Authors' objectives
To examine the effectiveness of community interventions to increase fruit and vegetable consumption in people aged 4 years and older.

Searching

Study selection
Study designs of evaluations included in the review
Prospective studies with a comparison group were eligible for inclusion. Randomised controlled trials (RCT), controlled trials (CCTs) and cohort analytic studies were included. Studies that were rated as 'weak' for the validity assessment were excluded.

Specific interventions included in the review
Studies that examined an intervention intended to alter fruit and vegetable consumption were eligible for inclusion in the review. Four studies were targeted at parents of young children, six at school-aged children, and five at adults, with two of the latter about worksite interventions. A professional nutritionist conducted most of the interventions.

Interventions with parents of young children: all of the included studies examined educational programmes. The specific programmes were: instruction using lectures, written materials and demonstrations on the topics of nutrition facts, selecting and buying food, cooking and preserving food and food safety (1 study); an educational programme delivered by a paraprofessional covering cooking methods, food choices, decreasing fatty foods, increasing fruit and vegetable consumption, and lifestyle factors (1 study); nutrition letters and workshops covering nutrition and pre-school children, feeding pre-school children, meal planning and preparation, and food shopping skills (1 study); group nutrition sessions using printed materials and reminders (1 study).

Interventions with school children: lessons and provision of 'hands on experience' in the cafeteria aimed at increasing knowledge as part of the school curriculum (6 studies), either with or without brochures being sent to parents.

Interventions with adults (non-worksite): mailed nutrition information (1 study); group education sessions (1 study); development of groups for 'Heart health' (1 study). Interventions with adults (worksite): health promotion campaign involving education, posters and information (2 studies).

Participants included in the review
Studies that included participants over 4 years of age were eligible for inclusion. The participants included in the review were: low-income mothers (n=4,106), grade 4 to 9 school children and Girl Scout troops (number not reported), adult patients at family practice offices (n=394), women at risk of breast cancer (n=303), adult workers (n=29,762) and unspecified (1 study).
Outcomes assessed in the review
Studies that provided information on the process or outcome evaluation were eligible for inclusion in the review. The specific outcome measures assessed were the consumption of fruit and vegetables, attitude change towards eating nutritious foods and vegetables, and knowledge about healthy eating.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed the retrieved articles for inclusion in the review. The reviewers did not state how any disagreements were resolved.

Assessment of study quality
The validity of the articles was assessed according to the following criteria: selection bias, study design, confounders, blinding, data collection methods, and the handling of withdrawals and drop-outs. Each criterion was rated as strong, moderate or weak, then a global rating (strong, moderate or weak) of the paper was also achieved. A study was rated as ‘strong’ if four of the six individual ratings were strong with no weak ratings; ‘moderate’ if it achieved less than four strong ratings and only one weak; and ‘weak’ if two or more criteria received weak ratings. Two reviewers independently assessed the validity of the primary studies. The reviewers did not state how any disagreements were resolved.

Data extraction
Two reviewers independently extracted the data. The reviewers did not state how any disagreements were resolved. Data on study author, year and geographical location, design and quality, participants, intervention, outcomes and results were extracted and tabulated.

Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken with the studies being grouped by intervention.

How were differences between studies investigated?
Differences between the studies were discussed by recourse to the type of intervention, the length of the programme and whether or not it was a multi- or uni-component intervention.

Results of the review
Fifteen studies (total n from 12 studies = 36,926) were included: 1 RCT (n=150), 12 CCTs (n=36,671, n not reported for 2 studies) and 2 cohort analytic studies (n=171, n not reported for 1 study).

All of the studies were rated moderate or strong in terms of quality.

Interventions with parents of young children (4 studies). Two of the 4 studies were independent evaluations of the Expanded Food and Nutrition Education Program (EFNEP). The results of the first study indicated that the intervention group experienced a significant increase in their fruit and vegetable consumption at the end of the 6-month programme, from 2.6 to 3.7 servings/day (P<0.001), with no significant change in the control group. A statistical comparison of the post-test intervention with the post-test control was not given. The results of the second study (RCT) showed that, at the end of the 6 months, the experimental group had a statistically-significant increase over the usual EFNEP intervention in their daily intake of fruits (from 1.5 to 2.6 servings/day, P<0.002) and vegetables (from 0.9 to 1.6 servings/day, P<0.05). A further multicentre cohort analytic study was conducted on mothers whose children were in a ‘Head Start’ programme. The results indicated that there were no significant differences in groups in total vegetable servings per day, nor in fruit intake for three of the five groups studied. Two of the intervention groups had an increase in fruit consumption, from 1.9 to 2.7 servings/day (P<0.05); they also experienced a significant increase in vitamin C-rich fruits (from 0.3 to 0.67 servings/day, P<0.05) and dark green vegetables (from 0.27 to 0.58 servings/day, P<0.05). The last controlled study assessed a special supplemental nutrition programme for women, infants and children. Both groups increased their fruit and vegetable intake, but the intervention group experienced a statistically-significant greater
increase in intake than the control group (P=0.002).

Interventions with school children (6 studies).

One study showed that there was a significant increase in consumption of broccoli, carrots, spinach salad (all at P<0.05) and green beans (P<0.01). The programme significantly improved the knowledge of students in kindergarten to grade 5, but not of those in grade 6. There was also a significant improvement in attitude towards eating nutritious foods and vegetables, but not towards eating new foods. A second study, which assessed a curriculum taught over grades 3, 4 and 5 on the experience of eating a variety of foods, indicated that there were no overall significant differences in the groups on food intake or attitude scores at post-test. The results of a study using a 5-A-Day Power Plus intervention showed no significant differences between the groups in total fruit and vegetable intake in 24-hour recall, but fruit consumption increased on 24-hour recall and as observed at lunch (p<0.001 in each measure). A further trial, which used a multi-component intervention, showed that at post-test time, 24-hour recalls revealed no differences in total servings of fruits, vegetables or fruits and vegetables combined. An analysis of variance also showed no differences by site, gender or ethnicity. Another trial that used a behaviour modification strategy indicated that at the 1-week follow-up after the end of the intervention, the intervention group had significantly increased their total daily servings of fruit and vegetables from 3.0 to 3.39, with no changes in the control group. However, this change was not maintained at the 3-month follow-up measurement. The results of the last school intervention that was based on the PRECEDE model showed that at post-test (1 year after completion of the 3-year programme), the intervention group had a significant increase in fruit and vegetable servings/day from 2.63 to 3.0 (P<0.05). They also showed an increase in knowledge scores (P<0.05). When the participants' stage of change were examined, fewer intervention students were in pre-contemplation and contemplation stages than the control group, and more were in preparation stage at post-test (all at P<0.05).

Interventions with adults - non-worksite (3 studies).

In one trial, in which the participants received either tailored or non-tailored information regarding dietary change, there were no differences between the groups observed at follow-up 4 months post-intervention. Both groups decreased their fruit and vegetable intake by 0.25 servings/day. The second randomised trial which was conducted on women who were at risk of breast cancer, aimed to reduce total calorie intake, increase complex carbohydrates, and ensure adequate intake of vitamins and minerals without supplements. The results showed at 12 and 24 months' follow-up, fruit and vegetable intake significantly increased (P<0.001) in the intervention group more than in the control, from a baseline of 15.9% of total kcal/day to 22% at 12 months and 23.1% at 24 months (P<0.001). The total energy intake decreased in the intervention group by 25% and they experienced a mean weight loss of 3.1 kg. The results of the final study, which assessed the effectiveness of having a Healthy Heart Coalition, showed that there was no change in the proportion of people who consumed at least five servings of fruits and vegetables per day, whether or not they were from a community that had an active coalition.

Interventions with adults - worksite (2 studies).

The results of the first trial indicated that the intake of fruits and vegetables increased from 2.6 to 2.8 servings/day in the intervention group, compared with 2.58 to 2.6 servings/day in the control group (P<0.001). Furthermore, movement through the stages of change was more likely in the intervention group, and dietary changes were associated with movement in stages of change. The results of the second trial showed that there was no post-test difference in the mean servings per month of fruit. However, the mean servings/month of vegetables decreased by 1.6 in the control group, and increased by 6.8 in the intervention group (P<0.02). The intervention group also a experienced significant mean reduction in the servings/week of margarine and butter.

Authors’ conclusions

There was support for the use of peer educators and paraprofessionals with low-income mothers, although a study of a direct comparison of two groups led by a professional nutritionist versus a paraprofessional has not been found. The most effective interventions gave clear messages about increasing fruit and vegetable consumption; incorporated multiple strategies that reinforced the messages; involved the family; were more intensive; were provided over a longer period of time, rather than one or two contacts; and were based on a theoretical framework.
People in public health positions who make decisions about nutrition interventions need to give priority to those interventions that are multi-pronged, flexible, open to input from target groups and theoretically based. Careful and cooperative, multisite evaluations should be conducted to guide future programmes.

CRD commentary
The authors addressed a clear review question in terms of the type of intervention, participants and outcome measures that were to be included in the review. The literature search was thorough, but was restricted to published studies; this means that relevant unpublished studies may have been missed. The review process, in terms of the inclusion of studies, the validity assessment and data extraction, was explicit and was undertaken systematically by more than one reviewer, although it was not stated how any discrepancies between the reviewers were handled. Appropriate steps were taken in all of these processes to minimise bias. Adequate details of the primary study characteristics were provided in the paper, allowing the reader to assess whether the authors’ results and conclusion are consistent with the evidence base reviewed. The narrative summary of the results was appropriate. Overall, this was a reasonably well-conducted review in which a number of steps were taken to minimise bias in the review process. The authors’ results and conclusions are consistent with the primary studies reviewed.

Implications of the review for practice and research
Practice: The authors stated that managers who make decisions about nutrition interventions need to consider the resource requirement of the more intensive intervention programmes. The use of paraprofessionals was effective in the EFNEP studies. Consideration should, therefore, be given to the use of paraprofessionals or peer educators who are trained and supervised by nutritionists to deliver education and skill-based programmes to low-income populations. Managers will also need to ensure that the intervention has been developed from a theoretical base, has a specific message about increasing fruit and vegetable consumption, and has a component about behaviour change.

Research: The authors stated that researchers need to work on the question of the clinical significance of differences in servings that are achievable from these types of intervention. Work also needs to address the cost and cost-benefit analysis of large-scale nutrition interventions. Little is known, as yet, about the total cost of large-scale, multi-component interventions, or the cost per participant.

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