Getting children to eat more fruit and vegetables: a systematic review
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CRD summary
This well-conducted review evaluated interventions to promote fruit and vegetable intake in children. The authors concluded that more research is needed and that evidence is strongest in favour of multi-component interventions. The conclusions should be regarded with some caution as it was difficult to evaluate whether the conclusions followed entirely from the available evidence or are the only possible conclusions.

Authors' objectives
To review published and unpublished studies on interventions to promote children's fruit and vegetable consumption.

Searching
The reviewers searched PubMed, CAB Abstracts, the Cochrane Library, Web of Knowledge, IBSS, PsycINFO (via BIDS), EMBASE, AGRICOLA, LILACS, ID21, ERIC, SIGLE and Ingenta from inception to April 2004 (see Other Publications of Related Interest). In addition, the authors stated that they searched explicitly for grey literature and contacted experts in the field.

Study selection
Study designs of evaluations included in the review
Studies with a control group and a follow-up of at least 3 months were eligible for inclusion. Studies where the effects of the fruit and vegetable interventions could not be separated from other intervention components were excluded. Most of the included studies were randomised controlled trials (RCTs). The follow-up periods in the included studies ranged from 3 months to 4 years.

Specific interventions included in the review
Studies reporting a fruit and vegetable intervention, or promotion programmes encouraging the consumption of fruit and/or vegetables, were eligible for inclusion. This encompassed large-scale fruit and vegetable promotions, nutrition education and information approaches, social marketing approaches and production increase approaches (e.g. home gardening). Individual or population-based interventions were eligible. The interventions in the included studies were classroom-based, school-wide, encompassed school food or nutrition policy, targeted the involvement of teachers, peer leaders, school food service staff, parents or the community (markets, local media), or a combination of these components. All but one intervention was school-based.

Participants included in the review
Studies on children and adolescents were eligible for inclusion. Excluded were studies on acutely ill or institutionalised individuals. The included studies targeted primary and secondary school aged children aged 5 to 18 years old and were mainly based in the USA.

Outcomes assessed in the review
The studies had to report fruit and vegetable intake to be eligible. The review reported results as effect sizes (servings per day) or as not significant.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Papers were assessed in detail, covering the following aspects: participant selection, study design, confounders, blinding, data collection method, withdrawals and drop-outs, intervention integrity and analyses.
Two reviewers independently assessed the quality of the studies. Any disagreements were resolved by discussion.

Data extraction
Two reviewers independently extracted the data. Any disagreements were resolved by discussion. The reviewers calculated effect sizes by measuring either the difference between groups in the change in intake of fruit and vegetable or the difference in intake between the groups at follow-up.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative review.

How were differences between studies investigated?
The review discussed results differentiated according to age group and intervention type and components.

Results of the review
Fifteen studies (n more than 7,912; exact number not stated) met the inclusion criteria. There were 11 RCTs (n more than 6,343) and 4 non-randomised controlled trials (n more than 1,569).

Ten of the 15 identified studies reported a significant effect with effect sizes ranging from 0.3 to 0.99 servings per day. None of the identified studies reported a negative effect on fruit and vegetable consumption caused by the intervention. While 9 out of 11 studies on primary school children showed positive effects, only 1 out of 4 identified secondary school interventions increased fruit and vegetable consumption statistically significantly. The proportion of studies reporting significant effects did not depend on the study design.

Authors' conclusions
More research on fruit and vegetable intervention studies is needed; evidence is strongest in favour of multi-component interventions.

CRD commentary
This was a review with a clear question and clear inclusion criteria. The search for relevant studies was thorough. Measures to reduce errors and bias in the data extraction and quality assessment were reported. This was not the case for the study selection process, although two reviewers were involved in the selection of full papers for the review on adult interventions (see Other Publications of Related Interest), so it might have taken place but was not reported. Only minimal information was reported for some included studies: e.g. the number of participants involved in the study was not stated or the results were summarised as 'no significant effect'.

There was little information on the statistical analyses in the primary studies, including whether the multiple levels (individual children, classes, schools) were addressed appropriately. This makes it difficult to evaluate whether the reported statistically significant effects were based on appropriate analyses or potentially overestimated treatment effects. It is also unclear whether the used outcome measure for the review (difference in fruit and vegetable servings per day) was indeed applicable to every study as the outcome measures appeared very varied.

Some caution should be applied regarding the conclusions: it is unclear whether more primary research or more appropriate analyses of the available evidence are needed; the conclusion about the complexity of the intervention was not easy to follow as the success of complex interventions, such as '5 a day power play', varied considerably within the studies.

Implications of the review for practice and research
Practice: The authors stated that an enabling environment for fruit and vegetable consumption by children should be
Research: The authors stated that further research is needed to examine, in more depth and for longer follow-up periods, the effectiveness and cost-effectiveness of interventions promoting fruit and vegetable consumption. Developing countries should be encouraged and supported to design, conduct and evaluate robust fruit and vegetable promotion interventions. New initiatives should include an effectiveness evaluation. Furthermore, more research is needed on what constitutes a meaningful change in intake and the effectiveness of specific components of interventions. The differential effects in different countries and barriers to effectiveness should also be investigated.

Funding
World Health Organization.

Bibliographic details
Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: a systematic review. Preventive Medicine 2006; 42(2): 85-95

PubMedID
16375956

DOI
10.1016/j.ypmed.2005.11.012

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Child; Child Nutritional Physiological Phenomena; Child, Preschool; Food Habits; Fruit; Global Health; Health Promotion /methods; Humans; Vegetables

AccessionNumber
12006001030

Date bibliographic record published
31/12/2006

Date abstract record published
31/12/2006

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