A proposed schema for evaluating evidence on public health interventions

Case Study One: evaluating evidence for interventions that aim to increase the consumption of fruit and vegetables

INTRODUCTION

The purpose of Case Study One was to trial the first draft of the National Public Health Partnership's proposed schema for evaluating evidence on public health interventions.

It was decided that the project team (the authors of the schema) should coordinate the first case study to assess the feasibility of using the schema. This was primarily so that they could identify and correct any major technical obstacles in applying the schema before it was given to external groups in subsequent case studies. The project team modified the schema following this case study to produce Version Two of the schema. Version Two of the schema was later tested by external groups in Case Studies Three and Four.

LITERATURE REVIEWED IN CASE STUDY ONE

The first draft of the schema was applied to a collection of papers on interventions that aim to increase the consumption of fruit and vegetables. The project team and steering group decided to use an existing collection of literature, which had been compiled and reviewed in 1999 by the CSIRO on behalf of the Commonwealth Department of Health and Aged Care.[1] This decision reflected a desire to focus on the technical aspects of applying the schema, rather than on the scope and content of the literature to be reviewed.

The literature was reviewed using the same categories (i.e. the intervention setting) as those identified by the CSIRO in 1999. The groups were as follows:

- schools
- community
- supermarkets
- catering
- worksites
- mass media

[1] DN Cox, N Beaumont-Smith, K Baghurst. "An issues paper on barriers to the consumption of fruits and vegetables, and previous efforts to promote an increased consumption of fruits and vegetables. Report to the Commonwealth Department of Health and Aged Care For the Strategic Inter-Governmental Nutrition Alliance (SIGNAL)." CSIRO Health Sciences & Nutrition, 1999.

The findings of the review conducted in Case Study One are provided below. Readers should note however that only those papers collated in 1999 by the CSIRO were reviewed, and *no further literature search was conducted* for Case Study One.

REVIEWERS FOR CASE STUDY ONE

Case Study One was coordinated and conducted by the project team. The primary review of each individual paper was conducted by an assistant researcher with a background in General Practice and a Master in Public Health. Three senior nutritionists from the NSW Centre for Public Health Nutrition applied the schema to the papers on catering-based intervention and provided feedback on their experience of using the schema.

REVIEW SUMMARIES FROM CASE STUDY ONE

These evidence summaries were prepared using Section J ("Summation of evidence from collected research reports") in the first draft of the proposed schema for evaluating evidence on public health interventions. (Note that the schema has since been significantly restructured.)

School-based interventions

Q: What do the combined research reports tell us about the intervention?

School-based interventions have mostly been studied in the USA. They focus on education strategies with targeted sessions or education messages that are integrated across a variety of subjects.

School-based interventions are often intensive programs that can be very demanding in terms of teacher time and commitment, and require additional funding in terms of education manuals and curriculum materials. Some have been supported by activities targeting parents and changes to the canteen. Several interventions have relied on support in the form of sponsorship from local industry (e.g. FV suppliers) to provide samples.

Most of the better quality evaluations showed curriculum based interventions to have little or no demonstrated impact on fruit and vegetable consumption, though some studies showed an improvement in knowledge and attitudes. General programs about healthy eating (rather than targeted to FV) did not have an impact on FV consumption.

The one intervention that had the largest (reliable) impact on FV consumption (+0.5 serve) included food service changes (point of sale promotion, increased variety in food options and better presentation), parental involvement in the program and take home snack packs. An intervention that reduced prices (-50%) of FV in a high school cafeteria showed increased sales in fruit (four-fold) and carrots (double), but no impact on salads. The increases were not sustainable beyond the low-price period.

Q: Do research studies with similar research questions produce consistent results?

Education strategies alone are unlikely to be effective in modifying dietary behaviour.

Q: Do studies examining different research questions produce compatible results?

Not applicable

Q: Is the body of evidence convincing?

There is no convincing evidence to support curriculum-only interventions to promote the consumption of FV. There is however some evidence to suggest that a 'whole of school' approach that involves food service changes, parents and community-based strategies can have an impact on the consumption of FV.

Q: What are the important gaps in the body of available evidence?

Often there is very little or no information provided about the social, physical and organisational characteristics of the schools, the support required (and given) to the intervention by the principal, staff or parents, or what the target group (school children) thought of the programs. There was very little scope in the evaluations conducted to determine why the ineffective interventions failed to increase FV consumption.

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

Interventions must work at the level of supply as well as demand, i.e. strategies must improve the availability and cost of fruit and vegetables, as well as addressing the knowledge, attitudes and intentions of school children and their parents.

<u>Community-based interventions</u>

Q: What do the combined research reports tell us about the intervention?

The community-based interventions examined were highly varied in the strategies adopted. They included computer-tailored information, intensive small-group education, peer education and market coupons.

Computer-tailored information or small-group sessions appear to improve knowledge and attitudes about FV consumption. These strategies may also increase FV consumption in the *short term* for educated and motivated women or early teenage girls.

Education bulletins that reported the greatest impact (+1 serve) and some sustainability was part of a multi-component program that was run through a church for its (African American) congregation. (Other strategies included increasing availability of FV at the church, social support and pastor sermons.)

Q: Do research studies with similar research questions produce consistent results?

Not applicable

Q: Do studies examining different research questions produce compatible results?

Yes, they indicate that education strategies can improve knowledge about FV consumption, and some may increase consumption in the short term if participants are well motivated. Sustainability of change is doubtful, unless education is reinforced and supported by other strategies that address both supply and demand.

Q: Is the body of evidence convincing?

No

Q: What are the important gaps in the body of available evidence?

Better multi-strategy interventions that address issues of community availability and cost of FV.

Good evaluation designs - several of the community-based interventions were very poorly evaluated.

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

Educated and motivated groups can benefit from health education in the short term…what's new?

<u>Supermarket interventions</u>

Q: What do the combined research reports tell us about the intervention?

There is insufficient evidence to show whether in-store promotional activities increase fruit and vegetable consumption. Existing studies were often poorly conducted and it is not clear if the lack of effect shown is due to poor implementation of the intervention or due to inadequate evaluation measures and methods. In-store supermarket activities may be effective in influencing FV consumption when they are properly implemented and part of multiple community-based strategies.

A computer-based multimedia system available in supermarkets may however be effective. The intervention was used over six weeks and addressed dietary behaviour on several levels, including: modelling food purchases and meal changes, setting goals and commitments for food purchases, and printing out shopping lists and financial incentives.

Q: Do research studies with similar research questions produce consistent results?

Not applicable – one study was just in-store interventions, one used multiple strategies, and one used a special computerised system.

Q: Do studies examining different research questions produce compatible results?

No

Q: Is the body of evidence convincing?

No

Q: What are the important gaps in the body of available evidence?

Careful study methods, with details about population base, recruitment, randomisation methods, sample size calculations (Implementation of RCTs was poorly documented, and #167 had no comparison group, not even baseline).

Well-developed comprehensive measures to evaluate intervention implementation and effects. Observations or measures are often too narrow in focus, inadequate and not tested.

Information commonly missing in studies include: The dietary habits of the population; contextual factors that determine / confound / interact with FV consumption; assessments of the intervention implementation prior to evaluation; unanticipated effects of the intervention; relative impact on disadvantaged groups; and qualitative data to assist explanations of effects.

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

Not applicable

<u>Catering interventions (comparison report 1)</u>

Q: What do the combined research reports tell us about the intervention?

Providing incentives by halving the cost and increasing availability and range of choice of fruit (by 50%) and vegetables (by 30%) in a University cafeteria can significantly increase sales of these items (three times baseline levels). The environmental changes were supported with educational and promotional materials. The effect on sales of fruit was not sustained three weeks after the intervention, but sales of salads remained higher. We do not know the nutritional composition of these salads e.g. mayonnaise potato?

A good nutrition campaign (increasing the range of healthy food choices, highlighting healthy food, providing displays and undertaking promotional activities) in a hospital

can have a positive effect on the type of meals selected. However, the general nutrition campaigns did not increase the consumption of fruit.

Large modifications are required in catering (e.g. halving cost) and promotional campaigns need to be time- and resource-intensive and supported by changes to food availability to have an impact on dietary behaviour.

It seems that to increase fruit and vegetables, there must be a focus specifically on those food choices. General nutrition can impact on selection of healthy meals, but not the purchase of fruit.

Q: Do research studies with similar research questions produce consistent results?

For the broad question about the effectiveness of positive incentives on dietary behaviour, the findings in these different studies are consistent.

Q: Do studies examining different research questions produce compatible results?

Specific research questions in each study were different: one was a pilot study in a university cafeteria and the other examined the implementation of a long-term food and nutrition policy within a hospital. Findings are compatible with health promotion theory about the need for multi-pronged and sustainable strategies.

Q: Is the body of evidence convincing?

The studies are credible and provide a positive indication that the strategy of modifying the price and availability of food in catering settings are worth attempting and investigating further. These finding are consistent with health promotion theory about using multiple strategies and creating supportive environments. However, environmental modifications undertaken in another setting will be context-specific and would require local evaluation.

Q: What are the important gaps in the body of available evidence?

Are such intervention effects sustainable? What level of price reduction and promotion is required to sustain healthy choices? Would these strategies work in other contexts, e.g. in a community store or restaurant, rather than university or hospital setting?

Why did some food choice change, but not others, e.g. no change to fruit and breads. How could the campaigns have been improved? (There was no qualitative assessment of process.) For whom do these intervention not work? For whom does it work and why? Subgroups were not examined.

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

Multi-pronged strategies are needed that create supporting and reinforcing environments. Cost and availability of food, supported by education and promotion are all important. The good nutrition campaign in the hospital was part of a broad food and nutrition policy that had been developed through the combined involvement of nutritionist and dietetics, health promotion, catering, nursing, quality assurance and the volunteer services. The campaign took place on several levels: hospital wards, in a hospital cafeteria and in the volunteer shops. This requires significant commitment from the hospital management and is totally reliant on a central role for the catering department.

Catering interventions (comparison report 2 – nutritionists)

Q: What do the combined research reports tell us about the intervention?

There is potential to increase selection of fruit and vegetable choices through interventions in catering settings.

Q: Do research studies with similar research questions produce consistent results?

Not applicable. These two 'interventions' were quite different and the studies addressed different research questions.

Q: Do studies examining different research questions produce compatible results?

Yes, but the results indicate that the success of the interventions depends on the type of intervention conducted and whether this suits the setting chosen.

Q: Is the body of evidence convincing?

These two papers are not convincing with respect to issues of causation and sustainability (of either intervention or outcomes). However, the results are sufficient to warrant further work in this area, using more sustainable interventions and more rigorous study designs.

Q: What are the important gaps in the body of available evidence?

There are not enough studies to form firm conclusions about the success of any specific intervention.

Neither of these papers contained sufficient detail on process evaluation (we assume this means that their process evaluations were limited).

As mentioned above, more work is needed using more sustainable interventions and more rigorous study designs.

Neither paper explored the effects of the intervention among different subgroups of the target population.

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

It seems that the context of the interventions was very important to the success of both programs. For example, the subsidising of FV choices, to the extent done in the Jeffrey et al. paper, is unlikely to be sustainable in the long term in the 'real world', i.e. outside the research study context. In addition, the success of the intervention(s) in the Morris et al. paper seems largely due to the considerable work that must have gone beforehand in setting up the Food Services Advisory Committee and developing the Food and Nutrition Policy (thus setting up the partnerships, commitment etc. required for such a 'full-on' intervention over a three-month period). Again, it is unlikely that this level of effort is sustainable in such a setting, and given that a large proportion of the target group is constantly changing (patients, visitors, students), the effort would need to be sustained to produce maintenance of the changes seen.

Worksite-based Interventions

Q: What do the combined research reports tell us about the intervention?

Worksite nutrition interventions may have a relatively small (+ 0.5 serving) but statistically significant effect on increasing F&V consumption and reducing fat intake, particularly for people with a poor baseline diet. Worksite interventions may be more effective if the advice is personally tailored or combined with strategies targeting the employee's family.

Q: Do research studies with similar research questions produce consistent results?

Both studies show some beneficial effect on FV consumption from worksite-initiated interventions.

Q: Do studies examining different research questions produce compatible results?

The Dutch study targeted mainly well-educated men and benefits were only seen in those with very low FV consumption. This study used a worksite to recruit subjects, but the intervention did not utilise the worksite setting. Instead, the computer-tailored nutrition intervention was mailed to participants.

In the US the subjects were mainly female employees of health centres, where worksite and family interventions increased FV consumption by 0.5 serve.

Q: Is the body of evidence convincing?

Not convincing, but promising, although sustainability of effect is unknown. There were only two studies (both RCTs). The Dutch study had 25% drop-out rate. The US study randomised 22 worksites to three groups, but only 50% of the post-intervention

evaluation group had also participated in the baseline measures. The greatest effect (+0.5 serving) for the worksite and family intervention lasted 19.5 months.

Q: What are the important gaps in the body of available evidence?

Are the small effects on fruit and vegetable consumption, observed immediately post-intervention, sustainable beyond the intervention period?

Q: If the evidence indicates that the intervention was effective, what were the factors that contributed to its success?

It is possible that tailoring nutrition advice to individuals, targeting those at risk due to very low FV consumption (less than one serve per day), and involving the families of employees can promote the effectiveness of worksite interventions.

Mass media campaigns

Q: What do the combined research reports tell us about the intervention?

There appears to be an underlying association between knowledge and the consumption of fruit and vegetables in the population. Large state-wide media campaigns can have a moderate impact on people's awareness about eating fruit and vegetables. No follow-up has been conducted to determine the sustainability of these effects.

A media campaign however, even when supported by point of sale promotions, does not appear to be sufficient to achieve the goal of improving the overall consumption of fruit and vegetables of a population to target levels of 5 servings per day. There is a potential negative effect in NESB populations with poor education.

Media campaigns are either very expensive, if media promotion must be purchased, or they must rely on donated media support. (One paper reported that in July 1990 in California, television advertising cost up to US$400,000 per hour.) Additional point of sale promotions usually require support and investment from Industry.

Q: Do research studies with similar research questions produce consistent results?

The campaign in California showed no overall effect on FV consumption. There was a minor positive effect in the white population alone (+ 0.3 servings, from 3.7 to 4.0), and a negative effect in the Hispanic population (- 0.7 servings, from 3.9 to 3.2), with the greatest negative effect observed in the Hispanic group with the least education (-1.4 servings, from 4.4 to 3.0).

The study in Victoria showed a slight increase in consumption of vegetables (+ 0.45 servings) and fruit (+ 0.18 servings), but the quality of this study was poor, with a high likelihood of bias.

Q: Do studies examining different research questions produce compatible results?

Not applicable

Q: Is the body of evidence convincing?

The studies were repeat cross-sectional surveys, with random samples, but no control groups. The surveys conducted in Victoria had a poor response rate and the resultant findings are not convincing. The study in California was more credible and the negative findings convincing, given the reviewers' 'a priori' assumptions that health education campaigns alone are unlikely to be effective in modifying dietary behaviour.

Q: What are the important gaps in the body of available evidence?

The evidence did not identify an effective strategy to modify behaviour in a large population. The relationships between changes in awareness, comprehension and behaviour were not empirically explored, and people were not asked about the reasons for the composition of their diet.

The negative impact on the Hispanic community in California was measured as a decrease in the consumption of oranges, but the reasons were not empirically explored (it was attributed by the authors to a failed crop rather than to the campaign).

Media campaigns can impact on nutrition awareness and knowledge, so there is potential for examining their role in supporting and reinforcing other interventions.

REFERENCE LIST OF PAPERS REVIEWED IN CASE STUDY ONE

Schools

Auld GW, Romaniello C, Heimendinger J, Hambidge C, Hambidge M. Outcomes from a school-based nutrition education program using resource teachers and cross-disciplinary models. Journal of Nutrition Education 1998;30:268-280.

Boaz A, Ziebland S. A 'five-a-day' fruit and vegetable pack for primary school children. Part I: development and pre-testing. Health Education Journal 1998;57:97-104.

Boaz A, Ziebland S, Wyke S, Walker J. A 'five-a-day' fruit and vegetable pack for primary school children. Part II: controlled evaluation in two Scottish schools. Health Education Journal 1998;57:105-116.

Domel SB, Baranowski T, Davis H, et al. Development and evaluation of a school intervention to increase fruit and vegetable consumption among 4th and 5th grade students. Journal of Nutrition Education 1993;25:345-349.

Foerster SB, Gregson J, Beall DL, et al. The California Children's 5 A Day Power Play Campaign - Evaluation of a Large-Scale Social Marketing Initiative. Family Community Health 1998;21:46-64.

French SA, Story M, Jeffery RW, et al. Pricing strategy to promote fruit and vegetable purchase in high school cafeterias. Journal of the American Dietetic Association 1997;97:1008-1010.

Horne PJ, Lowe CF, Fleming PFJ, Bowdery AJ. An effective procedure for changing food preferences in 5-7 year old children. Proceedings of the Nutrition Society 1995;54:441-452.

Lawatsch DE. A comparison of two teaching strategies on nutrition knowledge, attitudes and food behavior of preschool children. Journal of Nutrition Education 1990;22:117-123.

Liquori T, Koch PD, Contento IR, Castle J. The Cookshop Program - Outcome evaluation of a nutrition education program linking lunchroom food experiences with classroom cooking experiences. Journal of Nutrition Education 1998;30:302-313.

Perry C, Lytle LA, Feldman H, et al. Effects of the child and adolescent trial for cardiovascular health (CATCH) on fruit and vegetable intake. Journal of Nutrition Education 1998;30:354-360.

Perry CL, Bishop DB, Taylor G, et al. Changing fruit and vegetable consumption among children: the 5-a-day power plus program in St. Paul, Minnesota. American Journal Of Public Health 1998;88:603-609.

Resnicow K, Davis M, Smith M, et al. Results of The Teachwell Worksite Wellness Program. American Journal of Public Health 1998;88:250-257.

Ryan L, Anderson J, Sherman BM. The effect of nutrition education on improving fruit and vegetable consumption of youth. Journal of Extension 1995;33.

Community

Anliker JA, Winne M, Drake LT. An evaluation of the Connecticut Farmers' Market Coupon Program. Journal of Nutrition Education 1992;24:185-191.

Balsam A, Webber D, Oehlke B. The Farmer's Market Coupon Program for Low-Income Elders. Journal of Nutrition for the Elderly 1994;13:35-42.

Barnhart JM, Mossavar-Rahmani Y, Nelson M, Raiford Y, Wylie-Rosett J. An innovative, culturally-sensitive dietary intervention to increase fruit and vegetable intake among African-American women: a pilot study. Topics in Clinical Nutrition 1998;13:63-71.

Brug J, Glanz K, Van Assema P, Kok G, van Breukelen GJ. The impact of computer-tailored feedback and iterative feedback on fat, fruit, and vegetable intake. Health Education & Behavior 1998 Aug 1998;25:517-531.

Campbell MK, Bernhardt JM, Waldmiller M, et al. Varying the message source in computer-tailored nutrition education. Patient Education & Counselling 1999;36:157-169.

Cullen KW, Bartholomew LK, Parcel GS. Girl scouting: an effective channel for nutrition education. Journal of Nutrition Education 1997;29:86-91.

Emmons K, Macario E, Sorensen G, Hunt MK, Rudd RE. Nutrition education for cancer prevention among low-income populations: An extension of the EFNEP model. Journal of Nutrition Education 1999;31:47-53.

Hackman RM, Wagner EL. The Senior Gardening and Nutrition Project: development and transport of a dietary behavior change and health promotion program. Journal of Nutrition Education 1990;22:262-270.

Havas S, Damron D, Treiman K, et al. The Maryland WIC 5 a day promotion program pilot study: rationale, results, and lessons learned. Journal of Nutrition Education 1997;29:343-350.

Supermarkets

Kristal AR, Goldenhar L, Muldoon J, Morton RF. Evaluation of a supermarket intervention to increase consumption of fruits and vegetables. American Journal of Health Promotion 1997;11:422-425.

Scott JA, Begley AM, Miller MR, Binns CW. Nutrition education in supermarkets: the Lifestyle 2000 experience. Australian Journal of Public Health 1991 Mar 1991;15:49-55.

Winett RA, Anderson E, Bickley PG, et al. Nutrition for a Lifetime System (c): A multimedia system for altering food supermarket shoppers' purchases to meet nutritional guidelines. Computers in Human Behavior 1997;13:371-392.

Catering

Jeffery RW, French SA, Raether C, Baxter J. An environmental intervention to increase fruit and salad purchases in a cafeteria. Preventive Medicine 1994;23:788-792.

Morris HM, Davies M, Byrnes TJ, Orr PN, Goodwin S, Dyson LR. An approach to increasing the frequency of better food choices in a South Australian public hospital. Australian Journal of Nutrition and Dietetics 1994;51:9-13.

Worksite

Brug J, Steenhuis I, Van Assema P, de Vries H. The impact of a computer-tailored nutrition intervention. Preventive Medicine 1996 May-Jun 1996;25:236-242.

Sorensen G, Hunt MK, Cohen N, Stoddard A. Education for dietary change: The Treatwell 5 A Day Program. American Journal of Public Health 1999;(in Press)

Mass Media

Dixon H, Borland R, Segan C, Stafford H, Sindall C. Public reaction to Victoria's '2 Fruit 'n' 5 Veg Every Day' campaign and reported consumption of fruit and vegetables. Preventive Medicine 1998;27:572-582.

Foerster SB, Kizer KW, Disogra LK, Bal DG, Krieg BF, Bunch KL. California's "5 a day – for better health:" campaign: an innovative population-based effort to effect large-scale dietary change. American Journal of Preventive Medicine 1995 Mar-Apr 1995;11:124-131.