The Effectiveness of Community Interventions to Increase Fruit and Vegetable Consumption in People Four Years of Age and Older

Chronic Diseases and Injuries
Chronic Disease Prevention

March 1999
The Effectiveness of Community Interventions to Increase Fruit and Vegetable Consumption in People Four Years of Age and Older

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To determine the effectiveness of interventions included in the Mandatory Health Programs and Services Guidelines (MHP SG), the following systematic reviews were completed and funded by the Public Health Research, Education and Development (PHRED) Program of the Public Health Branch, Ontario Ministry of Health.

1998 - 1999

- Health Hazard Investigation
  - Emergency Response to Acute Environmental Hazards
  - Strategies to Enhance Public Awareness of Environmental Risks

- Chronic Diseases and Injuries
  - Chronic Disease Prevention
    - Community interventions to Enhance Fruit and Vegetable Consumption
    - Use of Coalitions in Heart Health, Tobacco Use Reduction and Injury Prevention
    - Community-Based Heart Health Programs
    - School-Based Adolescent Risk Behaviour Prevention Programs

- Family Health
  - Sexual Health
    - Adolescent Pregnancy Prevention Strategies
  - Child Health
    - Professionally Led Parenting Groups
    - Peer/Paraprofessional 1:1 Interventions in Improving Maternal/Child Health
    - Public Health Nurse Home Visiting
    - Curriculum Suicide Prevention Programs for Adolescents

- Infectious Diseases
  - Day Care Centre Infection Control Interventions
  - Adolescent STD Prevention Strategies

1999 – 2000

- Chronic Diseases and Injuries
  - Chronic Disease Prevention
    - Postpartum Smoking Relapse Prevention Strategies
    - Cervical Cancer Screening Interventions
  - Injury Prevention
    - Anticipatory Care Interventions with Community Dwelling Elderly

- Family Health
  - Sexual Health
    - Youth to Youth Peer Health Promotion
  - Child Health
    - Healthy Feeding in Infants Under One Year of Age
    - Injury Prevention in Children & Adolescents

- Infectious Diseases
  - Needle Exchange Programs
  - Online Computer Support Groups for Adults
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PREFACE

The Public Health Branch of the Ontario Ministry of Health released new Mandatory Health Programs and Services Guidelines (MHPSG) in December 1997. Although the MHPSG provide guidelines for a wide range of public health practices in Ontario, the strength of evidence for many of the guidelines has not been summarized in a systematic way.

In 1998-1999, the Public Health Branch provided funding for the Effective Public Health Practice Project. The mandate of the project was to complete 15 summary statements based upon systematic reviews of the effectiveness of specific requirements of the MHPSG. Each review was linked to one of the three general standards or three program standards. The reviews summarize the best available research evidence for public health practice in these areas. Research evidence is one piece of information needed to inform decision making in public health. Other factors, such as the local environment, local priorities, and available resources are also important.

The reviews were completed by review groups composed of members of the Ontario Public Health Research, Education and Development (PHRED) Program Health Units as well as representatives from other Health Units around the province. The PHRED Provincial Steering Committee has overseen the project.

Potential review topics were initially identified through a survey of public health practitioners and managers across Ontario. Each review group followed a systematic approach that included comprehensive search strategies and quality assessment of each primary research study selected for inclusion in the review.

One of the primary objectives in completing this work was to ensure that it is relevant to public health practitioners in the field. We contacted all Medical Officers of Health and asked for volunteer experts. The response was tremendous and more than 100 practitioners and managers from over 90% of health units across Ontario agreed to take on the role of peer reviewers for the draft reports.

This project already has had many benefits. Public Health professionals have developed skills in completing systematic reviews and have increased awareness of the importance and feasibility of evidence-based practice. Through this project, we have established new links with the Cochrane Collaboration. We hope that several reviews will be registered with the various Cochrane Review Groups, making them accessible to the international public health community. Finally, the process of completing this project has contributed to the development of a strong province-wide network of public health professionals.
Enhancing Fruit and Vegetable Consumption in People Four Years of Age and Older

Public Health Mandate

Public Health Units in Ontario are responsible for chronic disease prevention, following the *Chronic Disease and Injuries Program Standard*. They are required to implement multiple strategies to reduce the risk of heart disease, stroke, cancer, and many other chronic diseases. Public health nutrition strategies are directed to people age four years and older to increase awareness and knowledge, build skills, and improve the social and physical environment to support healthy eating in schools, workplaces, community agencies, restaurants, grocery stores, recreational facilities and the community at large.

Background

Chronic diseases are the leading causes of death and disability in Ontario. In 1995, heart disease and cancer were responsible for 66% of all deaths in Ontario, yet they are largely preventable. Diet exerts a positive effect on heart disease, stroke, and cancer. One estimate was that 35% of all cancer deaths are related to diet. The 1990 Ontario Health Survey revealed that Ontarians need to improve their diets. Many were eating too much fat, too little fibre, and not enough fruits and vegetables. A significant number were overweight. Poor diets and unhealthy weights place Ontarians at significant risk of chronic disease, and add substantial health care costs.

Issue

Making healthier food choices will prevent chronic disease and its costly treatment. Unfortunately, food choices are not simply a matter of personal choice. Economic and social forces, together with factors related to the physical environment influence food availability and an individual’s ability to make choices.

Over the past decade, public health nutrition programs have moved beyond education alone, to include
environmental support, and policy development initiatives. Recognizing the complexity of dietary change, the use of behaviour change theory in program planning and evaluation is growing. A number of articles have been published describing these interventions, but few articles evaluated their effectiveness. Given limited public health resources, there is a need to identify the most effective ways to have a positive influence on dietary behaviour.

Finding the Answers

A systematic review was conducted to identify community intervention programs that were effective in increasing fruit and vegetable consumption by school children, adolescents and adults. Primary prevention studies were chosen where the participants did not have a diagnosis of disease.

What's the Evidence?

One hundred ninety articles were retrieved, of which 60 were relevant, with 18 rated as ‘strong’ or ‘moderate’ methods and 42 as ‘weak’. These 18 higher quality reports of 15 studies were mostly controlled trials or cohort analytic studies. Four of the high quality studies were targeted to parents of young children, six to school-aged children, and five to adults.

The most effective interventions:

- Gave clear messages about increasing fruit and vegetable consumption;
- Incorporated behavioural theories and goals, providing a consistent framework for implementation and evaluation;
- Provided longer, more intensive interventions rather than one or two contacts;
- Actively involved influential people such as family members; and,
- had a greater impact on those whose knowledge or intake were lower at the beginning.

Implications for Practice and Research

There must be an investment in more rigorous evaluation of healthy eating interventions, using a variety of approaches, in a variety of populations and settings.

There must also be an investment in human resources to plan, implement, and evaluate public health nutrition interventions. Currently, there is a shortage of public health nutrition personnel to provide the long-term, intensive programs which this review finds effective.
More Sources of Information


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ABSTRACT

Objectives
Increasing dietary intake of fruits and vegetables has been proposed as an effective means of reducing morbidity and mortality related to cardiovascular disease and cancer. The systematic review sought to answer the question: what is the effectiveness of community interventions to increase fruit and vegetable consumption in people four years of age and older? Are there differences in outcome by target group, by preparation of the intervenor, or by site, intensity or theoretical basis of the intervention?

Methods
A search was conducted of the electronic databases from the first year of their existence to 1998. Key public health-related journals were hand-searched to the first issue of 1993 and key nutrition journals were hand-searched back to 1988. Relevant references were retrieved from bibliographies. Each article retrieved was rated for relevance and validity by two independent readers then data abstraction was done by two people for the studies that rated as strong or moderate. All tools used for the three phases had been pretested.

Results
One hundred and eighty-nine articles were retrieved. Sixty were rated as relevant. After validity rating, one was rated ‘strong’, 17 ‘moderate’ and 42 ‘weak’. Four studies were targeted to parents of young children, six to school-aged children, five to adults. The outcomes of the interventions varied by intensity and clarity of the messages more than by age of target group, or site of the intervention. There is support for use of peer educators and paraprofessionals with low-income mothers, although a study of 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.

Conclusions
People in public health positions of making 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 co-operative, multi-site evaluation should be done in order to guide future programs.
BACKGROUND

Introduction

Data from the Laboratory Centre for Disease Control, Health Canada, indicate that heart disease and cancer were responsible for 66% of all deaths in Ontario in 1995; 38% of these from all cardiovascular diseases and 28% from all cancers. Cancer incidence for Ontario (both sexes combined, all ages, all cancers) was 403/100,000 (Health Canada, 1995). While Doll & Peto (1981) once estimated that 35% of all cancer mortality in the United States was related to diet, it is likely that nutrition as a whole, and many other environmental factors affect cancer etiology. However, improving dietary intake of fruits and vegetables has been proposed as one way to reduce morbidity and mortality from heart disease and cancer.

Several essential nutrients such as Vitamin C and folate, and dietary factors such as fiber and flavonoids have been linked to prevention of various cancers and other chronic illnesses. Fruits and vegetables are the most important sources for these nutrients. The evidence for the relationship between fruit and vegetable intake with chronic disease is largely based on the epidemiological analysis of the relationship between morbidity and mortality to data on food consumption.

In a review of published studies searched from MEDLINE and EMBASE, Ness & Powles (1997) concluded that intake of fruits and vegetables exerts a strong protective effect for stroke and a weaker protective effect for coronary heart disease. They found that three of five ecological studies and six of eight cohort studies found a significant protective effect for stroke with consumption of fruits and vegetables or proxy nutrients. One case-control study was included in the review but no beneficial effect was found. For coronary heart disease, nine of ten ecological studies, two of three case-control studies and six of 16 cohort studies found a significant protective association (Ness).

In relation to cancer morbidity and mortality, intervention trials of supplements such as beta-carotene have not been effective (Mayne, 1996). Possible explanations for lack of effect include co-occurrence of other protective factors within populations that ingest higher levels of fruits and vegetables (Mayne) or that other micronutrients in fruits and vegetables, not found in supplements, are actually the protective agents. Therefore, groups such as the World Cancer Research Fund and the American Institute for Cancer Research continue to recommend that diet should be largely based on plant products with 400 grams of vegetables and fruits to provide more than 10% of energy consumed daily (Munoz de Chavez et al., 1998). In Canada, the national objectives for fruit and vegetable consumption have been set at five or more servings per day, and by 2010, the Ministry of Health hopes to have increased the proportion of the population following this recommendation to 75%. Actual intake from the Ontario Health Survey (1990) showed that 42% of participants age 12-19 consumed five or more servings of fruits and vegetables per day, down to 34% of people over age 65.

In Ontario, the Mandatory Health Programs and Services Guidelines (MHPKG), Ministry of Health, (1997) specify the responsibility of public health units in chronic disease prevention in the Chronic Diseases and Injuries Program Standard. They are required to implement multiple risk factor strategies to reduce the risk of heart disease, stroke, cancer and many other chronic diseases. Nutrition strategies, directed to those over four
years of age, are designed to increase awareness and knowledge, build skills and improve the social and physical environment to support healthy eating. Intervention sites include schools, workplaces, community agencies, restaurants, grocery stores, recreational facilities and the community at large.

Review Question
While there have been other reviews related to the effectiveness of nutrition interventions (Contento et al., 1995; Glanz, 1997), they have not specifically addressed fruit and vegetable intake as a target, or the range of interventions that occur in Public Health in Canada, and specifically in Ontario. These reviews are also in need of updating. Recognizing that the majority of people in Ontario consume less than the recommended number of fruits and vegetable servings, public health practitioners need to implement programs that will improve consumption. This review was not expecting to answer the etiology question about the relationship between fruit and vegetable intake to chronic illness, nor was it intended to look at outcomes of decreased morbidity and mortality as a result of fruit and vegetable consumption. The question for this review is:

What is the effectiveness of community interventions to increase fruit and vegetable consumption in people four years of age and older?

Within the question, the reviewers were interested in looking for differences in outcome by socioeconomic status or age of the target group, location of the intervention, intensity of the intervention, theoretical basis of the intervention, level of training, education or professional status of the intervenor.

METHODS

Search Strategy
The research team identified possible search terms, then two librarians consulted about the actual search strategy and one of them conducted the search. Search terms included the following: fruit, vegetables, community-based, nutrition, health promotion, evaluate, types of interventions (for example, point-of-purchase, supermarket, school nutrition, mass marketing), and outcome terms (for example, knowledge, attitudes, stages of change, food disappearance). One librarian conducted the search of the following databases from the first year of the database to August 1998, without language restrictions: CINAHL, Cochrane Library, Current Contents, Dissertation Abstracts, EMBASE, ERIC, Healthstar, MEDLINE, Public Health Effectiveness Project Database, PSYCHINFO, and Sociological Abstracts. Titles and abstracts were obtained. Two team members independently identified articles for retrieval. All articles selected by either team member were retrieved.


In each article, reference lists were checked and other articles that appeared appropriate to the review were retrieved back to 1988. Grey literature was sought from several places including the Canadian Produce Manufacturers Association, and several computer lists relevant to nutrition. All retrieved articles were entered in the Reference Manager database with appropriate key words.

Review Procedures
Two team members independently read and rated each retrieved article for relevance. Relevance criteria included: the article was about an intervention intended to alter fruit and vegetable consumption, was within the scope of practice of public health in Ontario, involved participants of four years of age and older, was a prospective study with a comparison group and provided information on process or outcome evaluation. For all articles rated as relevant, the validity (quality) of articles was independently assessed by two readers based on the following criteria: selection bias, study design, confounders, blinding, data collection methods, and handling of withdrawals and dropouts. 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; it was rated as ‘moderate’ if it achieved less than four strong ratings and only one weak; it was rated ‘weak’ if two or more criteria received weak ratings. Similarly, two readers again independently abstracted data using the data abstraction form.

RESULTS

Retrieval and Ratings
Two hundred and three articles were requested from the search results. One hundred eighty-nine were actually retrieved. Of these, 60 were rated as relevant. Many of the articles rated as non-relevant were not primary studies and included reviews, background theory, measurement issues and instruments and etiology papers related to fruit and vegetable intake. The validity criteria were applied to the 60 relevant reports; one was rated ‘strong’, 17 ‘moderate’ and 42 ‘weak’. Table 1 identifies the one strong and 17 moderate articles which constitute 18 reports of 15 different primary studies. Of the articles rated ‘weak’, most common threats to validity included the lack of randomization, lack of blinding and follow-up of less than 60% of those participants initially included in the studies. This review focuses on the 18 strong and moderate articles.

Content of the Articles
All 15 studies were conducted in the United States. In each case, when not specified, the intervention was conducted by a professional nutritionist. Four articles were targeted to parents of young children, six to school-aged children, and five to adults with two of the latter about worksite interventions. They will be described here by target groups.
1. **Interventions with Parents of Young Children**

Two of the four studies targeting parents with young children were independent evaluations of the *Expanded Food and Nutrition Education Program (EFNEP)*. The objective of this intervention was to improve eating habits in low-income, ‘hard to reach’ families. General criteria for participation in *EFNEP* included an income at or below 125% of the poverty level and at least one child under 12 years. The *EFNEP* program emphasized the dietary intake of the whole family but involved working with women in their home or in small neighbourhood groups. The program tailored the lesson activities, food preparation and practices to existing knowledge, skills and family resources. Lessons were taught by a nutrition paraprofessional, trained by dietitians. One study was conducted in California where 663 women eligible for *EFNEP* were randomly assigned to an intervention or a control group (Del Tredici et al., 1988). Over the six months of the intervention, participants were visited an average of 7.8 times by the nutrition paraprofessional for an average of 80 minutes. The intervention group experienced a significant increase in their fruit and vegetable consumption at the end of the six month program from 2.6 to 3.7 servings/day (p<0.001), with no significant change in the control group. A statistical comparison of the posttest intervention with the posttest control was not given.

Cox et al. (1996) studied the impact of *EFNEP* in Virginia randomizing women to the usual *EFNEP* or *EFNEP* intervention plus additional curriculum designed to reduce cardiovascular risk. The addition, called ‘Healthy Futures’ consisted of nine lessons from the traditional *EFNEP* curriculum, plus nine lessons on cardiovascular disease prevention. The latter was based on the Health Belief Model and included instruction related to dietary lifestyle factors, healthy food choices, and changes in cooking that would decrease fat intake and increase fruit and vegetable intake. At the end of six 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).

Koblinsky et al. (1992) conducted a cohort analytic study of 171 mothers whose children were in a *Head Start* program. Three centres in New York and two in Maryland were assigned to the intervention group and three centres in each state were assigned to the control. The intervention groups received 13 weekly nutrition letters and four workshops (2 hours each, 2 weeks apart) which included presentations, hands-on activities, small group discussion, and food demonstrations. They covered topics of nutrition and the preschool child, feeding preschool children, meal planning and preparation, and food shopping skills. In New York, some newsletters and workshops were implemented in Spanish to meet the needs of the population. The control group received no additional nutrition intervention. There were no significant differences in groups in total vegetable servings per day, nor in fruit intake in the New York group. Only the Maryland intervention group had an increase in fruit consumption from 1.9 to 2.7 servings per 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), dark green vegetables from 0.27 to 0.58 servings per day, (p<0.05) and dark orange vegetables from 0.3 to 0.3 servings/day, (p<0.05) While statistically significant, it is hard to be convinced of the clinical significance of the latter finding. One reason for the finding of no difference in the New York group was the baseline
level was higher than the Maryland group for fruit and vegetable intake (fruits=4.5, vegetables = 2.5), providing less room for change. Also, the variance in the New York group was three to five times higher than in the Maryland group, making it more difficult to detect significant differences between treatment and control groups.

In the *Special Supplemental Nutrition Program for Women, Infants and Children Program (WIC)*, Havas and colleagues (1998) randomized 16 WIC sites to a multifaceted intervention consisting of peer education and mailed supplemental printed materials, or to a control group who received ten minutes of nutrition education every two months, both over a two year period. 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). There was a positive relationship between attendance at the intervention session and changes in consumption. Also, in their sub-analysis, women who were white, less than 30 years of age, high school graduates, married, not working and non-smokers showed significantly greater increases in consumption (p<0.05).

2. **Interventions with School Children**

There were a total of six studies with interventions targeted to school-aged children. In two articles about different outcomes from the same intervention study, Graves et al. (1982) and Shannon et al. (1982) studied the effects of a nine week school curriculum called *Nutrition in a Changing World* on students from kindergarten through Grade 6. Nutrition activities were also carried out in the cafeteria with posters and student activity sheets. Baseline data were not reported, but the authors state 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 program significantly improved the knowledge of students in Grades K-5, but not for those in Grade 6. There was also a significant improvement in attitude for eating nutritious foods and vegetables, but not for eating new foods.

Shannon also studied a much more intense curriculum where Grade 3 students were randomized to receive a curriculum over Grade 3, 4 and 5 or no intervention (Shannon et al., 1988). The curriculum was taught by classroom teachers and focused on the experience of eating a variety of foods for 9-12 weeks each year. Posters and table tents supported the curriculum messages in the cafeteria during the time of the classroom intervention. There were no overall significant differences in the groups on food intake or attitude scores at posttest. However, if entry knowledge and attitude scores were low, the children in the intervention improved more than the control children.

The *5-A-Day Power Plus* study was a multi-component intervention conducted with fourth Grade students (Perry et al., 1998a). Schools were randomized to intervention or control groups. The intervention consisted of a school curriculum (two sessions/week of 40 minutes each for eight weeks), parent education packages, point-of-purchase promotion at the cafeteria, plus involvement of industry representatives in 30 minute classroom presentations and distribution of additional educational material. The curriculum was conducted by teachers to students in the last part of Grade 4 and the first part of Grade 5. At the end of the intervention period, posttest evaluation showed that there were no significant
differences 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).

Another controlled trial of multi-component interventions was the Child and Adolescent Trial for Cardiovascular Health (CATCH) (Perry et al., 1998b). One hundred eighty-six Grade 3 students were randomized to receive an intervention or to a control in order to assess the impact on fruit and vegetable consumption of third through fifth grade children. They were from 96 different schools in California, Louisiana and Texas. The intervention curriculum was taught in 40 minute lessons, 15-24 per grade, with a total of 47 lessons devoted to nutrition, and eight devoted to physical activity. The families received 15 activity packages and 'family fun nights' were held at the schools to supplement the curriculum. Food services offered new fruits and vegetables, taste-testing, posters and public address announcements. The control group received none of these interventions. At posttest time, 24 hour recalls revealed no differences in total servings of fruits, vegetables or fruits and vegetables combined. Analysis of variance showed no differences by site, gender or ethnicity.

Twenty-two Girl Guide troops were randomized to a control group or an intervention consisting of four weekly nutrition sessions that were based on behaviour modification strategies such as having a buddy, self-monitoring, problem-solving, food preparation and taste-testing, and information packages were sent to the parents (Cullen et al., 1997). At the posttest one week after the last intervention, the intervention group had significantly increased their total daily servings of fruit and vegetables from 3 to 3.39, with no changes in the control group. However, this change was not maintained at three month follow-up measurement.

Finally, the last school intervention was a controlled trial of 12 high schools where Grade 9 students were randomized to the Gimme 5 intervention or control (Nicklas et al., 1998). The development of the intervention was based on the PRECEDE model and addressed levels of behaviour change: awareness development, interest stimulation, skills training, reinforcement, application and maintenance. It involved a school curriculum (five workshops of 55 minutes each about knowledge, attitudes and skills over three years), parent education (brochures, taste-testing, recipes and food tips), and cafeteria food service changes (increased variety, availability and appeal of fruits and vegetables). At posttest (one year after completion of the three year program), 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 they studied participants’ stage of change, fewer intervention students were in pre-contemplation and contemplation and more in preparation stage at posttest than the control group (all at p<0.05).

3. **Interventions with Adults – Non-Worksite**

Three very different interventions were used with adults in non-worksites. One was an intervention in a primary care setting where 394 adult patients were identified in family practice offices (Campbell et al., 1994). They were randomized to receive a one-time nutrition information package, by mail, of either information that was tailored to their stage of dietary change, usual dietary intake
and psychosocial status or non-tailored nutrition messages. They were followed-up four months post-intervention. There was no difference by group. Both groups decreased their fruit and vegetable intake by 0.25 servings/day.

In the Women’s Health Trial, 303 women who were 45-69 years of age and at increased risk for breast cancer were randomized to an intervention group consisting of group plus individual counselling or to a control group (Gorbach et al., 1990; Henderson et al., 1990). The goal of the intervention was to reduce total calorie intake, increase complex carbohydrates, and ensure adequate intake of vitamins and minerals without supplements. It was taught in a group format (8-15 women), by a nutritionist, for eight weekly sessions, followed by twice monthly sessions for six months, then monthly sessions for four months. The nutritionist held individual sessions with participants at two and 12 weeks.

At 12 and 24 months follow-up, fruit and vegetable intake significantly increased (p<0.001) in the intervention group more than in 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). Total energy intake decreased in the intervention group by 25% and they experienced a mean weight loss of 3.1 kg.

Finally, the Bootheel Heart Health Project (Brownson et al., 1996) was an interrupted time series that focused on the development of coalitions for heart health activities in Southern Missouri. The coalitions developed walking clubs, aerobic exercise classes, heart healthy cooking demonstrations, community blood pressure and cholesterol screening, and cardiovascular disease education programs. They found no change in the proportion of people who consumed five or more servings of fruits and vegetables per day whether or not they were from a community that had an active coalition focused on Heart Health.

4. **Interventions with Adults - Worksite**

Three reports of two worksite studies were relevant and were rated as moderate. One of the studies was the Working Well Trial (Glanz, 1998; Sorensen et al., 1996). This was a large cancer prevention trial involving 108 worksites and 28,000 employees. Worksites were matched then randomized to the intervention, which consisted of a kickoff event, interactive activities, self-assessment, self-help materials, posters, brochures, a media campaign, contests and direct education or to control which consisted of an employee survey and documentation of all health promotion activities. The intervention lasted 80-125 weeks. The intake of fruits and vegetables increased from 2.6 to 2.8 servings/day in the intervention group compared to 2.58 to 2.6 in the control group (p<0.001) (Sorensen et al.). Moreover, movement through the stages of change was more likely in the intervention group and dietary changes were associated with movement in stages of change (Glanz).

The other worksite study included here was Treatwell (Hunt et al., 1993). This was a controlled trial of 1762 employees at 13 companies. There was an employee advisory board at the intervention sites and they chose from possible interventions: a core educational program (18 sessions), cafeteria point-of-purchase labelling, behaviour change strategies, health fairs, taste-tests, and food and cooking demonstrations. The control group had their usual health programs. There was no posttest difference in the mean servings per month of
fruit. However, in the control group, mean servings/month of vegetables decreased (1.6) and in the intervention group, increased by 6.8 (p<0.02). The intervention group also experienced significant mean reduction in margarine and butter servings/week.

**DISCUSSION**

Generally, it appears easier to effect a change in fruit intake than vegetable intake. Where they were analyzed separately, the change in total intake was often attributed to the increase in fruit intake. Multi-component interventions were most successful, and those that took place over a longer intervention time were more successful than those with only a few sessions or one-time only intervention.

It is interesting to note that one EFNEP study found significant effects for increasing fruit and vegetable consumption (Del Tredici et al., 1988). Another study not finding the traditional EFNEP intervention to be effective compared the standard intervention to a more intense one aimed specifically at cardiovascular risk (Cox et al., 1996). One possible explanation may be the effect of attention, whereas an effect of the usual EFNEP intervention came about in comparison to no attention in the control groups. A similar, but shorter intervention for the Head Start mothers produced no impact on total vegetable intake, but did improve fruit intake in one intervention group with lower initial fruit intake.

Three (Cox et al., 1996; Del Tredici et al., 1998; Havas et al., 1998) of the four studies of parents found significant increases in fruit and vegetable intake. All three used peers or paraprofessionals trained by nutritionists. Outcomes of interventions in the schools differed by intensity and clarity of messages delivered. Three reports of curriculum interventions of under ten weeks in duration found no significant impact on increasing fruit and vegetable consumption (Cullen et al., 1997; Graves et al., 1982; Shannon et al., 1982; Shannon et al., 1988). A more intensive, multi-pronged intervention of 16 weeks, which included interventions aimed at food services in the school, did not increase total fruit and vegetable intake, but did positively affect lunch intake (Perry, 1998a). A three year, multi-pronged intervention significantly increased fruit and vegetable intake in the intervention group (Nicklas et al., 1998), while another three year curriculum focused more generally on eating and physical activity had no impact on fruit and vegetable intake (Perry et al., 1998b).

For studies of adults, less intensive interventions such as mailed messages (Campbell et al., 1994) and very broad community interventions (Brownson, 1996) had no impact on fruit and vegetable intake. Worksite multi-pronged interventions had a statistically significant impact on intake (Hunt et al., 1993; Sorensen, 1996). However, the actual increase in intake of 6.8 servings per month may be of little clinical significance in the Treatwell Study (Hunt et al.).

The lack of significant findings in the multi-component studies such as CATCH and 5-A-Day Power Plus are surprising, given the multiple pathways for the messages to be transmitted and supported. Perry, the principal author of both studies, suggests that the food messages that are general are not likely to change specific non-targeted behaviours (Perry et al., 1998b). For example, the CATCH program had clear messages about fat consumption and did not have an impact on fruit and vegetable intake, while
the 5-A-Day Power Plus specifically targeted fruit and vegetable intake and managed to have an impact on increasing total fruit intake at lunch.

We cannot make conclusions at this point regarding the relative impact of interventions on different target groups. Related to preparation of the intervenor, there is support for use of peers and paraprofessionals with the EFNEP and Head Start studies with low income mothers, although a study of direct comparison of two groups lead by a professional nutritionist versus paraprofessional has not been found. Also, the comparisons regarding site of the intervention is difficult to do, as results vary by intensity and clarity of the messages.

There are several other evaluations currently underway which should lead to important results in the next few years. These evaluations are multiple-component school curricula and worksite health that will be publications of longer term follow-up related to 5-A-Day (Basch et al., 1994; Campbell et al., 1996; Campbell et al., 1998; Foerster et al., 1998; Harvey-Berino et al., 1998; Havas et al., 1994; Havas et al., 1995; Heimendinger et al., 1995; Heimendinger et al., 1996; Krebs et al., 1995; Kristal et al., 1997; McClelland et al., 1998; Neill et al., 1994; Subar et al., 1995; Thompson et al., 1995; Thompson et al., 1997), Gimme 5 (Baranowski et al., 1997; Domel et al., 1993; Nicklas et al., 1997; Resnicow et al., 1998b; Resnicow et al., 1998c), Know Your Body (Resnicow et al., 1992; Taggart et al., 1990; Walter, 1989) and Teachwell (Baranowski et al., 1995; Resnicow et al., 1998a). The results of these studies will further inform this systematic review question. Furthermore, while mass media campaigns are underway, no published reports of evaluation were found.

CONCLUSIONS
Implications for Research
There are several implications of this systematic overview for researchers. One is to ensure that the method of randomization is made explicit in the reporting of studies. Another is to develop tracking strategies to ensure greater follow-up participation of those who began the study. A third is to ensure that the outcome assessor is blind to the group allocation of the participants. A fourth is to utilize tools for measuring fruit and vegetable consumption that are valid and reliable. In many parts of the world, consumption of fruit and vegetables is seasonal, and as such, seasonality needs to be controlled in the evaluation of interventions. These are weaknesses in the literature as a whole, which, if corrected, would greatly enhance the quality of research in this field. In addition, some of the studies are hampered by small samples sizes due to limited resources for research. These studies would be greatly enhanced by co-ordination with other sites and the conduct of multi-site projects. Certainly a more co-ordinated approach to evaluation of nutrition interventions in Ontario would strengthen the ability to conduct higher quality evaluation.

Researchers also need to work on the question of clinical significance of differences in servings that are achievable from these interventions. For example, does a mean increase of 0.2 servings per day (Sorensen et al., 1996), while statistically significant, constitute a meaningful change in terms of altering someone’s risk of chronic disease, morbidity or mortality? Havas et al. (1998) have argued that a primary goal for interventions was to increase participants’ consumption of fruits and vegetables by at
least one half serving/day, which, if maintained could result in an 8% lower cancer incidence rate (World Cancer Research Fund, 1997).

Finally, researchers need to address the cost and cost-benefit analysis of large scale nutrition interventions. Little is known, as yet, even about the total cost of large scale, multi-component interventions, or cost per participant. Intuitively, it would seem that costs per serving increase in fruits and vegetables must be large as the outcomes appear modest to date, but clearer cost outcomes are necessary.

Implications for Practice
In summarizing the literature from 18 reports of 15 different studies with quality ratings of moderate or strong, not one of the studies found a harmful effect of the intervention, that is, none had a statistically significant effect of decreasing fruit and vegetable consumption. Generally, interventions were most successful if part of a multi-component program, if they included education directed at behavioural change as opposed to acquisition of information, if multiple contacts were made with the participants, and if the message was not generally about nutrition but specifically targeted to the increased intake of fruits and vegetables. These findings are in agreement with those found in Contento’s review of US studies (Contento et al., 1995). Thus managers, in making decisions about nutrition interventions need to consider the resource requirements of the more intensive programs. Use of paraprofessionals were effective in the EFNEP studies. Consideration should be given to the use of paraprofessionals or peer educators who are trained and supervised by nutritionists to deliver education and skill–based programs to low income populations groups. Managers 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.

Several publications in the next year or two, of longer term follow-up of some of the interventions in this report, will further our understanding of effectiveness of various interventions. In the meantime, there is support for continuation and further development of nutrition education programs in Ontario to promote the consumption of fruits and vegetables and an urgent need for resources to evaluate those programs.
# TABLE 1: Included Studies

**Interventions with Parents of Young Children**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design/Quality</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcomes</th>
<th>Results/Comments</th>
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<tbody>
<tr>
<td>Del Tredici et al. (1988) USA</td>
<td>Controlled Trial Moderate (No ‘weak’ ratings)</td>
<td>663 low income mothers in California • 355 EFNEP and 328 control</td>
<td>Instruction x 6 months • Mean visits = 7.8 • Mean/visit = 80.5 minutes Topics: nutrition facts • Selecting and buying • Cooking and preserving • Food safety</td>
<td>Increase in fruit &amp; vegetable consumption from 2.6 to 3.7 servings/day (p&lt;0.001)</td>
<td>Also increase in Vit. C and Vit. A rich fruits &amp; vegetables, and variety of fruits &amp; vegetables consumption • No intervention control group</td>
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EFNEP
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<tr>
<th>Study</th>
<th>Design/ Quality</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcomes</th>
<th>Results/Comments</th>
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<tbody>
<tr>
<td>Cox et al. (1996) USA</td>
<td>Randomized Controlled Trial Moderate</td>
<td>• 150 low income females in Virginia</td>
<td>Educational Intervention (18 sessions) 2 x week x 6 months delivered by nutrition paraprofessional.</td>
<td>Intervention group increased intake of:</td>
<td>• Collected 3 random – repeat 24 hour recalls at each measurement time to enhance accuracy and representations</td>
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<td>Interventions:</td>
<td>• Health Futures (cancer prevention) dietary, lifestyle factors, food choices, cooking methods ↓ fat, ↑ fruits and vegetables</td>
<td>• No impact on calcium/milk intake</td>
</tr>
<tr>
<td>EFNEP</td>
<td>(Rated ‘weak’ on blinding)</td>
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<td>Control:</td>
<td>• Experimental group also increased intake of Vit. E and fibre</td>
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<td></td>
<td></td>
<td>• EFNEP – lessons not part of CVD study</td>
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<td></td>
<td>• Money management</td>
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<td></td>
<td>Both interventions done in home or small neighbourhood groups, tailored to existing knowledge, skills, and resources</td>
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<tr>
<td>Study</td>
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<tr>
<td>Koblinsky et al. (1992) USA</td>
<td>Cohort analytic  Moderate (Rated 'weak' on blinding)</td>
<td>171 mothers from Head Start Program. • 3 New York centres and two Maryland centres were intervention group • 3 centres in each state were controls</td>
<td>13 weekly nutrition letters, four workshops (2 hours each, 2 weeks apart) • Presentation • Hands-on activity • Small group discussion • Food demonstration</td>
<td>• Maryland group had significant increase in fruit consumption compared to control, from 1.9 to 2.72 servings/day (p&lt;0.05) also increased intake of Vit. C rich foods, dark green or dark orange vegetables • No change in overall vegetable intake or in any fruit and vegetable intake in New York group</td>
<td>• Workshops and newsletters translated into Spanish for New York groups • New York groups had higher baseline levels of fruit and vegetable intake, and thus smaller room for improvement • Control group received usual Head Start Program</td>
</tr>
<tr>
<td>Havas et al. (1998) USA WIC</td>
<td>Controlled Trial Crossover Moderate (Rated 'weak' on blinding)</td>
<td>3122 low income women on Program for Women, Infants and Children (WIC) • 16 WIC sites used</td>
<td>Group nutrition sessions led by peer educators (three over six months) • Printed materials and reminders (four different packages mailed to participants)</td>
<td>Increase in fruit and vegetable consumption of 0.56 servings/day in intervention group and 0.13 in control group (both from 3.88 servings/day) (p=0.002)</td>
<td>Intervention participants showed greater progress in stages of change, knowledge, attitudes and self-efficacy • Change in consumption related to level of attendance at nutrition sessions • Control group received usual WIC intervention</td>
</tr>
</tbody>
</table>
### Interventions with School Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Design/Quality</th>
<th>Participants</th>
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<th>Outcomes</th>
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</thead>
</table>
| Graves et al. (1982)   | Cohort Analytic, Moderate    | Grade schools K – Grade 6     | 9 week school curriculum                          | • Significant effect of intervention on attitude scales of: eating nutritious foods and eating vegetables but not for eating new foods  
                        | (No ‘weak’ ratings)          |                               | • Cafeteria, posters and activity sheets                                                           |                                                                                                     | • Lowest scores on attitudes re: vegetables.  
                        |                              |                               |                                                                                                   |                                                                                                     | • Small difference in scores between groups but scale score range is 0-3  
                        |                              |                               |                                                                                                   |                                                                                                     | • Control group received usual health curriculum                                                    |
| Shannon et al. (1982)  | Controlled Trial, Moderate   | Grade 3 students,           | 9-12 weeks/year curriculum taught by classroom   | • Improvement in attitudes in both groups over time. However, if entry knowledge and attitudes scores were low, then intervention children improved more than control.  
                        | (Rated ‘weak’ on withdrawals and dropouts) | continued in Grades 4 and 5 | teachers                                           |                                                                                                     |                                                                                                     | • No intervention control group                                                                        |
|                        |                              |                               | • Focussed on participants trying out a variety of foods |                                                                                                     |                                                                                                     |                                                                                                     |
|                        |                              |                               | • Posters, table tents for cafeterias            |                                                                                                     |                                                                                                     |                                                                                                     |
| Shannon & Chen (1988)  |                              |                               |                                                    |                                                                                                     |                                                                                                     |                                                                                                     |
|                        |                              |                               |                                                    |                                                                                                     |                                                                                                     |                                                                                                     |
The table below summarizes the interventions with school children and their outcomes:

<table>
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<tr>
<th>Study</th>
<th>Design/ Quality</th>
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</tr>
</thead>
</table>
| Perry et al. (1998a)   | Controlled Trial | 536 Grade 4 Students | School Curriculum                                                            | **1. 24 hour recall**
No significant difference in total fruit and vegetable intake
Increased fruit servings/day (p<0.02)

2. Lunch intake 1.53 servings of fruits and vegetables/day for intervention group vs. 1.06 for control group (p < .001) and increased consumption of fruits (p < 0.001) | Intervention increased fruit intake but not vegetables or total intake of fruits and vegetables
Control group received usual health curriculum |

  - 16-40 min classroom sessions (2/week X 8 weeks)
  - Snack preparation and taste-testing
  - Comic books about nutrition
  - Team competitions

  Education Package to Parents
  - 5 packages sent at intervals
  - Parents signed they received
  - Snack packs

  Food Service
  - Point-of-purchase promotion of fruits and vegetables
  - Increased variety and attractiveness of fruits and vegetables
  - Provided 2 hour training of food service staff

  Industry
  - Coalition of producers
  - 30 minute presentation to classes
  - Additional educational material
<table>
<thead>
<tr>
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</table>
| Perry et al. (1998b)   | Controlled Trial Moderate         | 1186 Grade 3 students in 96 schools (12 school districts in California, Louisiana, Minnesota and Texas) | Curriculum over Grades 3, 4, 5  
- 15 lessons in Grade 3  
- 24 lessons in Grade 4  
- 16 lessons in Grade 5  
Curriculum included:  
- 47 lessons on nutrition including food preparation, and taste-testing  
- 8 lessons on physical activity  
Family education  
- 15 activity packages  
- Family fun nights at school  
Food service intervention offered new fruit and vegetable promotion, table tents, posters, taste-testing, PA announcements | Follow-up at end of Grade 5  
- 24 hour recall of daily servings of fruits and vegetables, fruits alone or vegetables alone, not significant  
- ANOVA showed no difference by site, gender or ethnicity  
- Only Texas site showed difference in fruit intake (increased intake in intervention group) | CATCH intervention had significant impact on increasing physical activity and decreasing fat intake  
Control group received usual health curriculum |
| USA                    | (Rated ‘weak’ on confounders)    |                                                                              |                                                                             |                                                                           |                                                                                |
| CATCH                  |                                  |                                                                              |                                                                             |                                                                           |                                                                                |
### Interventions with School Children

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<tr>
<th>Study</th>
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<th>Outcomes</th>
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<tbody>
<tr>
<td>Cullen et al. (1997) USA</td>
<td>Controlled Trial Moderate (Rated ‘weak’ on blinding)</td>
<td>22 Girl Scout troops • 259 girls (Grades 4 &amp; 5)</td>
<td>1 session/week X 4 weeks • Buddy • Self-monitoring • Goal setting • Problem-solving • Preparation and taste-testing • Info package to parents</td>
<td>1 week post test: increased 24 hour recall fruit and vegetable consumption in intervention group (3 to 3.39 servings/day) (p&lt;0.01) • Not maintained at 3 month posttest</td>
<td>19% dropped out at 1 week follow-up • No intervention control group</td>
</tr>
<tr>
<td>Nicklas et al. (1998) USA</td>
<td>Controlled Trial Moderate (Rated ‘weak’ on blinding)</td>
<td>12 schools • Grade 9 randomized to GIMME 5 or control • Followed to Grade 12</td>
<td>Based on PRECEDE model • 3 years • Mass media campaign in school • Curriculum of 5 workshops of 55 minutes each re: knowledge, attitudes and skills • Cafeteria increased availability, variety, appeal of F &amp; V • Brochures to parents, taste-testing, recipes, calendar with food tips</td>
<td>Significant increase in knowledge in intervention group (p&lt;0.05) • Significant increase in fruit and vegetable intake in intervention group (p&lt;0.05) Stages of Change • Fewer intervention students in pre-contemplation and contemplation and more in preparation stage at posttest, than control group</td>
<td>Increased fruit and vegetable consumption was maintained in the intervention group at follow-up but increased intake by control group resulted in no significant differences • Control group increase attributed to 5-A-Day campaign at same time • Control group received usual health curriculum</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Campbell et al.</td>
<td>Controlled Trial</td>
<td>394 adult patients from family practice offices</td>
<td>Tailored:</td>
<td>Daily intake of fruits and vegetables decreased in each group by 0.25 servings/day (p=0.19)</td>
<td>People in Intervention # 1 more likely to remember receiving information; more likely to have read all of message, reduced fat intake</td>
</tr>
<tr>
<td>(1994) USA</td>
<td>Strong</td>
<td></td>
<td>• Mailed nutrition information package, tailored to stage of change, dietary intake and psychosocial information</td>
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<tr>
<td></td>
<td>(No 'weak' validity ratings)</td>
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<td>Non-tailored:</td>
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<td></td>
<td></td>
<td></td>
<td>• Mailed nutrition package with standard risk information relating diet to disease vs. control</td>
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<td></td>
<td></td>
<td>No information</td>
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### Table 1: Included Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Design/Quality</th>
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</thead>
<tbody>
<tr>
<td>Gorbach et al. (1990)</td>
<td>Controlled Trial Moderate</td>
<td>Women 45-69 at risk for breast cancer</td>
<td>Group format (8-15 women taught by nutritionist):</td>
<td>12 month and 24 month follow-up, fruit and vegetable intake significantly increased (p&lt;0.001) in intervention group more than in control from baseline of 15.9 % of total kcal/day to 22% at 12 months and 23.1% at 24 months</td>
<td>Total energy intake in intervention group decreased by 25%, mean weight loss 3.1 kg</td>
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<tr>
<td></td>
<td>(Rated ‘weak’ on selection bias)</td>
<td>Randomized to intervention (184) or control (119)</td>
<td>weekly sessions x 8 weeks, 2 x/month x 6 months, then monthly for 4 months</td>
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<td>individual session with nutritionist at 2 and 12 weeks</td>
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<td></td>
<td>goal of intervention 20% reduction in total calories, increase complex carbohydrates, adequate intake of vitamins and minerals without supplements kept track of own fat intake, given fat gm/day goal</td>
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<tr>
<td>Henderson et al. (1990)</td>
<td>Interrupted time series</td>
<td>People in six counties in Southern Missouri</td>
<td>Development of coalitions for Heart Health</td>
<td>No change in proportion of people who consumed 5+ fruits and vegetables/day</td>
<td>No true control group</td>
</tr>
<tr>
<td>USA</td>
<td>(No ‘weak’ validity ratings)</td>
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<tr>
<td>Women’s Health Trial</td>
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<td>Study</td>
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<tr>
<td>Sorensen et al. (1996)</td>
<td>CCT Moderate</td>
<td>108 worksites 28,000 workers</td>
<td>• Kickoff event                   • Interactive activities                        • Intake of fruits &amp; vegetables increased by 0.2 (2.6 to 2.8) servings per day in intervention group vs. 0.02 (2.58 to 2.6) in control groups (p&lt; 0.001)</td>
<td>• 82% of process objectives obtained  • Control group sites documented usual health promotion activities</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>(Rated ‘weak’ on blinding)</td>
<td></td>
<td>• Posters &amp; brochures              • Self-assessment                     • Collected 3 years after pretest</td>
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<td></td>
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<td>• Self-help materials             • Campaigns &amp; contest</td>
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<td></td>
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<td></td>
<td>• Direct education vs. employee survey   • Documentation of health promotion activities</td>
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<td></td>
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<td>• Intake of fruits &amp; vegetables increased by 0.2 (2.6 to 2.8) servings per day in intervention group vs. 0.02 (2.58 to 2.6) in control groups (p&lt; 0.001)</td>
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<td></td>
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<td>• Duration 80-125 weeks</td>
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<tr>
<td>Glanz (1998)</td>
<td>Controlled Trial</td>
<td>13 companies 1762 workers</td>
<td>Employees on advisory boards Treatwell interventions • Core educational programs offered (18 sessions)</td>
<td>• Mean increase in total fruit servings/month was 2.9 in control and 6.8 in intervention (p&lt;0.21) and in vegetables a decrease in the control (~1.6 servings/month) and increase in intervention group (6.8 servings/month) (p&lt;0.02)</td>
<td>• Intervention group experienced significant mean reduction in margarine and butter (5.2 servings/week p&lt;0.01)  • No intervention control group</td>
</tr>
<tr>
<td>USA</td>
<td>Moderate</td>
<td></td>
<td>Treatwell interventions • Cafeteria, point-of-purchase labelling</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(Rated ‘weak’ on blinding)</td>
<td></td>
<td>• All groups used behaviour change strategies</td>
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<td></td>
<td></td>
<td></td>
<td>• Health fairs</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Taste-tests, food and cooking demonstrations vs. usual health programming in control sites</td>
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<tr>
<td>Hunt et al. (1993)</td>
<td>Controlled Trial</td>
<td></td>
<td>Employees on advisory boards Treatwell interventions • Core educational programs offered (18 sessions)</td>
<td>• Mean increase in total fruit servings/month was 2.9 in control and 6.8 in intervention (p&lt;0.21) and in vegetables a decrease in the control (~1.6 servings/month) and increase in intervention group (6.8 servings/month) (p&lt;0.02)</td>
<td>• Intervention group experienced significant mean reduction in margarine and butter (5.2 servings/week p&lt;0.01)  • No intervention control group</td>
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<tr>
<td>USA</td>
<td>Moderate</td>
<td></td>
<td>Treatwell interventions • Cafeteria, point-of-purchase labelling</td>
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<tr>
<td></td>
<td>(Rated ‘weak’ on blinding)</td>
<td></td>
<td>• All groups used behaviour change strategies</td>
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<td></td>
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<td>• Health fairs</td>
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<td></td>
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<td></td>
<td>• Taste-tests, food and cooking demonstrations vs. usual health programming in control sites</td>
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Table 1: Included Studies
REFERENCES


References


Health Canada, Laboratory Centre For Disease Control (1995).


APPENDICES

Appendix 1: Quality Assessment Tool
Appendix 2: References for Excluded Studies
Appendix 1:

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?
   1 Very likely
   2 Somewhat likely
   3 Not likely
   4 Can’t tell

(Q2) What percentage of selected individuals agreed to participate?
   1 80 - 100% agreement
   2 60 – 79% agreement
   3 less than 60% agreement
   4 Not applicable
   5 Can’t tell

B) STUDY DESIGN

Indicate the study design
   1 Randomized controlled trial
   2 Controlled clinical trial
   3 Cohort analytic (two group pre + post)
   4 Case-control
   5 Cohort (one group pre + post (before and after))
   6 Interrupted time series
   7 Other specify ________
   8 Can’t tell

Was the study described as randomized?
   No
   Yes

If NO, go to component C

If Yes, was the method of randomization described? (see dictionary)
   No
   Yes

If Yes, was the method appropriate? (see dictionary)
   No
   Yes

RATE THIS SECTION STRONG MODERATE WEAK
See dictionary
1 2 3
C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?
   1. Yes
   2. No
   3. Can’t tell

The following are examples of confounders:
   1. Race
   2. Sex
   3. Marital status / family
   4. Age
   5. SES (income or class)
   6. Education
   7. Health status
   8. Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?
   1. 80 – 100%
   2. 60 – 79%
   3. Less than 60%
   4. Can’t Tell

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?
   1. Yes
   2. No
   3. Can’t tell

(Q2) Were the study participants aware of the research question?
   1. Yes
   2. No
   3. Can’t tell

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?
   1. Yes
   2. No
   3. Can’t tell

(Q2) Were data collection tools shown to be reliable?
   1. Yes
   2. No
   3. Can’t tell
### F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and reasons per group?
1. Yes
2. No
3. Can’t tell

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).
1. 80 - 100%
2. 60 - 79%
3. less than 60%
4. Can’t tell

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<tr>
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### G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?
1. 80 - 100%
2. 60 - 79%
3. less than 60%
4. Can’t tell

(Q2) Was the consistency of the intervention measured?
1. Yes
2. No
3. Can’t tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?
1. Yes
2. No
3. Can’t tell

### H) ANALYSES

(Q1) Indicate the unit of allocation (circle one)
- community
- organization/institution
- practice/office
- provider
- client

(Q2) Indicate the unit of analysis (circle one)
- community
- organization/institution
- practice/office
- provider
- client

(Q3) Are the statistical methods appropriate for the study design?
1. Yes
2. No
3. Can’t tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?
1. Yes
2. No
3. Can’t tell
GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the gray boxes on pages 2-4 onto this page.

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GLOBAL RATING FOR THIS PAPER (circle one)

- 1 STRONG (four STRONG ratings with no WEAK ratings)
- 2 MODERATE (less than four STRONG ratings and one WEAK rating)
- 3 WEAK (two or more WEAK ratings)

WITH BOTH REVIEWERS DISCUSSING THE RATINGS:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

- No
- Yes

If yes, indicate the reason for the discrepancy

- 1 Oversight
- 2 Differences in interpretation of criteria
- 3 Differences in interpretation of study

FINAL DECISION OF BOTH REVIEWERS (circle one):

- 1 STRONG
- 2 MODERATE
- 3 WEAK
Appendix 2: References for Excluded Studies


