Health promotion interventions to promote healthy eating in the general population: a review
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Authors' objectives
The objectives are summarised as follows:

1. To summarise recent evaluations of 'Healthy Eating Interventions', and to critically assess the reliability of evidence on effectiveness and implications for future practice.

2. To identify research studies on the effectiveness of interventions to promote healthy eating in adults, adolescents and school aged children.

3. To critically assess the studies for both quality of research and evidence of effectiveness.

4. To examine any differences in effectiveness according to the method, content or intensity of intervention, or by setting, theoretical model or population.

5. To make recommendations of policy and practice, and to identify priorities for further research.

Searching
The following databases were searched from 1985 to 1996: MEDLINE, EMBASE, PsycLIT, the Science Citation Index, Biological Abstracts, CINAHL, the Social Sciences Citation Index, ERIC, Unicorn (Health Education Authority internal library management system), and Index to Scientific and Technical Proceedings. Full details of the search terms used for MEDLINE were recorded, whereas the search strategies for the other databases were only described briefly. The authors stated that copies of internal and unpublished evaluations were sought from an extensive list of key organisations and experts in the UK, but did not provide further details. Citation lists of identified research and review articles were examined. Non-English language papers without a summary in English were excluded. The search was started at 1985; the reason why earlier material was not sought was not explained.

Study selection
Study designs of evaluations included in the review
The author states that only evaluations with an experimental or quasi-experimental study design using a control group, i.e. randomised trials or cohort studies, were included in the review. Controlled trials, randomised controlled trials (RCTs) and prospective longitudinal cohort studies all had concurrent control groups. Uncontrolled trials were included for supermarket and catering outlet settings.

Specific interventions included in the review
Health promotion interventions such as health education, nutrition education, dietary change strategies and environmental modification, with content focusing on diet only or on diet and exercise in the settings of schools, workplaces, primary care, the community (cafeterias and restaurants) and supermarkets. The aim of intervention was 'healthy eating', defined as a diet reduced in fat or saturated fat as a percentage of energy, and increased in starchy foods, fruit and vegetables. Clinical techniques, the provision of food (e.g. school milk), and interventions focusing primarily on intake of total energy, sugar, salt or micronutrients, were generally excluded. Innovative interventions, not yet tested in a controlled trial setting, were discussed in a separate chapter.

Participants included in the review
Studies where participants were chosen on account of having a medical condition or elevated risk factors, e.g. cholesterol or weight, were excluded. Age, gender, ethnicity and socio-economic status were discussed.

School and university settings: participants were school children aged 5 to 18 years and university students; both sexes
were considered.

Workplace settings: participants were adult employees of both sexes but were predominantly male; some were from military establishments.

Primary care settings: participants were of both sexes with a mean age ranging from 40 to 49 years.

Community settings: participants had a mean age ranging from the mid-30s to mid-40s, and were predominantly female. Ethnic status was reported in 5 of the 16 studies.

Supermarket settings: details of participants were generally not reported, but for those studies that did, the majority of participants were female. The data on socio-economic status and ethnicity were scant; data were reported where available.

Catering settings including school cafeterias: 10 of the 15 studies provided information about population. Participants were of both sexes and included children under 11 years, boarders at boarding school with a mean age of 15 years, and students aged 17 to 21 years in university halls of residence.

Outcomes assessed in the review
The authors state 'Evaluations must have included outcome measures of dietary behaviour or diet-related physiological measures. Studies measuring nutritional knowledge only were excluded. Other than this there was no limit on outcome measures considered, which included biochemical measures, anthropometry, nutrient intake, food choice, food purchases, and cognitive and behavioural measures. The review considered cost-effectiveness measures where nutritional measures were also reported'. The primary outcome recorded in summary tables appeared to be the effect on diet. The secondary outcome of blood cholesterol levels was recorded in the following settings: school and university, workplace, primary care and community. The methods to measure outcome were 24-hour recall and diet diaries.

The primary outcome in supermarket settings appeared to be the effect on food purchase. This was measured by keeping a record of receipts, self-report or optical scanning of bar-coded goods.

The primary outcome in catering settings appeared to be the effect on food choice or diet, and was measured by self report or weighing waste bins.

How were decisions on the relevance of primary studies made?
Full copies of reports of interest were obtained and assessed by the 'review team', according to the inclusion and exclusion criteria. Two reviewers independently assessed the papers for validity and for inclusion in the systematic review, with any disagreements submitted to the 'review team' for resolution. Studies were assessed on 5 inclusion (or exclusion) criteria, based on recommendations of the NHS Centre of Reviews and Dissemination (see Other Publications of Related Interest): research design, intervention, population, outcomes, and time and place.

Assessment of study quality
Primary studies were assessed according to the dietary assessment method, attrition rate, appropriateness of statistical analysis, and treatment of potential bias. The authors provided further detail, including how they defined study quality, in an appendix. Study validity was based on a hierarchy of the following three factors:

1. Minimisation of the sources of bias.

2. Validity and appropriateness of outcome measures.

3. Validity and appropriateness of outcome analyses.

The assessment of study quality was performed independently by two reviewers, with any disagreements submitted to the 'review team' for resolution. The studies were classified as 'good', 'moderate' or 'poor' quality.
**Data extraction**
The data were extracted independently by two reviewers, with any disagreements submitted to the ‘review team’ for resolution. It was not recorded whether the abstractors were blinded. Data were abstracted from each trial on the following: study design, focus, setting, population, intervention, duration of intervention, theoretical model, outcomes and major results, outcome assessment, length of follow-up, overall attrition rate, assessment of effectiveness, and authors’ conclusions. Data abstracted from each of the studies were included in the appendices.

**Methods of synthesis**

How were the studies combined?
The studies were combined narratively using separate chapters for each setting and the following subheadings: range and quality of studies; overall effectiveness within the setting; influences on effectiveness, such as population group, theoretical model, method of intervention and length of follow up; summary; recent reviews in that setting. In addition, tables containing details of all included trials were presented for each specific setting. There was no meta-analysis. The authors stated that greater weighting was given to those 29 studies that were of high quality. Appendices contained full information on every included study. There were no method recorded for assessing publication bias.

How were differences between studies investigated?
The trials found for each setting were described narratively and in tabular format. Within the tables, the studies were grouped by quality, whilst within the text, the chapters were subdivided into the same standard headings for each setting.

**Results of the review**
Seventy-six study reports with a total number of participants in excess of 100,000 were identified: 29 studies were of good quality design, 30 were of moderate quality, and 17 were of poor quality.

School and university settings: 21 study reports with over 20,000 participants.

Workplace settings: 9 study reports with over 7,000 participants.

Primary care settings: 7 study reports with over 20,000 participants.

Community settings: 16 study reports with over 100,000 participants.

Supermarket settings: 8 study reports involving 311 participants plus customers at 75 supermarkets.

Catering settings: 15 study reports involving approximately 10,000 participants plus people who ate at 98 restaurants and cafeterias.

Most good quality studies, which reporting a dietary outcome measure, showed a benefit of intervention (15 studies out of 25).

Long-term interventions in the population achieved reductions in dietary fat of 1 to 4% of energy intake. Blood cholesterol was measured in less than half of the studies. The majority (7 out of 10) of good quality studies in the settings of schools, workplaces and primary care, showed a reduction in blood cholesterol ranging from 2 to 3% among adults in the general population and from 2 to 10% among children and adolescents. The majority (5 out of 6) of good quality studies of community-based interventions showed no effect on blood cholesterol. The greatest magnitude in change in diet was seen in studies with highly motivated volunteers in intensive programmes. A substantial number of studies showed no effect of the intervention on the main outcomes measured, compared with controls. This was seen particularly in the community setting, where a significant change in the intervention group was often equalled in the long term by a secular change in the control group. The majority of interventions in the supermarket and catering settings showed an effect on food purchases in the short term, i.e. while the intervention was in place. Passive manipulation of food composition decreased the fat content of catered meals. The characteristics of effective and less effective interventions were also reported.
Cost information
The authors state 'The review considered cost-effectiveness measures where nutritional measures were also reported'. For catering sessions: 'Changes in food accessibility or price had substantial effects in the short term but were not maintained after intervention. These strategies may not be acceptable in commercial catering outlets'. The data found were scant. There was no economic analysis.

Authors' conclusions
The authors concluded that they found clear evidence from recent controlled studies that, despite difficulties inherent in achieving dietary change in the general population, healthy eating interventions were effective in a variety of settings and populations. They also remarked that the beneficial effect was shown by multiple outcomes: a reduction in blood cholesterol; a reduction in dietary fat intake, as measured by validated methods: and an increase in the purchase of healthy food items, as measured by sales data. The lack of data on cost-effectiveness hinders an objective comparison with other intervention strategies, e.g. high-risk populations or pharmaceutical treatments.

CRD commentary
The review has been meticulously presented and summarised. The review question and inclusion criteria were excellent, well-defined and documented. The authors looked for cost-effectiveness but found little information in any of the studies. The literature searches were comprehensive and well documented. Non-English language papers were excluded if they did not have a summary in English. The search was started at 1985, but no reason was given for not searching earlier material. The methods used to assess study validity were well documented and appropriate. Primary data presentation was excellent with summary tables provided for all studies, grouped according to setting. An appendix containing all the data and information abstracted from each study was presented. It was appropriate to pool data by descriptive rather than statistical means as the differences in measurement of outcomes was great.

The strength of the authors' conclusions are warranted, based on the work contained and presented in the review.

Implications of the review for practice and research
Practice: The authors state that interventions directed at healthy eating should address at most one related outcome. Interventions directed at healthy eating should address at most one related risk factor, such as exercise. If the intervention is part of a multiple risk factor programme, dietary change should be central and supported by a validated outcome measure.

Research: The authors state that there is a need for the development and evaluation of healthy eating interventions aimed at increasing dietary intakes of starchy foods and fruit and vegetables, and a need for validated dietary and biochemical methods of measuring dietary changes, since there is a lack of well evaluated interventions. Further controlled research is needed in settings such as the supermarket and catering, with longer duration of intervention and follow-up. Research is needed to develop evaluated interventions for specific populations, e.g. gender, age and adolescents. More controlled research work on so called innovative intervention is required. Data on cost-effectiveness also needs to be reported.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.