

# Successful ways to modify food choice: lessons from the literature

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## Summary

Effecting positive dietary change is one of the major health challenges facing the government and health professionals and is likely to be influenced by an understanding of the factors that shape food choice. On behalf of the Food Standards Agency, the British Nutrition Foundation recently completed an in-depth, critical review of the factors that influence food choice, attempting to identify effective mechanisms and highlight existing gaps in the evidence base. This article provides a summary of the findings and recommendations of that review.

**Keywords:** behavioural change, critical review, fat, food choice, psychosocial

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## Introduction

In February 2003, the Food Standards Agency (FSA) commissioned the British Nutrition Foundation (BNF) to conduct a critical review (although not a systematic review) of the psychosocial basis of food choice, paying particular attention to the identification of factors that influence positive food choices, examples of positive interventions and gaps in the evidence base (Buttriss *et al.* 2004). This project (Project number: NO 9017) is part of the FSA's *Food Acceptability and Choice Programme* (N09) and comprises two strands, the first being an overview of the major psychosocial factors that affect food choice. The information collated for this part of the review (strand 1) is presented as (1) influences on food choice (*e.g.* beliefs and attitudes, availability and access, education and knowledge); (2) mechanisms by which choice may be influenced (*e.g.* labelling, presentation and packaging, media communications); and (3) other variables (*e.g.* culture and ethnicity, biological and physiological signals).

The second and major part of the project was a critical appraisal of published intervention studies, in which particular attention was paid to study design, robustness of baseline data, robustness of data collection methods (particularly those relating to diet and dietary change), and evaluation techniques. A detailed summary of each of the intervention studies identified is presented in the Report to the FSA by setting, for example, supermarkets, catering settings, primary care, schools and colleges, the workplace, community, and in some cases by approach, such as peer-led interventions and those employing computer-based interventions (Buttriss *et al.* 2004).

## Aims and objectives

The main objectives of the project were:

- to use an in-depth and structured approach (although not a formal systematic review) to produce a critical review of the literature on the psychosocial basis of food choice, identifying factors that influence positive food choices, examples of positive interventions and gaps in the evidence base;
- to establish and utilise the expertise of an advisory group of experts to guide the project and to help formulate recommendations;

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- to disseminate the findings in user-friendly and relevant formats to key stakeholders.

Given that the remit of the FSA includes the aim to help people eat more healthily, priority has been given to (1) the identification of aspects of interventions that might be of relevance to helping populations in the UK to improve their dietary habits and (2) the identification of research opportunities for the Agency's consideration. To inform these aims, a general overview of the literature was performed, followed by an in-depth scrutiny of published intervention studies.

In recognition of the government's emphasis on tackling health inequalities, we have sought to identify rate-limiting steps with regard to dietary change for those groups considered the most vulnerable or the most in need of change, recognising that even amongst deprived groups, there is heterogeneity in the extent to which dietary change has been made or is perceived to be feasible.

To limit the scope and focus of the review, it was agreed with the FSA that the report would not be a systematic review. It would exclude specialist areas such as slimming and sensory analysis, and focus on the general free-living population (excluding those with special dietary needs and underlying medical conditions). It focuses on the age range 5–65 years and is inclusive of ethnic minorities and low-income groups. It was agreed that interventions published before 1990 would be excluded.

In drawing together the findings of these two strands of the review, the primary aims were: (1) identifying the best designed studies, the most successful studies and those with the strongest effects in each setting; (2) commenting on rate limiting steps with reference to priority groups for action (*e.g.* young adults, low-income families); and (3) highlighting gaps in the evidence base and recommendations for future action and research. Consideration is also given to the extent to which the findings of different studies can be directly compared (*e.g.* different definitions of fruit and vegetables have been used). The report ends with a series of recommendations, which have been developed with the remit of the FSA in mind, in particular the aim to help people to eat more healthily, and which take account of current public health priorities, the findings of the recent National Diet & Nutrition Survey (NDNS) of adults and existing programmes of work in the UK. These are summarised at the end of this short article.

## Methodology

A literature search was conducted by using keywords selected with guidance from an advisory

group. A total of 10 databases were searched for relevant studies published in the English language. Emphasis was given to papers published since 1990. Hand searching of key journals was carried out and relevant books identified and key investigators in the field were contacted. Intervention studies were only included in the critical review (strand 2) if they met the inclusion criteria list referred to above and were published since 1990. Each study identified for strand 2 was critically appraised using a standard set of criteria.

The main criteria used to review the studies were:

- details of reference;
- primary and secondary hypotheses;
- setting;
- subject characteristics (age, number, etc.);
- design;
- if the study was a randomised controlled trial (RCT):
  - Was the assignment of subjects random?
  - Was there a placebo group? If so, give details.
  - Were groups similar at baseline? If not, was this considered in the results?
  - Were subjects and researchers blind to intervention?
  - Was follow-up complete?
- details of the main intervention (duration, etc.);
- measures of exposure/outcome (*e.g.* evidence of validation);
- main results (including size of effect, how likely any finding was due to chance);
- any other limitations of the study (*e.g.* confounding factors);
- major conclusions of the study;
- generalisability of findings to other groups/settings.

## Definition of food choice

A number of different interpretations of the phrase 'food choice' exist, but the definition used in the report is that provided by the FSA: 'the selection of foods for consumption, which results from the competing, reinforcing and interacting influences of a variety of factors. These range from the sensory, physiological and psychological responses of individual consumers to the interactions between social, environmental and economic influences, and include the variety of foods and the activities of the food industry to promote them'. As the contractors are nutrition scientists, with experience in public health and dietetics, this definition has inevitably been interpreted largely from a nutrition perspective.

## Limitations of the published interventions

Eating behaviour is evidently very difficult to alter because so many, often interrelated, factors influence food habits. A number of models of behaviour change have been developed, but they have been employed in relatively few of the interventions. The most commonly used is the Stages of Change model (Prochaska *et al.* 1992), which was originally designed for use in smoking and drug cessation programmes and has been adopted for use in nutrition interventions.

There is a general lack of well-designed randomised controlled trials (RCTs) in most of the settings considered, although it is recognised that RCTs are not feasible in all situations. There is also a lack of validated, objective outcome measures for many types of intervention. Often inadequate combinations of outcomes, mostly subjective, have been used. The importance of choosing robust and appropriate tools for accurately assessing changes in food intake, knowledge and attitudes (at baseline and subsequently) has often not been recognised. Published studies frequently lack practical details about the dietary messages used and how they were defined, making it difficult to judge how well designed and appropriate these were. Many of the studies reviewed have been fairly small or in specific target groups or highly selected groups, making it difficult to generalise or to extrapolate the findings to other groups or settings. Most studies have been of short duration, which may limit the size of the effect, and most of the research has been carried out in the US and Canada, and may not be directly transferable to the UK, for example some of the studies in worksites and with low-income groups participating in the Women, Infant and Children (WIC) programme in the US. Most of the larger multi-component interventions in children were US-based (*e.g.* the CATCH studies – Dwyer *et al.* 1996; Edmundson *et al.* 1996; Luepker *et al.* 1996; Osganian *et al.* 1996; Nader *et al.* 1999; Hoelscher *et al.* 2003; Lytle *et al.* 2003; Osganian *et al.* 2003). Not all of the studies have included follow-up, and relatively few have considered sustainability or cost-effectiveness.

Some of the larger school and community studies have incorporated a range of approaches, for example smoking cessation, physical activity, as well as dietary change. It has proved difficult to disentangle the various effects, and future work needs to ensure that, where multicomponent trials are conducted, outcomes for individual components of the intervention are reported in more detail.

Low socio-economic status and ethnic minority groups are frequently under-represented, especially in

community trials, and drop out rates are often higher; different strategies may be needed to target these groups.

Most of the published studies focused on fruit and vegetables, especially the larger more robust studies. Few looked at fat reduction and even fewer at fatty acid profile or salt intake [although one Australian study (Chapman *et al.* 1990) adopted a novel approach to dietary salt management that is worthy of consideration in other settings].

The challenge is to interest people in food behaviour modification, given that, although people tend to be motivated by ill health (*e.g.* a heart attack or being diagnosed as hypertensive/hypercholesterolaemic, etc.), they seem less interested in health promotion unless there is a cosmetic reason for the behaviour change, for example desire to lose weight. This does mean, however, that screening in settings such as the workplace and supermarkets can have a role in overcoming optimistic bias and motivating people to participate in health promotion programmes.

## What works?

A 'one size fits all' approach does not seem to be particularly effective; tailored approaches have been more successful, and different approaches seem to suit different population groups and different aspects of diet, for example fruit intake vs. fat consumption. Covert approaches (*e.g.* a gradual unannounced stepwise reduction in the salt or fat content of a product or dish) or interventions in primary care may be more effective at tackling the more complex issues (*e.g.* fat and salt reduction).

Novel approaches such as computer-delivered (Internet and multimedia) information have been successful in other countries and may be a way of reaching children and young adults in the UK, whereas supermarket-based interventions may be more effective at reaching women than men; restaurant-based interventions are more likely to reach higher income groups who eat out frequently; and peer-led interventions may be successful for school children or for disadvantaged or 'hard-to-reach' groups. Hands-on activities for children provide a sense of ownership and hands-on practical interventions such as cook and eat classes (Demas 1998; Kennedy *et al.* 1999; Weaver *et al.* 1999; Anderson *et al.* 2003; Edmunds & Jones 2003) have been shown to appeal to low-income groups. Tailoring interventions for different cultural settings is a key consideration. Message reinforcement is important for sustainability.

Efforts to change behaviour benefit from a supportive environment, for example as is provided by peer support or in primary care. Successful interventions have generally combined nutrition education with supportive changes in canteens, tuck shops and/or vending machines, and promoted ownership and participation. Although most of the primary care interventions identified were not multicomponent (*i.e.* they focused on nutrition education alone), some of these studies did show beneficial dietary changes.

The mass media has been used to promote campaigns and has been effective in raising campaign message awareness amongst community members, for example, the UK *folic acid campaign* and Sweden's *Green Keyhole Programme*, but this approach has not cascaded into any substantial effect on behaviour change. Publicity campaigns must be supported by other activities, such as environmental changes and/or tailored advice, that provide practical solutions to facilitate positive changes.

Co-operative approaches and the use of coalitions, as in the *Black Churches United for Better Health* campaign in the US (Campbell *et al.* 1999b), have shown that involving the whole community in planning and delivering an intervention is a key element. The success of co-operative approaches relies on developing good partnerships (including health professionals, local food suppliers and producers, public and private sector organisations) and motivated groups of people within the community to make effective and sustainable changes.

Many of the interventions in supermarkets and restaurants have been hampered by competing promotions and campaigns, and lack of awareness or motivation to engage. Whilst customers say they want comprehensive nutrition information, it does not seem to be a major influence on choice of purchases in restaurants and supermarkets. In such circumstances, interventions probably need to be undemanding and to fit in easily with current lifestyles (*e.g.* audio broadcasts appear to be more effective than printed nutrition information in stores). Providing information at point-of-purchase (*e.g.* shelf labelling, food labelling) is useful but probably only going to benefit those motivated to change.

Familiarisation is important – particularly for children. Studies suggest that positive behaviour changes can be promoted if children are exposed to 'healthier' foods through teaching and through peer modelling, via the school cafeteria and in vending machines. Generally, interventions that are interactive are more successful, for example store tours vs. traditional printed material, cooking skills classes, and interactive activities for chil-

dren (*e.g.* hands-on preparation of food, tasting, tuck shops run by older children, compost heaps, growing foods).

The findings from interventions in commonly used settings are reviewed in the Report submitted to the FSA, but there are others that may need to be explored in future studies, for example sports centres, pubs (to target young men); text messaging (for teenagers and young adults); magazines to target young adults/particularly young women; high street stores (to target teenage girls/young women); and beauty salons, nail bars, hairdressers and pharmacies (to target women). For each of these, appropriate training of those delivering the intervention would be a key prerequisite.

### Point-of-purchase interventions in a supermarket setting

Supermarkets are able to influence purchasing habits at the point where decisions are most commonly made. A recent FSA survey in the UK showed that 95% of those interviewed buy most of their food shopping from supermarkets (TNS 2004). Several trials have attempted to assess the effectiveness of multicomponent or single interventions in a supermarket setting. Most have been modestly successful in raising awareness of their programmes and some have demonstrated improvements in nutrition knowledge and attitudes amongst shoppers, but there is little evidence, particularly from UK studies, of any real behaviour change. Elsewhere, the most successful interventions have tended to be those using computerised interventions and brief audio messages. For example, a randomised controlled trial (Anderson *et al.* 2001) showed an increase in fruit and vegetable intake of 0.5 servings/1000 kcals, using computer-tailored nutrition information provided in-store.

Screening in supermarkets is feasible and may motivate customers identified to be 'at risk' to change their dietary habits. Shop tours have also been shown to be a useful strategy to provide practical advice for 'high risk' groups such as those with diabetes or heart disease (Church & Drake 1999). Fewer attempts have been made to evaluate their success at changing dietary habits amongst the general population but a limited number of studies suggest that they can have a positive impact on improving knowledge/skills, food preparation methods, attitudes, self-efficacy and self-reported purchasing behaviour. If adapted to the target group, they may be effective amongst low-income consumers, although a peer-led, rather than health professional-led, approach may be necessary (Sadler *et al.* 2003).

Changing price is likely to influence purchasing habits, and in recognition of this, several UK supermarkets have introduced 'value line' or 'economy line' foods to improve their attractiveness to low-income consumers. However, the image of cheaper products remains important as supermarket polls show that some shoppers are embarrassed about buying budget brands and try to hide them at the bottom of their supermarket trolleys.

### Environmental interventions in catering settings

As the proportion of food eaten away from home is increasing, cafeterias and restaurants are becoming attractive settings for interventions to encourage healthier food choices.

Increasing the availability of healthier choices and making covert changes to dishes to improve their nutritional value has been shown to improve dietary behaviour. For example, The *Lunchpower! Project* in Minnesota (Snyder *et al.* 1992) offered elementary students tasty food choices that were lower in energy, fat and sodium and included additional interactive activities (*e.g.* parent tips, skill-building games). This intervention reduced the average fat content of school lunches by 39% and the energy content by 13% but unfortunately did not monitor the impact on children's food choices. Similarly, Lassen and colleagues in Denmark showed an increase in fruit and vegetable consumption at lunchtime in five worksite canteens when these foods were made more easily available and appealing (Lassen *et al.* 2004).

There have been a number of attempts to encourage healthy eating by promoting 'healthier' menu items in cafeterias and restaurants through menu-labelling interventions but their success has been limited. In the UK, the effect of the *Heartbeat Award* has been evaluated in restaurants (Holdsworth *et al.* 1997) and the *Starstruck* scheme in a worksite cafeteria (Williams & Poulter 1991) but neither provided evidence of behaviour change. Two studies in UK universities also had little impact. Elsewhere, two studies adopting this approach have shown an increase in sales of labelled healthier dishes (Levin 1996; Eldridge *et al.* 1997).

Pricing strategies that make healthier food choices more attractive economically have generally been most effective and may be particularly successful with groups with less disposable income. For example, one study showed that a 50% price reduction on healthier snacks in vending machines in worksites and schools increased sales of these items by 93% (French *et al.* 2001). However, workplace and school cafeterias are likely to be more easily motivated to adopt such strategies com-

pared to commercial outlets because of financial concerns and there remains a need to consider the impact on revenue in most settings. One possible strategy proposed is to raise prices of popular higher fat/energy-dense foods to generate revenues that could then be used to subsidise price reductions on 'healthier' foods, whilst maintaining overall profits. This type of strategy has recently been pilot-tested in a single US high school with some success (Hannan *et al.* 2002), but further research is merited to examine the effects of simultaneous price increases and decreases on food revenues and sales volume in different settings. Despite calls for a 'fat tax', there is little research on the effect of increasing prices of less healthy items. Although the experience with cigarettes is often cited, it is difficult to translate this to foods where the intention is substitution rather than elimination.

### Interventions in a primary care setting

Benefits have been shown in some studies in this setting. The best effect for fruits and vegetables (an increase of 1.5 portions/day) was seen in a UK study of individuals who received behavioural counselling (Steptoe *et al.* 2003), although this study had a number of design limitations. Another study increased fibre intake by ~7 g a day in men and almost 6 g a day in women following a 3-month intervention where subjects were provided with dietary advice, but the size of effect was not sustained at one year follow-up (Baron *et al.* 1990). Studies in a primary care setting have been able to tackle several dietary factors simultaneously, for example dietary fat and fruit and vegetables (Delichatsios *et al.* 2001b; Stevens *et al.* 2002).

It is difficult to compare the effectiveness of various types of interventions as only two studies directly compared different methods. The study by Steptoe *et al.* found behavioural counselling to be more effective than nutrition counselling, with an average increase of 1.5 portions of fruit and vegetables/day (from a baseline intake of 3.60 portions/day) compared with 0.9 portions/day (from a baseline intake of 3.67 portions/day), respectively (Steptoe *et al.* 2003). The benefits of tailoring information (on fat) have also been demonstrated in a study in the US (Campbell *et al.* 1994). Total fat was decreased by 23% in those receiving tailored nutrition information, compared to a decrease of 9% in the non-tailored group and 3% in the control group.

As behavioural counselling appears to be an effective strategy in the healthcare setting, consideration should be given to incorporating this into the training of health professionals, including dietitians, practice nurses and

general practitioners (GPs). As primary care interventions are likely to be most useful in groups who have regular contact with their health care providers (*e.g.* pregnant women and the elderly), they may have limited impact on the most vulnerable groups who are less likely to be registered with a GP. Alternative ways of reaching these groups is required.

### Nutrition education interventions in a school, college or university setting

Schools are an attractive setting because they reach young people, also target parents and can influence the whole community (canteen staff, suppliers, etc.) in a low-cost manner and for prolonged periods of time. Integrating school-based interventions into the curriculum and the normal school day seems to be most effective. The success often depends on the enthusiasm and commitment of key individuals; it is critical that at least one key person is involved and enthusiastic in school settings. This is also true in other settings. Adoption of a 'whole school approach', which provides schools with a general framework for discussion and decision making, has been shown to be effective, and CD-ROMs and the Internet have been successful in tailoring interventions to suit pupils' needs in school settings. They also reduced teacher input and the demands on teacher time. Some studies included novelty aspects, for example, cartoon characters for young children, and it needs to be established whether these have the durability of approaches such as the 'whole school approach'.

UK studies in schools have been successful at increasing fruit and vegetable consumption, but less emphasis has been placed on reducing salt and fat intakes and/or increasing fibre intakes. Features of these studies have been the use of tuck shops (Moe *et al.* 2001; Sahota *et al.* 2001a,b; Anderson *et al.* 2003), which in one study increased fruit and vegetable intake by 0.6 portions per day; multimedia, such as The *Food Dudes* project (Horne *et al.* 1995; 1998; Lowe *et al.* 2003), which incorporated a video as part of the intervention package and resulted in increases in fruit and vegetable consumption of up to 0.6–0.75 servings/day; and a whole-school approach, in which fruit consumption increased by 0.36 servings/day, and vegetable consumption increased by 0.1–0.3 servings/day (Sahota *et al.* 2001a,b; Edmunds & Jones 2003). Novel methods such as theatre have also been of benefit (+ 0.5 servings/day) (Pearson *et al.* 2003).

Taking the evidence base as a whole, on average fruit consumption has been increased by approximately 0.3 portions/day and vegetable consumption by approxi-

mately 0.2 portions/day. The most successful studies were tailored interventions (*e.g.* Baranowski *et al.* 2003b), in which intakes of fruit and vegetables increased by 1.2 portions/day. Use of multimedia and/or the Internet (Baranowski *et al.* 2003a) increased intakes by 1.0 portions/day, and interventions involving peers (*e.g.* Birnbaum *et al.* 2002) increased fruit and vegetables by 0.5 portions/day. Whole-school policies have increased consumption of fruit and vegetables by 0.46 portions/day (Edmunds & Jones 2003). Interventions that involved a 'hands-on' approach have also been effective (0.5–1.0 portions/day) (Demas 1998; Anderson *et al.* 2003; Baranowski *et al.* 2003a,b; Edmunds & Jones 2003).

Interventions in schools, colleges and universities were less successful at increasing intakes of fibre and decreasing sodium intake (Arbeit *et al.* 1992; Snyder *et al.* 1992; Donnelly *et al.* 1996; Luepker *et al.* 1996; Osganian *et al.* 1996; Gortmaker *et al.* 1999; Fries *et al.* 2000; Schnoll & Zimmerman 2001). The findings of studies with children/young adults re-emphasise the difficulty in converting changing attitudes and knowledge (which was generally evident) to changes in behaviours.

### Interventions carried out in a workplace setting

Worksites seem attractive settings for health interventions, as there is easy access to large numbers, a wide target group can be reached and a supportive environment can be provided, as can peer support. There is also the opportunity to screen employees for those at greatest risk; the presence of risk factors can help to motivate individuals to make healthier choices. However, as yet there have been no large studies demonstrating substantial dietary changes in worksite interventions in the UK. Elsewhere, studies showing benefits from nutrition education activities in this setting have found fruit and vegetable intake to rise by 0.4–0.8 servings/day using computer-tailored nutrition education (*e.g.* Campbell *et al.* 2002) or a peer-led approach (Buller *et al.* 1999). There is also good evidence from a few studies that improving availability (Lassen *et al.* 2004) and/or reducing the price of healthier items in worksite cafeterias and vending machines can encourage increased sales of fruit and vegetables and low-fat snacks (Jeffery *et al.* 1994; French *et al.* 1997; 2001). However, the impact in workplaces of large multicomponent trials (RCTs), conducted predominantly in the US, has generally been disappointing (any improvement seen was typically less than 0.2 servings of fruit and vegetables/day). The *Working Well Trial* demonstrated that longer, interactive intervention efforts (*e.g.* contests, nutrition educa-

tion classes) were more effective in increasing fruit and vegetable intake than one-off activities or more passive efforts (e.g. printed materials) (Patterson *et al.* 1997). Interactive activities also encouraged the greatest participation amongst employees in the intervention.

Very little research appears to have been carried out to investigate the effectiveness of peer-led nutrition education interventions in the workplace, although the one peer-led study found the approach to be effective in increasing fruit and vegetable intake amongst lower socio-economic, multicultural adult employees in the US (Buller *et al.* 1999). Probably the most successful intervention was one which focused beyond the worksite to include the family (Sorensen *et al.* 1999); this increased fruit and vegetable intake by 19% (+ 0.5 servings/day).

### Community-based studies

Community-based interventions have varied from single-nutrient or single-food interventions in a small targeted community (e.g. Reger *et al.* 1999) to multifaceted major national programmes such as *5 a Day for Better Health* (Potter *et al.* 2000). Very few community-based food choice interventions have, however, been carried out in the UK, particularly amongst vulnerable groups, and only one has used a randomised design (Anderson *et al.* 1998; Cox *et al.* 1998; Anderson & Cox 2000). Elsewhere, several community-based studies using a tailored approach have been effective in reducing fat intakes (Gorbach *et al.* 1990; Coates *et al.* 1999), but most have focused on fruit and vegetable intake. Those that were most effective included either individual counselling and/or practical suggestions for including more fruit and vegetables in the diet. For example, the *Take 5* project was an 8-week programme, in two UK communities, based on educational and behavioural strategies (Anderson *et al.* 1998; Cox *et al.* 1998; Anderson & Cox 2000), which increased fruit and vegetable intake from 324 g/day to 557 g/day). Use of motivational and educational messages or motivational interviewing has also been effective (Campbell *et al.* 1999b; Marcus *et al.* 2001; Resnicow & Jackson 2001).

Interventions in community settings that have combined individually tailored components with community-wide activities have frequently shown some additional effect of including the personalised element; however, it needs to be established whether the additional input required is economically worthwhile if the extra effect is only small.

Multicomponent strategies have generally highlighted the need for sustainability to be built into an intervention (e.g. Greiser 1993; Weinehall *et al.* 1999;

Scheuermann *et al.* 2000). Most studies targeted multiple dietary changes, and only three interventions targeted specific foods other than fruit and vegetables (Chapman *et al.* 1990; Tian *et al.* 1995; Reger *et al.* 1999).

### Peer-led interventions

At the heart of peer-led programmes, which have been popular in the US, is the assumption that engaging people through their own social networks increases adoption of behaviour change. Most studies utilising this approach have attempted to change more than one dietary behaviour and most have focused on adults. Typically, modest effects were achieved for fruit and vegetables (e.g. Buller *et al.* 1999; Haire-Joshu *et al.* 2003), and one study reduced fat intake by about 5% of energy and increased fibre intake by 4–6 g/day (Cox *et al.* 1995; 1996). However, there is little information available about the sustainability of the effects of this approach. Peer-led interventions have been effective in some settings, but quality control, context, cost of training, retention and sustainability all need more consideration. Future work could investigate the use of peer-led interventions to reach young people.

### Computerised individually tailored nutrition education

Computer-based interventions are appealing as they can be used to provide information tailored to people's needs and stage of change, and appear to be an attractive delivery method for many groups (e.g. children, young people, adult men). These have been used in a number of settings, including schools, primary care and worksites, outside the UK.

This novel approach has been investigated primarily in North America and The Netherlands. The best study in a supermarket setting (Anderson *et al.* 2001) increased fruit and vegetables intake by around half a serving per 1000 kcals. Similar studies in a community setting typically showed small improvements in fat, fruit and vegetable intake, the best effect being in a church-based study in the US (Campbell *et al.* 1999a,b). The greatest effect in a worksite setting increased fruit and vegetable intake by 0.7 servings/day amongst female blue collar employees in North Carolina in the US using computer tailored magazines (Campbell *et al.* 2002). Some interventions of this type in a primary care setting have achieved an increase in fruit and vegetables intake of more than 1 serving a day (Delichatsios *et al.* 2001a; Stevens *et al.* 2002), suggesting that this type of approach may be particularly effective in this setting.

## Interventions targeting couples, families and pregnant women

There is little evaluated work in this area; however, a US study amongst pregnant teenagers (a recognised at-risk group) demonstrated that targeted and practical nutrition activities (in addition to the usual WIC programme received by the control group) resulted in a lower prevalence of low birth weight (6.6% vs. 12.3%) (Long *et al.* 2002). A peer-led intervention (Fitzgibbon *et al.* 1996) in young mothers increased fruit, vegetables and fibre, and decreased fat intake.

## Recommendations

A full list of recommendations, arising from the various components of the review, is available in the Report submitted to the FSA (Buttriss *et al.* 2004). But to help prioritise opportunities for future FSA action or research arising from the BNF's review of the gaps in the evidence base, 15 primary recommendations have been made, taking into consideration the following aspects:

- those which have the greatest potential for making a difference, taking into account 'quick wins' vs. longer term objectives;
- the range of activities currently underway and tools/resources available, for example schools-orientated projects (*e.g.* lunch boxes, vending, etc.), School Fruit Scheme, *Balance of Good Health* model, *Eight Guidelines for a Healthy Diet*;
- the fit with findings of the NDNS series and other government surveys, which demonstrate a deterioration in the dietary patterns of young adults and the existence of widespread low intakes of some micronutrients in this age group;
- the fit with the conceptual framework provided by the provisional goals identified for the *Food and Health Action Plan*;
- the need to address health inequalities and to identify rate limiting steps.

The 15 primary recommendations are summarised below. Readers are referred to the full report for more details (Buttriss *et al.* 2004).

### General recommendations

#### *Recommendation 1*

Review the contemporary applicability of the *Balance of Good Health* and the *Eight Guidelines for a Healthy Diet*, and consider the opportunities for relaunching the

food guide in combination with information on interpretation of nutrition labelling.

#### *Recommendation 2*

Consider using the recent NDNS database to develop food-based dietary guidelines targeted at reduction of dietary fat (particularly saturates) and salt, and at those dietary patterns associated with bodyweight gain in overweight people.

#### *Recommendation 3*

Using experience gained from the studies that have successfully increased fruit intake, investigate the extent to which successful approaches can be extrapolated to changing more complex behaviours such as fat or salt intake, perhaps making use of more novel approaches, for example peer modelling, computer and Internet delivery, and comparing covert vs. information provision approaches.

#### *Recommendation 4*

Use the findings of the Review to develop a user-friendly and practical manual or tool kit to help people planning future healthy eating interventions.

### Recommendations for different settings

#### *Recommendation 5*

Whilst the results of important ongoing research in schools are collated, we recommend that schools adopt a 'whole school approach' to nutrition, with a view to implementing the findings of the new research in due course.

#### *Recommendation 6*

(1) Consider targeting workplace (and other) canteens for intervention. (2) Encourage inclusion of practical nutrition in the syllabus for all catering students and in refresher courses for catering staff, and promote *Catering for Health* more widely (Food Standards Agency and Department of Health 2001).

#### *Recommendation 7*

Consider investigating the effect of comprehensive approaches to improving food choice in the workplace, in the UK.

### Recommendation 8

Continue to work with manufacturers and retailers to improve the nutrient profile of foods and drinks and to identify viable and sustainable mechanisms that promote healthier choices.

### Recommendation 9

More work is needed regarding the impact of price on food selection, and the interaction of price with other variables, such as provision of nutrition information.

### Recommendation 10

Consider funding a study to compare the effectiveness, both in terms of accuracy/impact of message delivery and of cost, of different health professionals (*e.g.* GPs, practice nurses, dietitians, pharmacists) delivering a targeted intervention. Also, evaluate the most effective skill mix and the training needs of the different professional groups. The latter could be fed back into undergraduate and continued professional training.

## Recommendations for vulnerable groups and target nutrients

### Recommendation 11

Identify and evaluate novel methods of reaching young men and women, recognising that separate approaches may be warranted. Linked with this, investigate the potential of computer-tailored and web-based approaches.

### Recommendation 12

Investigate the extent to which food packaging featuring 'significant others' (*e.g.* cartoon characters and role models) can be used to encourage healthy eating in children, incorporating the concept of media literacy.

### Recommendation 13

Investigate culturally sensitive and income-sensitive interventions that might be applicable in the UK, targeting aspects of nutrition identified as problematic in the ongoing Low Income Diet and Nutrition Survey.

### Recommendation 14

By using a randomised controlled trial design, explore the possibility of utilising appropriately developed

self-monitoring tools to manage salt reduction in the UK.

### Recommendation 15

Identify life stages or events when individuals may be more amenable to dietary change (*e.g.* pregnancy, individuals identified by health care professionals as 'at-risk'), and develop strategies to target these subgroups.

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