

Factors which influence 'healthy' eating patterns: results from the 1993 Health Education Authority health and lifestyle survey in England

BM Margetts^{1*}, RL Thompson¹, V Speller² and D McVey³

¹Institute of Human Nutrition, University of Southampton, Southampton General Hospital, Southampton SO16 6YD, UK; ²Wessex Institute for Health Research and Development, University of Southampton, Southampton SO16 6YD, UK; ³Health Education Authority, Trevelyan House, 30 Great Peter Street, London SW1P 2HW, UK

Submitted 10 April 1998; Accepted 12 July 1998

Abstract

Objectives: This study explores the factors that influence eating patterns in a nationally representative sample of the English population.

Design: Subjects were interviewed in 1993; questions covered basic demographic details, attitudes about nutrition, and they completed a short food frequency questionnaire that had previously been validated. Cluster analysis was used to summarize dietary intake into more or less healthy clusters.

Setting: A random sample of the English population.

Subjects: A cross-sectional survey of 5553 men and women (response rate 70%) aged between 16 and 74 years.

Results: As defined from the cluster analysis about half the sample were currently reporting a more healthy diet; respondents in the better educated middle-aged demographic cluster were more likely to report eating a more healthy diet than respondents in the younger lower-income family cluster. About three-quarters of all respondents believed that they either already ate a healthy diet or had changed to a healthy diet in the last 3 years. For those respondents who said they were eating a healthy diet about half of them were eating a more healthy diet. Respondents who had not changed their diet were more likely than those who had to believe that healthy foods were just another fashion (men 34% v. 13%; women 30% v. 12%), or expensive (men 50% v. 35%; women 53% v. 40%); they were less likely to care about what they ate (men 45% v. 13%; women 27% v. 7%). Nearly three-quarters of all respondents agreed that experts never agree about what foods are good for you. Younger, low-income families, and those who smoked, were the group least likely to be eating a more healthy diet.

Conclusions: The results of this study suggest that about half of the population has reported a change to a healthier diet over the last 3 years and that overall about half of the population report eating a healthy diet. Those who had not made any change and were currently reporting a less healthy diet were more likely to smoke and come from the 'worse off' group in the survey; they were also more likely to hold negative attitudes about healthy eating. A more focused and integrated approach to promoting healthy lifestyle in general is required, while at the same time ensuring that there is continued support for the majority of the population who have made healthy dietary changes.

Keywords
Dietary change
Healthy eating
Cluster analysis
Demographic behaviour

There is wide agreement that diet is a key factor for the prevention of most chronic diseases^{1–3}. There is also reasonable consensus in broad terms about the type of diet which is likely to reduce the risk of chronic disease². Within the UK the government have identified targets for change in dietary practices, focusing on the type and relative contribution of fat to total energy intake³. The recent American dietary guidelines

focused on food patterns and emphasized variety, balance and fruits and vegetables, as well as changes in fat intake².

There are marked socioeconomic differences in the dietary patterns of a population^{4–7}. Poorer people tend to eat diets that are less likely to meet current healthy guidelines. While income and education are two key factors, it is unlikely that they explain all the social class

*Corresponding author: E-mail bmm@soton.ac.uk

differences that have been seen. There is evidence that all people have a notion about the need to eat less fat as part of a healthy diet, but that this knowledge does not lead directly to behaviour⁸. Those who change their diets and seek advice about healthy eating are already more likely to be eating a healthier diet⁹.

There is relatively little information on the link between attitudes and behaviour in a large nationally representative population^{10–12}. The present study seeks to explore the factors influencing the choice of a more healthy diet.

Methods

The sampling procedure and field work were carried out by MORI (a private marketing company) between May and September 1993 in England only. The study was conducted by the Health Education Authority on behalf of the Department of Health; the methodology is presented in more detail elsewhere¹³. In brief, MORI conducted a random probability survey, using a nationally representative sample of 386 census enumeration districts (selected at random from all possible districts within a geographic region) within England for persons aged between 16 and 74 years of age. The probability of selection within each enumeration district was proportional to the population within each enumeration district aged between 16 and 74 years of age. Within each enumeration district 65 addresses were drawn at random from the Small Users Postcode Address file. The sample was stratified by the eight regional health authorities or NHS regions (referred to as regions in the results), and summarized into geographically related regions as northern and southern.

A letter was sent to each address included in the survey to explain the purpose of the survey and to inform people that a MORI interviewer would be calling at their address. The sample addresses were screened by interviewers and those which were identifiable as invalid (non-residential, vacant, demolished, etc.) were eliminated from the sample. Addresses were screened for multiple households and if necessary a Kish grid^{14,15} was used to select households and the individual within the household to be interviewed. The Kish grid is a method for selecting the unit to investigate where there is more than one eligible unit at the address or household that should be interviewed^{14,15}. In order to carry out the selection procedure the interviewer lists all eligible persons (in this case adults over 16 years of age) or all eligible households at the address, a number is then allocated to each person or household at the address. Eligible persons are listed in descending order of age, males followed by females. The persons are then numbered serially and the interviewer makes the selection by

referring to the two lines of figures printed on the questionnaire.

Of the 7887 eligible subjects; 1419 refused to be interviewed (18%); 601 (8%) non-contacts even after repeated calls at the house; 314 were not interviewed because they were too ill or had moved away since the original screening. Interviews were conducted with 5553 respondents; 70% of the 7887 eligible subjects.

All respondents completed a face-to-face interview covering their (and their households) demographic characteristics, smoking and nutrition. The demographic questions included: living arrangements, number of people in household, type of accommodation; type of work and related qualifications; level of education; marital status; whether they received a range of benefits from government agencies (types of welfare) such as child support, unemployment benefit, housing benefit; and use of a car. 'No formal qualifications' was used to describe respondents who had no school certificates or trade apprenticeships or any other formal certificates of educational achievement. The level of educational attainment was divided into three categories; A levels and above (university entrance), up to O levels (GCSE, high school graduation at age 16 years) or trades (plumbers, electricians, etc.); and no formal qualification. Full-time education meant that the respondent was at school or college full-time, not part-time. Living in overcrowded conditions was defined as the number of bedrooms matched to the household residents in terms of age, gender, relationship; if below the minimum standard living conditions were defined as overcrowded (e.g. if more than two children of either gender under 10 years of age shared a room, or two adolescents aged 10–20 years of the same gender shared a room).

The nutrition questions covered barriers to eating certain foods; and attitudes to a range of statements about healthy eating.

All interviewers were trained prior to undertaking the interviews and were given a detailed manual for guidance. Data on food consumption were obtained using a short food frequency questionnaire which had been calibrated by comparison with a 4-day weighed record collected from subjects similar to those included in the present study¹⁶. The interview took about 45 min to complete.

Data were weighted by a factor that took into account age, gender, region and household type (using 1991 Census data¹⁷) to the general population. Data were analysed using SPSS for Windows version 6.1.

Cluster analysis

Cluster analysis was used to summarize the dietary and demographic characteristics of the sample into two

separate variables. The rationale for the use of this method was that to explore the association of each dietary variable with each demographic (and other variables) would take many tables and would be difficult to summarize into key messages. For example, we could have analysed differences in attitudes and other factors for respondents who consumed white bread more often than wholemeal bread, whole milk consumers versus skimmed milk consumers, and so on. Cluster analysis combines respondents into clusters of people with similar characteristics. Cluster analysis enables one new variable to be created which combines many variables (for the dietary analysis the frequency of consumption of each food was entered into the analysis), but without losing the key differences within the sample. The researcher selects which variables to include, and the number of clusters to be included in the cluster analysis; the computer program then runs a series of iterations until it finds the best separation between groups, with no change in the within-cluster variance. The computer program enters the variables into the cluster analysis in descending order of influence on the effect of separation between cluster groups. Each subject is then given a cluster score, and this score can then be used in further analysis as a composite variable. The internal consistency and logical groupings derived from the cluster analysis suggested that the individual cluster score for each person represented a reasonable proxy measure for the cluster of characteristics included in the analysis. The method has been used recently by Millen *et al.*¹⁸ and Huijbregts *et al.*¹⁹ to

summarize dietary patterns: the method is described in more detail by Armitage and Berry²⁰.

Two new variables were computed using cluster analysis; one based on demographic variables and the second based on the dietary questions to give an impression of the overall dietary behaviour (Table 1). The variables which show the greatest difference from the sample mean are listed first, whilst those showing least variation are listed last. The greatest difference between the groups was achieved using four clusters for the demographic variables and two clusters for the dietary variables. The dietary clusters have been referred to as more or less healthy dietary clusters. The foods that contributed most to the contrast between more or less healthy diets were the types of bread (wholemeal versus white) and milk (whole versus skimmed) used more often, the type of fat used for cooking and spreading (vegetable versus butter). Those in the more healthy cluster were more likely to consume fruit more often, whereas the less healthy cluster subjects were more likely to consume processed meats (burgers, sausages, pies, bacon) more often. About a half of all respondents were eating a more healthy diet, although women were statistically significantly more likely than men to be eating a more healthy diet.

Four demographic clusters provided the best contrasts within the sample. Qualifications and level of education provided the greatest contrasts; the 'better off' cluster (cluster 3) could be characterized as being subjects who were better qualified, working in non-manual occupations and living in their own home with

Table 1 Characteristics of respondents: demographic and dietary clusters

	Characteristics*
Demographic cluster	
(1) Young educated	Full-time education; aged 16–19 years; have qualifications Single; no children; aged 20–24 years Three or more adults in household
(2) Younger, low-income families (<i>'worse off'</i>)	Receiving income support; single parent Living in rented accommodation; receiving housing benefit; do not have use of a car; living in overcrowded conditions; looking after family/home—not employed; unemployed; no formal qualifications
(3) Middle-aged educated (<i>'better off'</i>)	Manual occupation; aged 25–34 years Have qualifications; two adults with children; have use of a car; employed; own property/have mortgage
(4) Older, less educated	Non-manual occupation; aged 35–44 years No formal qualifications; aged 65–74 years; retired couple Aged 55–64 years; retired single person; manual occupation
Dietary cluster	
More healthy	More wholemeal and brown bread; more likely to fry with vegetable oils and to use polyunsaturated margarine or low-fat spread on bread; more skimmed milk; more polyunsaturated fats for cooking; more fruit; more fish
Less healthy	More white bread; more whole milk; more likely to fry in lard; more fried foods; more likely to use butter or ordinary margarine on bread and for cooking; more burgers and sausages; more bacon, meat pies and processed meats

*See text for a fuller description of each demographic characteristic.

children, with their own car. By contrast the 'worse off' cluster (cluster 2) were likely to be receiving social services benefit payments from the government (to be on welfare), to be single parents living in crowded and rented accommodation, to be less qualified and more likely to be unemployed or employed in manual occupations.

Results

The sample was selected to reflect the English population and after weighting the basic demographic profile of responders was similar to the 1991 census. We have no information about the demographic characteristics of the non-responders (30% of those eligible). The proportion of responders stating they were currently unemployed (men 10%, women 3%) was similar to the current rate of unemployment in the whole population (in 1993 men 9%; women 5%)²¹. About a quarter of all men and a third of women in the study had no formal educational qualifications, and just under a quarter of men and women had no access to a car. These characteristics were all similar to available national data²¹.

Frequency of consumption of individual foods was explored before undertaking the cluster analysis. Women were more likely than men to be in the highest frequency category of fruit consumption. Younger men and women, and women on income support, were more likely than older men and women to be consuming fruit less frequently. Younger men were more likely to be consuming high-fat foods more frequently than older men (54% in men aged 16–19 years compared with 28% in men aged 55–64 years), and men who smoked were also more likely to have a higher frequency of consumption of high-fat foods. For most of the demographic questions there were statistically significant differences in the per cent of subjects reporting high frequency of consumption of high-fat foods and low frequency of consumption of fruits and vegetables.

Cluster analysis was used to simplify the interpretation of the many possible combinations and interactions which could have been explored. Men were less likely than women to be defined as having a more healthy diet using the dietary cluster (men 47%; women 57%; Table 2). Men who smoked were the least likely to be eating a healthy diet (33% of respondents), whereas ex-smokers (both men 55% and women 64%) were most likely to be eating a healthy diet (Table 2).

Figure 1 shows the percentages of respondents in each demographic cluster eating a more healthy diet (as defined by the dietary cluster). Just over a third of all respondents in demographic cluster 2 ('worse off') were classified as eating a more healthy diet compared with 59% in cluster 3 ('better off'). About half of the

Table 2 Percentage of respondents consuming a more healthy diet by smoking status, and dietary change group by gender

	Men ¹	Women
All subjects	47	57
Smoking status		
current smokers	33	46
ex-smokers	55	64
never smoked	51	58
Change in diet in last 3 years		
no change (various reasons) ²	25	28*
no change (already healthy)	52	58
other changes ³	53	63
more healthy diet ^{4,5}	57	65

¹Chi-squared test for differences between men and women statistically significant ($P < 0.05$) unless marked with *.

²Reasons included: like taste of food already eat, not interested, lack of knowledge.

³Changes included: some less healthy changes—omitting meals, eating more sugary or fatty foods or less fruit and vegetables.

⁴Included: more fruit and vegetables, less fatty and sugary foods, changed to low-fat milks, ate more high-fibre foods.

⁵Missing 1% men and 1% women.

respondents in the older less educated cluster (cluster 4) and the younger educated cluster (cluster 1) were eating a more healthy diet.

Respondents were asked if they had changed their diets over the last 3 years. Responses were broken down into four groups: (a) no change over the last 3 years for reasons such as, like taste of food already eating, not interested or lack of knowledge; (b) no change because diet was already healthy; (c) changed to a more healthy diet, as defined by changing to eat more fruits and vegetables, less fatty and sugary foods, low-fat milk and more high-fibre foods (these were subjective impressions of respondent's change); and (d) people who made other changes such as some less healthy changes. Table 2 presents the percentage of men and women defined as eating a more healthy diet using the dietary cluster variable, broken down by the four dietary change groups outlined above. Among those respondents who said that they had not changed their diets in the last 3 years, a quarter of them were currently eating a more healthy diet (as defined by the cluster analysis), compared with 65% for women and 57% for men who said they had changed to a more healthy diet. For those respondents who considered that they already ate a healthy diet just over a half of them were so doing, at least according to their dietary cluster measure. Current smokers were the least likely to have made any changes to their diets over the last 3 years.

Table 3 presents the percentage distribution of respondent's agreement about barriers to healthy eating broken down by dietary change category and gender. Nearly three-quarters of all respondents agreed that experts never agree about what foods are good for you, and there was no difference in the percentage between those who made a more healthy change and

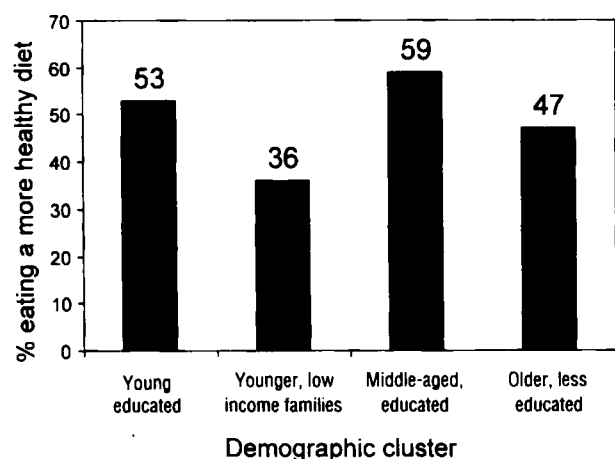


Fig. 1 Percentage of respondents in each demographic cluster group classified as eating a more healthy diet. (All differences between groups statistically significant, $P < 0.05$).

those who did not. Respondents who had changed to a healthy diet were more likely than those who had not changed to believe that healthy foods were enjoyable. Those who had not changed their diet were more likely to agree that healthy eating was just another fashion, and that it was expensive. They were also more likely not to really care about what they eat.

Discussion

The results from this study are likely to reflect the patterns seen in the English population. The sampling strategy ensured a representative sample for those characteristics from which this could be judged^{17,21}. Additional data were collected for a wide range of demographic factors which have been summarized into a single variable using cluster analysis. This single

variable allows for a more statistically efficient approach to explore the effects of these factors. Respondents were categorized as having either a 'more' healthy or 'less' healthy diet using cluster analysis based on the frequency of consumption of a wide range of foods. The term 'healthy' was used as a short-hand term to imply patterns of eating that are most similar to the current consensus about what constitutes a 'healthy diet' from a Western/Northern perspective. No single food can be described as 'healthy' or 'unhealthy' but in broad terms dietary quality can be defined in terms of food patterns associated with good health or by levels of nutrients in relation to recommended levels. It should be recognized that this notion of healthy may not be appropriate for all groups in England, and in other countries with different health profiles. In order to interpret the results of the present study it must be assumed that self-reported intakes reflect real intakes, and that there is no differential bias in the dietary assessment. We have no data on the truth of these assumptions.

The results of this study suggest that about half of the population has reported a change to a healthier diet over the last 3 years and that overall about half of the population report eating a healthy diet. Those who had not made any change and were currently reporting a less healthy diet were more likely to come from the 'worse off' group in the survey; they were more likely to hold negative attitudes about healthy eating.

Irrespective of current dietary behaviour nearly three-quarters of all respondents believed that the experts never agree about what foods are good for you. Even among those people who eat a healthy diet, there was widespread agreement with the perception that the experts can never agree. This appears to run

Table 3 Percentage distribution of agreement with barriers to healthy eating by dietary change in the last three years by gender

Barriers to dietary change	Men		Women	
	More healthy diet (%)	No change various reasons (%)	More healthy diet (%)	No change various reasons (%)
Healthy eating is just another fashion	13	34	12	30
It's not very easy to eat healthy foods if you eat out	47	41	38	35*
Eating healthy food is expensive	35	50	40	53
Healthy foods are enjoyable	77	57	83	63
The tastiest foods are the ones that are bad for you	58	64	58	69
I don't really care what I eat	13	45	7	27
I get confused over what's supposed to be healthy and what isn't	36	54	31	49
Experts never agree about what foods are good for you	74	76*	73	77*

¹Chi-squared test for differences between more healthy diet and no change, various reasons statistically significant ($P < 0.05$) unless marked with *.

against the remarkable consistency in the dietary guidelines produced in the USA and Europe on what constitutes a healthy diet; a message that has not changed dramatically in the last 10 years. The public's perception of disagreement probably arises out of the way scientific debate is presented in the popular media.

The greater proportions of both men and women in the present study reporting the consumption of a less healthy diet who were smoking is consistent with results from other studies²². Smokers were also less likely to have changed their diets over the last 3 years. Smokers tend to be in the 'worse off' demographic cluster. Smokers who give up smoking appear to make other lifestyle changes that improve their overall health.

In conclusion, only half the respondents in the present survey are currently eating a more healthy diet, but over half of those surveyed have made some positive changes to their diets in the last 3 years. The people who have been most receptive to change are less likely to have negative attitudes to healthy eating; they are also more likely to be better educated and generally better off. A more targeted approach is required to reach the high-risk groups who have negative attitudes and behaviour about their diet.

Acknowledgements

This work was supported by the Health Education Authority. We are grateful to colleagues in the Institute for their help in the preparation of this manuscript.

References

- Public Health Service. *Healthy people 2000: National health promotion and disease prevention objectives*. Washington, DC: US Department of Health and Human Services, 1991.
- US Department of Agriculture. *Nutrition and your health: dietary guidelines for Americans*. USDA, 1995.
- Department of Health. *The Health of the Nation. A Strategy for Health in England*. London: HMSO, 1992.
- Gregory J, Foster K, Tyler H, Wiseman M. *The Dietary and Nutritional survey of British Adults*. London: HMSO, 1990.
- Bennett N, Dodd T, Flateley J, Freeth S, Bolling K. *Health Survey of England 1993*. London: HMSO, 1995.
- Treiman K, Freimuth V, Damron D *et al.* Attitudes and behaviour related to fruits and vegetables among low-income women in the WIC Program. *J. Nutr. Educ.* 1996; **28**: 149–56.
- Variyam JN, Blaylock J, Smallwood DM. Modelling nutrition knowledge, attitudes, and diet–disease awareness: the case of dietary fibre. *Stat. Med.* 1996; **15**: 23–35.
- Paisley C, Lloyd H, Spaarks P, Mela DJ. Consumer perceptions of dietary changes for reducing fat intake. *Nutr. Res.* 1995; **15**: 1755–66.
- Worsley A, Crawford D. Awareness and compliance with the Australian dietary guidelines: a descriptive study of Melbourne residents. *Nutr. Res.* 1986; **5**: 1291–1308.
- Devine CM, Sandstrom B. Danish women's attitudes and beliefs about dietary fat: age group differences. *Scand. J. Nutr.* 1995; **39**: 98–102.
- Griffith S, Chipperfield B, Todd S, Rushton C, McCarthy M. Dietary beliefs, practices and attitudes of adults in an inner city population. *J. Hum. Nutr. Dietet.* 1994; **7**: 319–34.
- Thorogood M, Coulter A, Jones L, Yudkin P, Muir J, Mant D. Factors affecting response to an invitation to attend for a health check. *J. Epidemiol. Com. Health* 1993; **47**: 224–8.
- Margetts B, McVey D, Oldfield K *et al.* *Health and Lifestyle Survey*. London: Health Education Authority, 1997.
- Kish L. *Survey Sampling*. New York: Wiley, 1965.
- Moser C, Kalton G. *Survey Methods in Social Investigation*. London: Heinemann Educational Books, 1979.
- Roe L, Strong C, Whiteside C, Neil A, Mant D. Dietary intervention in primary care: validity of the DINE method for dietary assessment. *Family Practice* 1994; **11**: 375–81.
- Office of Population Censuses and Surveys. *The 1991 Census*. London: HMSO, 1993.
- Millen BE, Quatromoni PA, Cagnon DR, Cupples LA, Franz MM, D'Agostino RB. Dietary patterns of men and women suggest targets for health promotion: the Framingham Nutrition Survey. *Am. J. Health Promot.* 1996; **11**: 42–53.
- Huijbregts PPCW, Feskens EJM, Kromhout D. Dietary patterns and cardiovascular risk factors in elderly men: the Zutphen Elderly Study. *Int. J. Epidemiol.* 1995; **24**: 313–20.
- Armitage P, Berry G. *Statistical Methods in Medical Research*. Oxford: Blackwell Scientific Publications, third edition, 1994.
- Foster, Jackson B, Thomas M, Hunter P, Bennett N. *General Household Survey 1993*. London: HMSO, 1995.
- Margetts BM, Jackson AA. Interactions between people's diet and their smoking habits: the dietary and nutritional survey of British Adults. *Br. Med. J.* 1993; **307**: 1381–4.