, i.e. those with lower education consumed more fruits.

**Discussion**

In interpreting the results several types of limitations have to be taken into account. There are possible problems related to the identification of studies. Therefore, studies were identified with the help of both literature searches and by consulting experts. Because we mainly relied on published data, our ability to do secondary analyses on primary data was limited. In secondary analyses, validity, reliability and representativeness of primary studies are important. The potential problems include issues related to the sample, time, method and reporting. The methods used in the studies varied from questionnaires to dietary recalls and records. Since all methods are subject to different limitations the studies were grouped according to method. The dietary (group A) and health behaviour surveys (group C) fulfilled the predefined criteria of study inclusion better than the household budget surveys (group B), which did not provide age and gender specific estimates of fruit and vegetable consumption.

The number of identified studies was limited and may not be representative for the countries. However, most of the studies were large-scale, based on random samples and had acceptable response rates. To diminish the problems of the sample, age boundaries were set and only studies focusing on adults were included. Although the definition of disparities in food habits and the criteria for choosing the studies dealt with some of the problems, it was impossible
to take all factors into account. For example, because education has a skewed distribution in the population, older adults are often over-represented in the groups with low education. Also, the various forms of reporting socio-economic status (education, occupation and social class) and variation in the number and size of classes (e.g. low/intermediate/high) may cause problems because results vary depending on the variable used. To diminish the problem related to the heterogeneity of the studies, we assessed the variation in consumption based on socio-economic status within each study and compared the patterns instead of comparing absolute differences.

Under-reporting of food intake has often been associated with lower social classes and lower levels of education, but there is also evidence that it can be linked to those belonging to higher social classes and with high levels of education. Under-reporting by those with lower levels of education has been explained by their poor literacy skills, whereas misreporting of food by those with higher levels of education may be connected to the health image of foods and the wish to convey a socially desirable image. Assuming that those belonging to lower social groups under-report consumption of vegetables and fruits, whereas those belonging to higher social groups over-report consumption of healthy vegetables and fruits, the disparities in consumption of vegetables and fruits might be smaller than reported. However, estimating the effects of possible under- and over-reporting is problematic and other factors such as a selective dropout may lead to the underestimation of the real differences in the population. Turrell and Najman showed that sampling and data collection methods may underestimate the true range of socio-economic inequalities in food habits. They concluded that mailed survey questionnaires are inappropriate for use with respondents from very low socio-economic status backgrounds.

A major finding from this review of disparities in vegetable and fruit consumption in Europe was that, in particular in the north and west, those with a high educational level tend to consume more vegetables and fruits, i.e. have healthier food habits, than those with a low educational level. This result is in line with previous analyses which have shown inequalities in more northern countries. In southern European countries the pattern shows a reverse tendency, in some studies those with higher educational levels of education have been explained by their poor literacy skills, whereas misreporting of food by those with higher levels of education may be connected to the health image of foods and the wish to convey a socially desirable image. Assuming that those belonging to lower social groups under-report consumption of vegetables and fruits, whereas those belonging to higher social groups over-report consumption of healthy vegetables and fruits, the disparities in consumption of vegetables and fruits might be smaller than reported. However, estimating the effects of possible under- and over-reporting is problematic and other factors such as a selective dropout may lead to the underestimation of the real differences in the population. Turrell and Najman showed that sampling and data collection methods may underestimate the true range of socio-economic inequalities in food habits. They concluded that mailed survey questionnaires are inappropriate for use with respondents from very low socio-economic status backgrounds.

This review indicates that the pattern of disparities in food consumption varies in Europe. To get a deeper understanding of the variation it would be useful to gather more comparable information from a few countries representing the different regions. To improve our understanding of reasons for health inequalities there are various alternatives for future research approaches. It would be important to obtain a better understanding of how diet contributes to the social differentials in health and whether socio-economic status modifies associations between diet and disease. A prerequisite for analysing the role of diet in inequalities of health is to have an understanding of the role of other health behaviours. Therefore, there is also a need for studies on socio-economic differences in food habits in relation to other health behaviours and lifestyle. The differences in the patterns of disparities between regions need to be considered when efforts to improve nutrition and health are planned. In northern Europe it could, for example, be effective to address the question of...
how to direct the increase in vegetable consumption more to those with low education. In the south, the traditional diet includes vegetables and it is therefore relevant to try to keep the traditional diet and prevent the low socio-economic groups from adopting ‘northern’ habits.

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References

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