

Young people and healthy eating: a systematic review of research on barriers and facilitators

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Abstract

A systematic review was conducted to examine the barriers to, and facilitators of, healthy eating among young people (11–16 years). The review focused on the wider determinants of health, examining community- and society-level interventions. Seven outcome evaluations and eight studies of young people's views were included. The effectiveness of the interventions was mixed, with improvements in knowledge and increases in healthy eating but differences according to gender. Barriers to healthy eating included poor school meal provision and ease of access to, relative cheapness of and personal taste preferences for fast food. Facilitators included support from family, wider availability of healthy foods, desire to look after one's appearance and will-power. Friends and teachers were generally not a common source of information. Some of the barriers and facilitators identified by young people had been addressed by soundly evaluated effective interventions, but significant gaps were identified where no evaluated interventions appear to have been published (e.g. better labelling

of food products), or where there were no methodologically sound evaluations. Rigorous evaluation is required particularly to assess the effectiveness of increasing the availability of affordable healthy food in the public and private spaces occupied by young people.

Introduction

Healthy eating contributes to an overall sense of well-being, and is a cornerstone in the prevention of a number of conditions, including heart disease, diabetes, high blood pressure, stroke, cancer, dental caries and asthma. For children and young people, healthy eating is particularly important for healthy growth and cognitive development. Eating behaviours adopted during this period are likely to be maintained into adulthood, underscoring the importance of encouraging healthy eating as early as possible [1]. Guidelines recommend consumption of at least five portions of fruit and vegetables a day, reduced intakes of saturated fat and salt and increased consumption of complex carbohydrates [2, 3]. Yet average consumption of fruit and vegetables in the UK is only about three portions a day [4]. A survey of young people aged 11–16 years found that nearly one in five did not eat breakfast before going to school [5]. Recent figures also show alarming numbers of obese and overweight children and young people [6]. Discussion about how to tackle the 'epidemic' of obesity is currently high on the health policy agenda [7], and effective health promotion remains a key strategy [8–10].

Evidence for the effectiveness of interventions is therefore needed to support policy and practice.

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The aim of this paper is to report a systematic review of the literature on young people and healthy eating. The objectives were

- (i) to undertake a ‘systematic mapping’ of research on the barriers to, and facilitators of, healthy eating among young people, especially those from socially excluded groups (e.g. low-income, ethnic minority—in accordance with government health policy);
- (ii) to prioritize a subset of studies to systematically review ‘in-depth’;
- (iii) to ‘synthesize’ what is known from these studies about the barriers to, and facilitators of, healthy eating with young people, and how these can be addressed and
- (iv) to identify gaps in existing research evidence.

Method

General approach

This study followed standard procedures for a systematic review [11, 12]. It also sought to develop a novel approach in three key areas.

First, it adopted a conceptual framework of ‘barriers’ to and ‘facilitators’ of health. Research findings about the barriers to, and facilitators of, healthy eating among young people can help in the development of potentially effective intervention strategies. Interventions can aim to modify or remove barriers and use or build upon existing facilitators. This framework has been successfully applied in other related systematic reviews in the area of healthy eating in children [13], physical activity with children [14] and young people [15] and mental health with young people [16; S. Oliver, A. Harden, R. Rees, J. Shepherd, G. Brunton and A. Oakley, manuscript in preparation].

Second, the review was carried out in two stages: a systematic search for, and mapping of, literature on healthy eating with young people, followed by an in-depth systematic review of the quality and findings of a subset of these studies. The rationale for a two-stage review to ensure the review was as relevant as possible to users. By mapping a broad area of evi-

dence, the key characteristics of the extant literature can be identified and discussed with review users, with the aim of prioritizing the most relevant research areas for systematic in-depth analysis [17, 18].

Third, the review utilized a ‘mixed methods’ triangulatory approach. Data from effectiveness studies (‘outcome evaluations’, primarily quantitative data) were combined with data from studies which described young people’s views of factors influencing their healthy eating in negative or positive ways (‘views’ studies, primarily qualitative). We also sought data on young people’s perceptions of interventions when these had been collected alongside outcomes data in outcome evaluations. However, the main source of young people’s views was surveys or interview-based studies that were conducted independently of intervention evaluation (‘non-intervention’ research). The purpose was to enable us to ascertain not just whether interventions are effective, but whether they address issues important to young people, using their views as a marker of appropriateness. Few systematic reviews have attempted to synthesize evidence from both intervention and non-intervention research: most have been restricted to outcome evaluations. This study therefore represents one of the few attempts that have been made to date to integrate different study designs into systematic reviews of effectiveness [19–22].

Literature searching

A highly sensitive search strategy was developed to locate potentially relevant studies. A wide range of terms for healthy eating (e.g. nutrition, food preferences, feeding behaviour, diets and health food) were combined with health promotion terms or general or specific terms for determinants of health or ill-health (e.g. health promotion, behaviour modification, at-risk-populations, sociocultural factors and poverty) and with terms for young people (e.g. adolescent, teenager, young adult and youth). A number of electronic bibliographic databases were searched, including Medline, EMBASE, The Cochrane Library, PsycINFO, ERIC, Social Science Citation Index, CINAHL, BiblioMap and HealthPromis. The searches covered the full range

of publication years available in each database up to 2001 (when the review was completed).

Full reports of potentially relevant studies identified from the literature search were obtained and classified (e.g. in terms of specific topic area, context, characteristics of young people, research design and methodological attributes).

Inclusion screening

Inclusion criteria were developed and applied to each study. The first round of screening was to identify studies to populate the map. To be included, a study had to (i) focus on healthy eating; (ii) include young people aged 11–16 years; (iii) be about the promotion of healthy eating, and/or the barriers to, or facilitators of, healthy eating; (iv) be a relevant study type: (a) an outcome evaluation or (b) a non-intervention study (e.g. cohort or case control studies, or interview studies) conducted in the UK only (to maximize relevance to UK policy and practice) and (v) be published in the English language.

The results of the map, which are reported in greater detail elsewhere [23], were used to prioritize a subset of policy relevant studies for the in-depth systematic review.

A second round of inclusion screening was performed. As before, all studies had to have healthy eating as their main focus and include young people aged 11–16 years. In addition, outcome evaluations had to

- (i) use a comparison or control group; report pre- and post-intervention data and, if a non-randomized trial, equivalent on sociodemographic characteristics and pre-intervention outcome variables (demonstrating their ‘potential soundness’ in advance of further quality assessment);
- (ii) report an intervention that aims to make a change at the community or society level and
- (iii) measure behavioural and/or physical health status outcomes.

For a non-intervention study to be included it had to

- (i) examine young people’s attitudes, opinions, beliefs, feelings, understanding or experi-

ences about healthy eating (rather than solely examine health status, behaviour or factual knowledge);

- (ii) access views about one or more of the following: young people’s definitions of and/or ideas about healthy eating, factors influencing their own or other young people’s healthy eating and whether and how young people think healthy eating can be promoted and
- (iii) privilege young people’s views—presenting views directly as data that are valuable and interesting in themselves, rather than only as a route to generating variables to be tested in a predictive or causal model.

Non-intervention studies published before 1990 were excluded in order to maximize the relevance of the review findings to current policy issues.

Data extraction and quality assessment

All studies meeting inclusion criteria underwent data extraction and quality assessment, using a standardized framework [24]. Data for each study were entered independently by two researchers into a specialized computer database [25] (the full and final data extraction and quality assessment judgement for each study in the in-depth systematic review can be viewed on the Internet by visiting <http://eppi.ioe.ac.uk>).

Outcome evaluations were considered methodologically ‘sound’ if they reported:

- (i) a control or comparison group equivalent to the intervention group on sociodemographic characteristics and pre-intervention outcome variables.
- (ii) pre-intervention data for all individuals or groups recruited into the evaluation;
- (iii) post-intervention data for all individuals or groups recruited into the evaluation and
- (iv) on all outcomes, as described in the aims of the intervention.

Only studies meeting these criteria were used to draw conclusions about effectiveness. The results

of the studies which did not meet these quality criteria were judged unclear.

Non-intervention studies were assessed according to a total of seven criteria (common to sets of criteria proposed by four research groups for qualitative research [26–29]):

- (i) an explicit account of theoretical framework and/or the inclusion of a literature review which outlined a rationale for the intervention;
- (ii) clearly stated aims and objectives;
- (iii) a clear description of context which includes detail on factors important for interpreting the results;
- (iv) a clear description of the sample;
- (v) a clear description of methodology, including systematic data collection methods;
- (vi) analysis of the data by more than one researcher and
- (vii) the inclusion of sufficient original data to mediate between data and interpretation.

Data synthesis

Three types of analyses were performed: (i) narrative synthesis of outcome evaluations, (ii) narrative synthesis of non-intervention studies and (iii) synthesis of intervention and non-intervention studies together.

For the last of these a matrix was constructed which laid out the barriers and facilitators identified by young people alongside descriptions of the interventions included in the in-depth systematic review of outcome evaluations. The matrix was stratified by four analytical themes to characterize the levels at which the barriers and facilitators appeared to be operating: the school, family and friends, the self and practical and material resources. This methodology is described further elsewhere [20, 22, 30].

From the matrix it is possible to see:

- (i) where barriers have been modified and/or facilitators built upon by soundly evaluated interventions, and ‘promising’ interventions which need further, more rigorous, evaluation (matches) and

- (ii) where barriers have not been modified and facilitators not built upon by any evaluated intervention, necessitating the development and rigorous evaluation of new interventions (gaps).

Results

Figure 1 outlines the number of studies included at various stages of the review. Of the total of 7048 reports identified, 135 reports (describing 116 studies) met the first round of screening and were included in the descriptive map. The results of the map are reported in detail in a separate publication—see Shepherd *et al.* [23] (the report can be downloaded free of charge via <http://eppi.ioe.ac.uk>). A subset of 22 outcome evaluations and 8 studies of young people’s views met the criteria for the in-depth systematic review.

Outcome evaluations

Of the 22 outcome evaluations, most were conducted in the United States ($n = 16$) [31–45], two in Finland [46, 47], and one each in the UK [48], Norway [49], Denmark [50] and Australia [51]. In addition to the main focus on promoting healthy eating, they also addressed other related issues including cardiovascular disease in general, tobacco use, accidents, obesity, alcohol and illicit drug use. Most were based in primary or secondary school settings and were delivered by teachers. Interventions varied considerably in content. While many involved some form of information provision, over half ($n = 13$) involved attempts to make structural changes to young people’s physical environments; half ($n = 11$) trained parents in or about nutrition, seven developed health-screening resources, five provided feedback to young people on biological measures and their behavioural risk status and three aimed to provide social support systems for young people or others in the community. Social learning theory was the most common theoretical framework used to develop these interventions. Only a minority of studies included

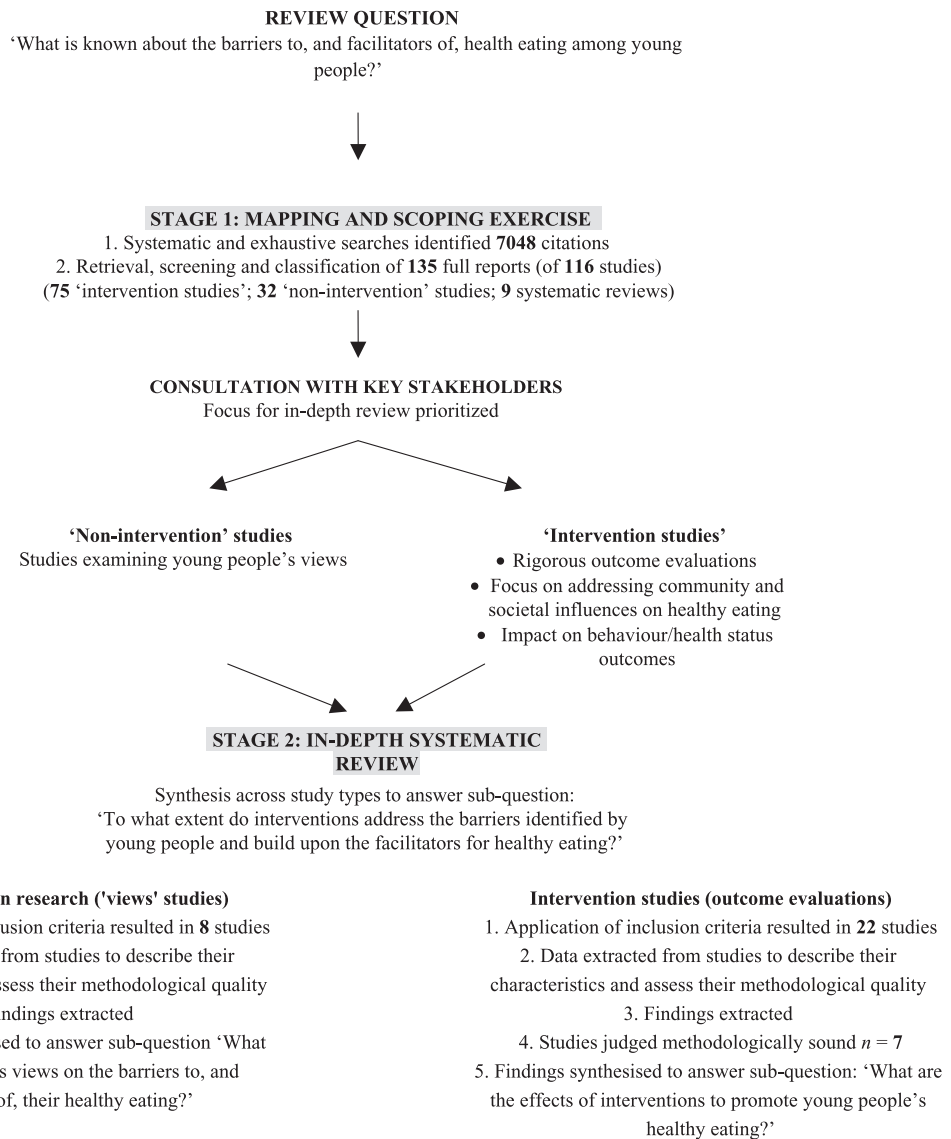


Fig. 1. The review process.

young people who could be considered socially excluded ($n = 6$), primarily young people from ethnic minorities (e.g. African Americans and Hispanics).

Following detailed data extraction and critical appraisal, only seven of the 22 outcome evaluations were judged to be methodologically sound. For the remainder of this section we only report the results

of these seven. Four of the seven were from the United States, with one each from the UK, Norway and Finland. The studies varied in the comprehensiveness of their reporting of the characteristics of the young people (e.g. sociodemographic/economic status). Most were White, living in middle class urban areas. All attended secondary schools. Table I

Table I. *Soundly evaluated outcome evaluations: study characteristics (n = 7)*

Author/Country/Design	Population	Setting	Objectives	Providers	Programme content
Klepp and Wilhelmsen [49], Norway, CT (+PE)	Seventh grade (13 years old) students	Secondary schools	<ul style="list-style-type: none"> To increase the consumption of fresh fruits, vegetables, whole-wheat bread and low-fat dairy products, and decrease the consumption of high-sugar and high-fat snack foods 	Teachers and peer educators	<ul style="list-style-type: none"> Small group classroom discussion to identify healthy and unhealthy foods, the consequences of diet and rationales for choosing healthy foods, identifying healthy alternative snacks and discussing presentation of food by the media A computer program allowed students to analyse the nutritional status of various foods Students analysed food items available in local stores, their homes and local youth organizations Peer educators led classroom group-work and role-plays Students prepared healthy foods at school and home, and shared information with friends and families
Moon <i>et al.</i> [48], UK, CT (+PE)	Year 8 and Year 11 pupils (aged 11–16 years)	Secondary schools	<ul style="list-style-type: none"> To evaluate the impact on levels of health promotion activity, organization and functioning of participating schools To determine the effects on pupils' health-related knowledge, attitudes and behaviour 	<ul style="list-style-type: none"> Teachers and key school staff Members of the school community ('holistic' approach) 	<ul style="list-style-type: none"> The 'Wessex Healthy Schools Award' The award scheme provides structured frameworks, health-related targets and external support to help schools become health promoting The scheme covers nine key areas: 1, the curriculum; 2, links with the wider community; 3, a smoke-free school; 4, healthy food choices; 5, physical activity; 6, responsibility for health; 7, health promoting workplace; 8, environment and 9, equal opportunities and access to health

Table I. *Continued*

Author/Country/Design	Population	Setting	Objectives	Providers	Programme content
Nicklas <i>et al.</i> [40], USA, RCT (+PE)	Ninth grade (age range 14–15 years) at start; 3-year longitudinal cohort intervention	High schools	Objective of the ‘Gimme 5’ programme <ul style="list-style-type: none"> To promote changes in knowledge, attitudes and behaviours in relation to daily consumption of fruit and vegetables Objective of the parent programme ‘5 a Day For Better Health’: <ul style="list-style-type: none"> To promote a per capita intake of five servings of fruits and vegetables a day 	Teachers, health educators and school catering personnel	<ul style="list-style-type: none"> The ‘Gimme 5’ programme A 3-year multicomponent intervention incorporating a school-wide media marketing campaign (posters, public address announcements, marketing stations), classroom activities (teacher- or health educator-led workshops), parental involvement (newsletters, brochures sent home) and changes to the content of school meals (increased availability and portion sizes of fruits and vegetables)
Perry <i>et al.</i> [41], USA, RCT (+PE)	Ninth grade (14- to 15-year-old pupils)	Suburban high school	<ul style="list-style-type: none"> To establish positive eating and physical activity patterns and behavioural goals To decrease salt and saturated fat intake and increase intake of complex carbohydrates To increase level of physical activity 	Teachers administered the programme in general, with 30 class-elected peer leaders leading the class-based sessions	<ul style="list-style-type: none"> The ‘Slice of Life’ programme A 10-session high school curriculum designed to promote healthy eating and physical activity patterns among young people Intervention covered knowledge about benefits of fitness, characteristics of a heart healthy diet, social influences on eating and exercise habits and issues to do with weight control. Environmental influences (e.g. provision of health food options in school canteen) were identified and strategies for improvement were presented to school personnel
Vartiainen <i>et al.</i> [47], Finland, RCT (+PE)	12- to 16-year-old students	Secondary schools in the Karelia and Kuopio regions of Finland	<ul style="list-style-type: none"> To improve nutrition and positive social relations with peers and adults, and to improve problem-solving and -coping skills 	Health educators, school nurses, peer educators, school teachers	<ul style="list-style-type: none"> The second ‘North Karelia Youth Programme’

Table I. *Continued*

Author/Country/Design	Population	Setting	Objectives	Providers	Programme content
Walter I and II ^a [45], USA, RCT (+PE)	Fourth grade (mean age 9 years at start); 5-year longitudinal cohort intervention	Elementary and junior high schools	<ul style="list-style-type: none"> To favourably modify the population distributions of risk factors for coronary heart disease and cancer through changes in diet 	Teachers delivered the classroom component. Health and education professionals conducted risk factor examination screening	<ul style="list-style-type: none"> Multi component intervention featuring: classroom educational activities, media campaign (production of a television programme), changes to the nutritional content of school meals, health-screening activities and health education initiative in the workplaces of the parents The 'Know Your Body' programme Classroom component: 2 hours a week of education on healthy eating, promotion of physical activity and targeting of beliefs and attitudes around smoking Parental involvement component: parents receive newsletters of their children's activities, take part in food surveys and family exercise days, as well as evening seminars Risk factor examination component: students' height, weight, skinfold thickness, blood pressure, post-exercise pulse rate and cholesterol levels were measured and results fed back to them. Teachers discuss the results with the pupils in the classroom in terms of setting behavioural goals

RCT = Randomized Controlled Trial; CT = controlled trial (no randomization); PE = process evaluation.^a Separate evaluations of the same intervention in two populations in New York (the Bronx and Westchester County).

details the interventions in these sound studies. Generally, they were multicomponent interventions in which classroom activities were complemented with school-wide initiatives and activities in the home. All but one of the seven sound evaluations included and an integral evaluation of the intervention processes. Some studies report results according to demographic characteristics such as age and gender.

The UK-based intervention was an award scheme (the 'Wessex Healthy Schools Award') that sought to make health-promoting changes in school ethos, organizational functioning and curriculum [48]. Changes made in schools included the introduction of health education curricula, as well as the setting of targets in key health promotion areas (including healthy eating). Knowledge levels, which were high at baseline, changed little over the course of the intervention. Intervention schools performed better in terms of healthy food choices (on audit scores). The impact on measures of healthy eating such as choosing healthy snacks varied according to age and sex. The intervention only appeared possibly to be effective for young women in Year 11 (aged 15–16 years) on these measures (statistical significance not reported).

The 'Know Your Body' intervention, a cardiovascular risk reduction programme, was evaluated in two separate studies in two demographically different areas of New York (the Bronx and Westchester County) [45]. Lasting for 5 years it comprised teacher-led classroom education, parental involvement activities and risk factor examination in elementary and junior high schools. In the Bronx evaluation, statistically significant increases in knowledge were reported, but favourable changes in cholesterol levels and dietary fat were not significant. In the Westchester County evaluation, we judged the effects to be unclear due to shortcomings in methods reported.

A second US-based study, the 3-year 'Gimme 5' programme [40], focused on increasing consumption of fruits and vegetables through a school-wide media campaign, complemented by classroom activities, parental involvement and changes to nutritional content of school meals. The intervention

was effective at increasing knowledge (particularly among young women). Effects were measured in terms of changes in knowledge scores between baseline and two follow-up periods. Differences between the intervention and comparison group were significant at both follow-ups. There was a significant increase in consumption of fruit and vegetables in the intervention group, although this was not sustained.

In the third US study, the 'Slice of Life' intervention, peer leaders taught 10 sessions covering the benefits of fitness, healthy diets and issues concerning weight control [41]. School functioning was also addressed by student recommendations to school administrators. For young women, there were statistically significant differences between intervention and comparison groups on healthy eating scores, salt consumption scores, making healthy food choices, knowledge of healthy food, reading food labels for salt and fat content and awareness of healthy eating. However, among young men differences were only significant for salt and knowledge scores. The process evaluation suggested that having peers deliver training was acceptable to students and the peer-trainers themselves.

A Norwegian study evaluated a similar intervention to the 'Slice of Life' programme, employing peer educators to lead classroom activities and small group discussions on nutrition [49]. Students also analysed the availability of healthy food in their social and home environment and used a computer program to analyse the nutritional status of foods. There were significant intervention effects for reported healthy eating behaviour (but not maintained by young men) and for knowledge (not young women).

The second 'North Karelia Youth Study' in Finland featured classroom educational activities, a community media campaign, health-screening activities, changes to school meals and a health education initiative in the parents' workplace [47]. It was judged to be effective for healthy eating behaviour, reducing systolic blood pressure and modifying fat content of school meals, but less so for reducing cholesterol levels and diastolic blood pressure.

The evidence from the well-designed evaluations of the effectiveness of healthy eating initiatives is therefore mixed. Interventions tend to be more effective among young women than young men.

Young people's views

Table II describes the key characteristics of the eight studies of young people's views. The most consistently reported characteristics of the young people were age, gender and social class. Socio-economic status was mixed, and in the two studies reporting ethnicity, the young people participating were predominantly White. Most studies collected data in mainstream schools and may therefore not be applicable to young people who infrequently or never attend school.

All eight studies asked young people about their perceptions of, or attitudes towards, healthy eating, while none explicitly asked them what prevents them from eating healthily. Only two studies asked them what they think helps them to eat healthy foods, and only one asked for their ideas about what could or should be done to promote nutrition.

Young people tended to talk about food in terms of what they liked and disliked, rather than what was healthy/unhealthy. Healthy foods were predominantly associated with parents/adults and the home, while 'fast food' was associated with pleasure, friendship and social environments. Links were also made between food and appearance, with fast food perceived as having negative consequences on weight and facial appearance (and therefore a rationale for eating healthier foods). Attitudes towards healthy eating were generally positive, and the importance of a healthy diet was acknowledged. However, personal preferences for fast foods on grounds of taste tended to dominate food choice. Young people particularly valued the ability to choose what they eat.

Despite not being explicitly asked about barriers, young people discussed factors inhibiting their ability to eat healthily. These included poor availability of healthy meals at school, healthy foods sometimes being expensive and wide availability of, and personal preferences for, fast foods. Things that young people thought should be done to

facilitate healthy eating included reducing the price of healthy snacks and better availability of healthy foods at school, at take-aways and in vending machines. Will-power and encouragement from the family were commonly mentioned support mechanisms for healthy eating, while teachers and peers were the least commonly cited sources of information on nutrition. Ideas for promoting healthy eating included the provision of information on nutritional content of school meals (mentioned by young women particularly) and better food labelling in general.

Synthesis

Table III shows the synthesis matrix which juxtaposes barriers and facilitators alongside results of outcome evaluations. There were some matches but also significant gaps between, on the one hand, what young people say are barriers to healthy eating, what helps them and what could or should be done and, on the other, soundly evaluated interventions that address these issues.

In terms of the school environment, most of the barriers identified by young people appear to have been addressed. At least two sound outcome evaluations demonstrated the effectiveness of increasing the availability of healthy foods in the school canteen [40, 47]. Furthermore, despite the low status of teachers and peers as sources of nutritional information, several soundly evaluated studies showed that they can be employed effectively to deliver nutrition interventions.

Young people associated parents and the home environment with healthy eating, and half of the sound outcome evaluations involved parents in the education of young people about nutrition. However, problems were sometimes experienced in securing parental attendance at intervention activities (e.g. seminar evenings). Why friends were not a common source of information about good nutrition is not clear. However, if peer pressure to eat unhealthy foods is a likely explanation, then it has been addressed by the peer-led interventions in three sound outcome evaluations (generally effectively) [41, 47, 49] and two outcome evaluations

Table II. Characteristics of young people's views studies (n = 8)

Study	Aims and objectives	Sample characteristics
Dennison and Shepherd [56]	<ul style="list-style-type: none"> To increase understanding of the factors affecting food choice decisions To build a theoretical model through which existing research into the factors influencing adolescent food choice can be integrated 	Location: English secondary schools Sample number: 675 Age range: 11–12 years (55%), 14–15 years (45%) Gender: mixed Class: majority of students in classes A, B, C1 and C2
Harris [57]	<ul style="list-style-type: none"> To explore young people's attitudes, views and beliefs with respect to health, fitness and exercise To explore whether perceptions varied on the basis of age and gender 	Location: two large comprehensive schools in Staffordshire and Wiltshire Sample number: 61 Age range: 11–13 years Gender: mixed Class: not stated—aim was for a mix of socioeconomic backgrounds Ethnicity: not stated
McDougall [58]	<ul style="list-style-type: none"> To examine awareness of and attitudes towards nutrition among Year 11 pupils in a local comprehensive school To look at the types of food they eat Focus on pupils' views of the nutritional value of meals available in schools and their ideas for improving these meals 	Location: secondary school, Hartlepool, NE England Sample number: 165 Age range: 15–16 years Gender: F = 80, M = 85 Class: school was in a relatively affluent part of town Ethnicity: not stated
Miles and Eid [59]	<ul style="list-style-type: none"> To compare young people's knowledge of healthy eating with their behaviour To elicit young people's views on healthy eating and to feed them back to 'decision-makers' 	Location: comprehensive school in unspecified part of England Sample number: 109 Age range: not stated (young people in secondary school) Gender: M = 55, F = 54 Class: not stated Ethnicity: not stated
Roberts <i>et al.</i> [60]	<ul style="list-style-type: none"> To examine the general dieting behaviour and characteristics of young women in the UK To examine the socioeconomic characteristics and to address other dieting behaviours 	Location: six schools in England—Merseyside and Lancashire Sample number: 569 Age range: 11–15 years (mean age 12.8 years) Gender: girls only Class: school type used as proxy for social class—2 comprehensive schools; 2 independent schools and 2 high schools Ethnicity: not stated
Ross [61]	<ul style="list-style-type: none"> To explore the attitudes and beliefs which underpin health-related behaviour to increase understanding young people's food choices 	Location: Scotland, small primary school in Edinburgh Sample number: 46 Age range: 10–12 years (mean age 11 years) Gender: mixed—no numbers given Class: school located in area with residents of mixed socioeconomic background Ethnicity: authors report sample to be predominantly White

Table II. *Continued*

Study	Aims and objectives	Sample characteristics
Watt and Sheiham [62]	<ul style="list-style-type: none"> To assess dietary patterns and experiences of change of a sample of 469 young people aged 13–14 years in inner city London To investigate knowledge, skills and beliefs about food and health To determine applicability of ‘stages of change’ model and assess factors that may influence young people’s ability to change eating patterns 	Location: four schools in Camden, London Sample number: 479 Age range: 13–14 years (mean 14.3 years) Gender: 40% girls; 60% boys Class: 34% non-manual, 52% manual and 14% unclassifiable Ethnicity: 62% White, 38% from 10 diverse minority ethnic groups
Watt and Sheiham [63]	<ul style="list-style-type: none"> To assess the meanings of food-associated concepts for young people, and how they fit into their lives 	Location: England, four state secondary schools located in Camden. London Sample number: 81 Age range: 13–14 years Gender: M = 41, F = 40 Class: not stated Ethnicity: not stated

which did not meet the quality criteria (effectiveness unclear) [33, 50].

The fact that young people choose fast foods on grounds of taste has generally not been addressed by interventions, apart from one soundly evaluated effective intervention which included taste testings of fruit and vegetables [40]. Young people’s concern over their appearance (which could be interpreted as both a barrier and a facilitator) has only been addressed in one of the sound outcome evaluations (which revealed an effective intervention) [41]. Will-power to eat healthy foods has only been examined in one outcome evaluation in the in-depth systematic review (judged to be sound and effective) (Walter I—Bronx evaluation) [45]. The need for information on nutrition was addressed by the majority of interventions in the in-depth systematic review. However, no studies were found which evaluated attempts to increase the nutritional content of school meals.

Barriers and facilitators relating to young people’s practical and material resources were generally not addressed by interventions, soundly evaluated or otherwise. No studies were found which examined the effectiveness of interventions

to lower the price of healthy foods. However, one soundly evaluated intervention was partially effective in increasing the availability of healthy snacks in community youth groups (Walter I—Bronx evaluation) [45]. At best, interventions have attempted to raise young people’s awareness of environmental constraints on eating healthily, or encouraged them to lobby for increased availability of nutritious foods (in the case of the latter without reporting whether any changes have been effected as a result).

Discussion

This review has systematically identified some of the barriers to, and facilitators of, healthy eating with young people, and illustrated to what extent they have been addressed by soundly evaluated effective interventions.

The evidence for effectiveness is mixed. Increases in knowledge of nutrition (measured in all but one study) were not consistent across studies, and changes in clinical risk factors (measured in two studies) varied, with one study detecting reductions

Table III. *Synthesis matrix*

Young people's views on barriers and facilitators		Interventions which address barriers or build on facilitators identified by young people	
Barriers	Facilitators	Soundly evaluated interventions (<i>n</i> = 7)	Other evaluated interventions (<i>n</i> = 15)
A. Healthy eating and the school			
<ul style="list-style-type: none"> Schools do not offer healthy choices at lunch-time (<i>Y3, Y6, Y8</i>) 	<ul style="list-style-type: none"> Healthier choices in school canteens (<i>Y4</i>) 	<ul style="list-style-type: none"> 'Wessex Healthy Schools Award' included 'healthy food choices' (<i>OE11</i>) 'Gimme 5', changes were made to the content of school meals (increased availability and portion sizes of fruits and vegetables) (<i>OE13</i>) The second 'North Karelia Youth Programme', changes to the nutritional content of school meals (<i>OE20</i>) The 'Slice of Life' intervention—young people lobbied for health-supporting environmental changes in their schools (e.g. changes to nutritional content of school foods). It is not clear whether these changes were implemented (<i>OE14</i>) 	<ul style="list-style-type: none"> An intervention targeted at catering staff at boarding schools to reduce sodium and fat levels of school meals was evaluated. Outcome measures included nutrient intake, blood pressure and sodium and fat content of foods (<i>OE4</i>) The first 'North Karelia Youth Study' included modification of school lunches/changes to cooking practices (<i>OE19</i>)
<ul style="list-style-type: none"> Teachers, one of the least cited sources of information on nutrition (<i>Y7</i>) 	<ul style="list-style-type: none"> Information on nutritional content of foods (<i>Y3</i>) 	<ul style="list-style-type: none"> Teachers were involved in the delivery of all the interventions evaluated A school-based multicomponent intervention used a computer program which allowed students to analyse the nutritional status of various foods (<i>OE10</i>) 	<ul style="list-style-type: none"> None identified None identified
B. Healthy eating, family and friends			
<ul style="list-style-type: none"> Unhealthy food associated with life outside home, and with friendship, pleasure and relaxation (<i>Y8</i>) 	<ul style="list-style-type: none"> Young people associate home with healthy foods (<i>Y6</i>) as well as with adulthood (<i>Y8</i>) Family members, a common source of information on nutrition (<i>Y7</i>) 	<ul style="list-style-type: none"> In a school-based multi component intervention, students prepared healthy foods at school and home, and shared information with friends and families (<i>OE10</i>) The 'Gimme 5' programme, parents were sent newsletters and brochures informing them of the project, and recipes and coupons (<i>OE13</i>). 	<ul style="list-style-type: none"> Obesity prevention intervention among African American mothers and daughters to encourage the choosing of reduced fat food in fast food restaurants (<i>OE6</i>) The 'Great Sensations' programme—to resist pressure from friends, family and the media to eat snacks high in salt (<i>OE3</i>)

Table III. *Continued*

Young people's views on barriers and facilitators		Interventions which address barriers or build on facilitators identified by young people	
Barriers	Facilitators	Soundly evaluated interventions (<i>n</i> = 7)	Other evaluated interventions (<i>n</i> = 15)
<ul style="list-style-type: none"> • Friends, one of the least cited sources of information on nutrition (<i>Y7</i>) • Friends cited as one of least helpful in promoting diet change (<i>Y7</i>) 	<ul style="list-style-type: none"> • Support from family, one of the most cited factors as helpful in promoting diet change (<i>Y7</i>) • Talking to friends, a prominent source of information on nutrition for young women (<i>Y4</i>) 	<ul style="list-style-type: none"> • The 'Know Your Body' programme included a parental component. Parents received newsletters about their children's activities and took part in food surveys and evening seminars (<i>OE21</i>) • A school-based multicomponent intervention also involved local youth groups who increased provision of healthy snacks available to young people (<i>OE10</i>) • The 'Slice of Life' intervention—recruited peer leaders, chosen for their popularity to deliver information about nutrition (<i>OE14</i>) • The second 'North Karelia Youth Programme', a multi-component school-wide initiative, included classroom sessions to explore peer pressure and family influences on health (<i>OE20</i>) • (<i>OE10</i>) as above 	<ul style="list-style-type: none"> • 'Chicago Heart Health Curriculum'—parent participation in conjunction with school-based activities (<i>OE15</i>) (see also <i>OE7</i>) • The 'Class of 89' programme ('Minnesota Heart Health Program')—social support for young people to eat healthily (<i>OE9</i>) • School-based cardiovascular health intervention plus encouragement for parents to encourage them to prepare healthy recipes (<i>OE18</i>) • Centre-based exercise and nutrition programme for Black American families. Tastings took place of low-salt and low-fat food (<i>OE1</i>) • The 'Learning by teaching' study used older peer educators to influence younger peers (e.g. marketing the attractiveness of healthy food products) (<i>OE8</i>) • (<i>OE3</i>) as above
<p>C. Healthy eating and the self</p> <ul style="list-style-type: none"> • Preferences for fast foods influence choice (e.g. taste/texture). (<i>Y6</i>), (<i>Y8</i>), (<i>Y3</i>) 		<ul style="list-style-type: none"> • The school-wide 'Gimme 5' programme included 'taste-testings' with produce give-aways of fruits and vegetables (<i>OE13</i>) • All the outcome evaluations judged to be sound included educational components to increase knowledge and foster positive attitudes towards healthy eating 	<ul style="list-style-type: none"> • Obesity prevention intervention among African American mothers and daughters to encourage the choosing of reduced fat food in fast food restaurants (<i>OE6</i>)

Table III. *Continued*

Young people's views on barriers and facilitators		Interventions which address barriers or build on facilitators identified by young people	
Barriers	Facilitators	Soundly evaluated interventions (n = 7)	Other evaluated interventions (n = 15)
<ul style="list-style-type: none"> Concerns over appearance (e.g. being overweight) influences dieting (Y5) 	<ul style="list-style-type: none"> Concerns over appearance (e.g. being overweight, acne) may prompt young people to moderate their intake of fast foods/unhealthy foods (Y6, Y8) Will-power cited as a major factor that helps diet change (Y7) Information on nutritional content of school meals would help to make informed food choices (particularly for young women) (Y3) 	<ul style="list-style-type: none"> The 'Slice of Life' intervention analysed commercial diets and discussed sensible approach to weight control (OE14) The 'Know Your Body' programme: students' height, weight, skinfold thickness, blood pressure and cholesterol levels were measured and results fed back to them. Behavioural goals were set (OE21) (OE21) as above None identified—research gap 	<ul style="list-style-type: none"> The 'Learning by teaching' intervention examined body image and healthy eating (OE8) The 'Dance for Health' intervention examined obesity and unhealthy weight regulation practices (OE5) None identified
D. Healthy eating and practical and material resources			
<ul style="list-style-type: none"> Fast food is cheap and easy to buy (e.g. at or around school premises) (Y3) Healthy food sometimes too expensive (e.g. at school) (Y6) 	<ul style="list-style-type: none"> Healthier snacks in vending machines; healthier options on the menu at take-aways (Y4) Reduction in the price of healthy snacks (Y4) 	<ul style="list-style-type: none"> A school-based multicomponent intervention also involved local youth groups who increased provision of healthy snacks available to young people (OE10) In the 'Slice of Life' intervention young people analysed food available in local supermarkets, and in their school, and they lobbied for health-supporting environmental changes in their schools (e.g. changes to nutritional content of school foods). It is not clear whether these changes were implemented (OE14) In the 'Gimme 5' programme parents were sent recipes and coupons for food items (OE13) No outcome evaluations evaluated the effects of lowering the price of healthy foods/increasing the price of fast food No outcome evaluations assessed changing food availability in vending machines or take-aways 	<ul style="list-style-type: none"> The 'Learning by teaching' study examined environment influences on young people's 'free choice' (e.g. visiting supermarkets to examine food supply) (OE8) The 'Minnesota Heart Health Program' sought to effect better nutritional food labelling at restaurants (OE9)

Table III. *Continued*

Young people's views on barriers and facilitators		Interventions which address barriers or build on facilitators identified by young people	
Barriers	Facilitators	Soundly evaluated interventions (<i>n</i> = 7)	Other evaluated interventions (<i>n</i> = 15)
<ul style="list-style-type: none"> • Healthy food is not always convenient/takes too long to prepare/time could be spent socializing (<i>Y6</i>) 	<ul style="list-style-type: none"> • Better labelling of food products (<i>Y7</i>) • TV and magazines, a source of information on nutrition for young women (<i>Y4</i>) 	<ul style="list-style-type: none"> • None identified—research gap 	<ul style="list-style-type: none"> • The 'Minnesota Heart Health Program' sought to effect better nutritional food labelling at restaurants (<i>OE9</i>)
		<ul style="list-style-type: none"> • None identified—research gap 	
		<ul style="list-style-type: none"> • None identified—research gap 	

Key to young people's views studies: *Y1*, Dennison and Shepherd [56]; *Y2*, Harris [57]; *Y3*, McDougall [58]; *Y4*, Miles and Eid [59]; *Y5*, Roberts *et al.* [60]; *Y6*, Ross [61]; *Y7*, Watt and Sheiham [62]; *Y8*, Watt and Sheiham [63]. Key to intervention studies: *OE1*, Baranowski *et al.* [31]; *OE2*, Bush *et al.* [32]; *OE3*, Coates *et al.* [33]; *OE4*, Ellison *et al.* [34]; *OE5*, Flores [36]; *OE6*, Fitzgibbon *et al.* [35]; *OE7*, Hopper *et al.* [64]; *OE8*, Holund [50]; *OE9*, Kelder *et al.* [38]; *OE10*, Klepp and Wilhelmsen [49]; *OE11*, Moon *et al.* [48]; *OE12*, Nader *et al.* [39]; *OE13*, Nicklas *et al.* [40]; *OE14*, Perry *et al.* [41]; *OE15*, Petchers *et al.* [42]; *OE16*, Schinke *et al.* [43]; *OE17*, Wagner *et al.* [44]; *OE18*, Vandongen *et al.* [51]; *OE19*, Vartiainen *et al.* [46]; *OE20*, Vartiainen *et al.* [47]; *OE21*, Walter I [45]; *OE22*, Walter II [45]. *OE10*, *OE11*, *OE13*, *OE14*, *OE20*, *OE21* and *OE22* denote a sound outcome evaluation. *OE21* and *OE22* are separate evaluations of the same intervention. Due to methodological limitations, we have judged the effects of *OE22* to be unclear. *Y1* and *Y2* do not appear in the synthesis matrix as they did not explicitly report barriers or facilitators, and it was not possible for us to infer potential barriers or facilitators. However, these two studies did report what young people understood by healthy eating, their perceptions, and their views and opinions on the importance of eating a healthy diet. *OE2*, *OE12*, *OE16* and *OE17* do not appear in the synthesis matrix as they did not address any of the barriers or facilitators.

in cholesterol and another detecting no change. Increases in reported healthy eating behaviour were observed, but mostly among young women revealing a distinct gender pattern in the findings. This was the case in four of the seven outcome evaluations (in which analysis was stratified by gender). The authors of one of the studies suggest that emphasis of the intervention on healthy weight management was more likely to appeal to young women. It was proposed that interventions directed at young men should stress the benefits of nutrition on strength, physical endurance and physical activity, particularly to appeal to those who exercise and play sports. Furthermore, age was a significant factor in determining effectiveness in one study [48]. Impact was greatest on young people in the 15- to 16-year age range (particularly for young women)

in comparison with those aged 12–13 years, suggesting that dietary influences may vary with age. Tailoring the intervention to take account of age and gender is therefore crucial to ensure that interventions are as relevant and meaningful as possible.

Other systematic reviews of interventions to promote healthy eating (which included some of the studies with young people fitting the age range of this review) also show mixed results [52–55]. The findings of these reviews, while not being directly comparable in terms of conceptual framework, methods and age group, seem to offer some support for the findings of this review. The main message is that while there is some evidence to suggest effectiveness, the evidence base is limited. We have identified no comparable systematic reviews in this area.

Unlike other reviews, however, this study adopted a wider perspective through inclusion of studies of young people's views as well as effectiveness studies. A number of barriers to healthy eating were identified, including poor availability of healthy foods at school and in young people's social spaces, teachers and friends not always being a source of information/support for healthy eating, personal preferences for fast foods and healthy foods generally being expensive. Facilitating factors included information about nutritional content of foods/better labelling, parents and family members being supportive; healthy eating to improve or maintain one's personal appearance, will-power and better availability/lower pricing of healthy snacks.

Juxtaposing barriers and facilitators alongside effectiveness studies allowed us to examine the extent to which the needs of young people had been adequately addressed by evaluated interventions. To some extent they had. Most of the barriers and facilitators that related to the school and relationships with family and friends appear to have been taken into account by soundly evaluated interventions, although, as mentioned, their effectiveness varied. Many of the gaps tended to be in relation to young people as individuals (although our prioritization of interventions at the level of the community and society may have resulted in the exclusion of some of these interventions) and the wider determinants of health ('practical and material resources'). Despite a wide search, we found few evaluations of strategies to improve nutritional labelling on foods particularly in schools or to increase the availability of affordable healthy foods particularly in settings where young people socialize. A number of initiatives are currently in place which may fill these gaps, but their effectiveness does not appear to have been reported yet. It is therefore crucial for any such schemes to be thoroughly evaluated and disseminated, at which point an updated systematic review would be timely.

This review is also constrained by the fact that its conclusions can only be supported by a relatively small proportion of the extant literature. Only seven of the 22 outcome evaluations identified were

considered to be methodologically sound. As illustrated in Table III, a number of the remaining 15 interventions appear to modify barriers/build on facilitators but their results can only be judged unclear until more rigorous evaluation of these 'promising' interventions has been reported.

Finally, it is important to acknowledge that the majority of the outcome evaluations were conducted in the United States, and by virtue of the inclusion criteria, all the young people's views studies were UK based. The literature therefore might not be generalizable to other countries, where sociocultural values and socioeconomic circumstances may be quite different. Further evidence synthesis is needed on barriers to, and facilitators of, healthy eating and nutrition worldwide, particularly in developing countries.

Conclusion

The aim of this study was to survey what is known about the barriers to, and facilitators of, healthy eating among young people with a view to drawing out the implications for policy and practice. The review has mapped and quality screened the extant research in this area, and brought together the findings from evaluations of interventions aiming to promote healthy eating and studies which have elicited young people's views.

There has been much research activity in this area, yet it is disappointing that so few evaluation studies were methodologically strong enough to enable us to draw conclusions about effectiveness. There is some evidence to suggest that multicomponent school-based interventions can be effective, although effects tended to vary according to age and gender. Tailoring intervention messages accordingly is a promising approach which should therefore be evaluated. A key theme was the value young people place on choice and autonomy in relation to food. Increasing the provision and range of healthy, affordable snacks and meals in schools and social spaces will enable them to exercise their choice of healthier, tasty options.

We have identified that several barriers to, and facilitators of, healthy eating in young people have received little attention in evaluation research. Further work is needed to develop and evaluate interventions which modify or remove these barriers, and build on these facilitators. Further qualitative studies are also needed so that we can continue to listen to the views of young people. This is crucial if we are to develop and test meaningful, appropriate and effective health promotion strategies.

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