The Tooty Fruity Vegie project: Changing knowledge and attitudes about fruits and vegetables

Sallie A. Newell¹ PhD

Anna D. Huddy¹ Grad Dip Nut&Diet

Jillian K. Adams¹ Grad Dip Nut&Diet

Margaret Miller² MSc

Libby Holden¹ Grad Dip Ed, Trg & Dev

Uta C. Dietrich¹ MSc

1 Health Promotion Unit, Northern Rivers Area Health Service, LISMORE, NSW 2480

2 Marg Miller Health Consulting, 16 Rudwick St, MOSMAN PARK, WA 6012

Address for Correspondence / Reprints

Assoc Prof Sallie Newell, Health Promotion Unit, Northern Rivers Area Health Service, 31 Uralba St,
PO Box 498, Lismore NSW 2480.

Email: sallien@nrhs.health.nsw.gov.au

Phone: 02 6620 7262

Fax: 02 6622 2151

Counts

Abstract: 265 words

Text: 3477 words

Pages: 20

Tables: 5

Figures: 0

Abstract

Objectives: The Tooty Fruity Vegie (TFV) project is a multi-strategic, school-based intervention, aimed at preventing the substantial decline in fruit and vegetable intake that typically starts during primary school. This paper reports project implementation and its impact on a range of knowledge, attitudinal and behavioural indicators amongst the children, their parents and teachers.

Methods: During 1999 and 2000, TFV was implemented in 10 volunteer primary schools across the Northern Rivers region of New South Wales. Surveys were conducted, in late 2000, with children, parents, teachers and principals across nine intervention and three matched control schools. Intervention schools' management teams also completed Strategy Implementation Indexes indicating how often, how well and with how many people each major strategy was implemented.

Results: Completed surveys from 613 parents (59%), 392 older children (65%), 50 teachers (81%) and all 10 intervention principals and school management teams showed the project was well implemented, achieved high reach and was very positively received. The project enhanced the quality, diversity and frequency of classroom fruit and vegetable promoting activities, substantially increasing children's involvement and enjoyment levels. It significantly improved children's fruit and vegetable knowledge, attitudes, access and preparation skills; parents' knowledge and involvement in fruit and vegetable promoting activities in schools and beyond; and teachers' perceived support for doing school-based fruit and vegetable promotions.

Conclusion: Despite some methodological limitations, which may limit confidence in our findings, survey results across all target groups consistently indicated that primary schools can be supported to establish, implement and sustain highly acceptable and effective fruit and vegetable promoting programs.

Implications: TFV is a resource-efficient investment for health services to improve children's access to, and motivation to eat more, fruits and vegetables, with long-term implications for many major diseases.

Key words: fruits & vegetables, intervention, primary school children

Introduction

Eating enough fruits and vegetables is one of the clearest, evidence-based dietary health promotion messages: with inadequate intakes consistently and strongly associated with increased incidences of many cancers, cardiovascular and coronary disease¹⁻³. While intake levels appear adequate among pre-schoolers, they become increasingly inadequate as children get older⁴⁻⁶, with most Australian adults' diets also falling well below recommended daily intakes^{4, 7, 8}. Therefore, we developed a fruit and vegetable promoting intervention for primary schools, drawing on the successes and lessons learned from similar Australian and overseas projects⁹⁻¹⁵, as well as broader health promotion and behaviour change theories^{16, 17}.

The Tooty Fruity Vegie (TFV) project is a two year, multi-strategy program, which ran in 10 primary schools during the 1999 and 2000 school years. As summarised in Table 1, TFV promoted a whole-of-school approach, aiming to create a supportive environment by developing, and helping schools implement, fruit and vegetable promoting educational resources and activities for children, their parents, teachers, schools, school canteens and the broader community¹⁸⁻²⁰. Each school formed a TFV School Management Team (TFV-SMT) to oversee implementation in their school, supported by a TFV Project Officer from the Health Promotion Unit. TFV-SMTs chose the strategies to be implemented in their school, organised their implementation, monitored responses and modified them as needed. Small annual implementation grants (\$270 – \$750) were available, based on need.

INSERT TABLE 1 ABOUT HERE

This paper reports findings from our impact evaluation, which explored its impact on a range of knowledge, attitudinal and behavioural indicators amongst the children, their parents and teachers. It also presents highlights from our process evaluation, which explored how well each major intervention strategy was implemented and received by children, their parents and school communities. More process evaluation data are available elsewhere²⁰.

Methods

Sample

In late 1998, 10 Northern Rivers primary schools volunteered as intervention schools. Another six were recruited as demographically and geographically matched controls. During the two-year intervention period, 1,589 children were enrolled across intervention schools and 1,272 across control schools.

In November 2000, all 16 schools were asked to participate in a range of surveys (see Materials section) to assess how well the project was implemented and received and its effect on relevant impact indicators, such as children's, parents' and teachers' knowledge, attitudes and behaviours regarding fruits and vegetables. In consenting schools, the principal and all parents, teachers and currently-enrolled, older children (Years 3 – 6) were asked to complete surveys.

Data Collection Materials

We drafted, pilot-tested and revised surveys for each target group (copies available from: www.nrahs.nsw.gov.au/population/promotion/tooty_fruity)²⁰. Each survey assessed a range of process and impact indicators, as summarised in Table 2. Except for the principals' survey, which was mostly open-ended, most survey questions were closed-ended, involving various four-point Likert scales, as detailed in the Results section's tables and text. However, each survey ended with an open question offering respondents the opportunity to make comments about the project or survey. The children's survey had an additional open question, asking children to name their five favourite foods. The Strategy Implementation Index was developed using best practice principles for process evaluation²¹.

INSERT TABLE 2 ABOUT HERE

Data Collection Procedures

Parents' and children's surveys

Trained TFV Data Collectors visited each class in consenting intervention and control schools during November and December 2000 to explain and distribute parent surveys for children to take home. Surveys were accompanied by letters explaining the purpose and importance of the data collection, and consent forms, for parents of Year 3 – 6 children, to indicate their consent (or otherwise) for their children to be surveyed. Data Collectors returned to each class the next day to collect completed parent surveys, conduct the children's surveys and leave reply paid envelopes with class teachers for late-arriving surveys. Children without parental consent forms completed surveys, which they took home to be returned, if their parents agreed. This survey was intended for Year 4 – 6 children but some Year 3 children also participated, due to mixed year classes.

Teachers' survey

Data Collectors also distributed teacher surveys, with self-completion instructions, as they visited each class. Completed surveys were collected on the return visit or sent back in the reply paid envelopes.

Principals' survey

An independent consultant (the fourth author) conducted structured telephone surveys with intervention school principals during December 2000.

Strategy Implementation Index

During November and December 2000, each intervention school's TFV-SMT completed a Strategy Implementation Index about the project's implementation in their school, assisted by their TFV Project Officer, who also looked back over meeting minutes for other relevant information to be incorporated.

Analyses

All data were entered, cleaned and analysed using SAS²². Analyses were confined to frequency distributions, calculation and comparison of mean scores and cross tabulations between intervention and control groups. Cross tabulations by age and gender were also conducted within the intervention group for the children's survey (cell sizes were too small for similar analyses within the control group). Significance of differences between groups in two by two comparisons of categorical data were tested using two-tailed, continuity-adjusted chi squares or Fishers' Exact Tests, depending on sample sizes. For larger tables, standard chi squares were used. For continuous data comparisons, t-tests or Wilcoxon rank sum tests were used, depending on data distributions. A 0.05 significance level was applied to all analyses.

Ethics

The TFV project was approved by the Northern Rivers Area Health Service Human Research Ethics Committee and by the NSW Department of Education and Training's Strategic Information and Reporting Section.

Results

Response Rates

Schools

Nine intervention and three control schools participated. Non-consenting control schools felt it too onerous for staff or families. From baseline data, the participating control schools were representative of all six in relation to size, geography, response rate, socioeconomic and fruit and vegetable consumption variables. All intervention schools completed a Strategy Implementation Index.

Individuals

Surveys were completed by 613 parents (59% of families with currently-enrolled children), 392 children (65% of currently-enrolled children in eligible age-group), 50 teachers (81%) and 10 intervention principals (100%). Response rates were similar between intervention and control groups, except more intervention than control teachers participated (87% vs 60%; continuity-adjusted $\chi^2 = 3.800$, $p=0.05$).

Demographic characteristics

Children

Overall, 48% of child respondents were male, 34% were in Years 3 – 4 and 80% attended schools throughout the whole intervention period. There were no significant differences between intervention and control groups on gender balance or proportion enrolled throughout the intervention. However, as fewer surveyed control school classes included Year 3 children, there were significantly more older children (Years 5 – 6) in the control group (86% vs 60%; continuity-adjusted $\chi^2 = 18.718$, $p<0.0001$).

Parents

Each primary school year, from Kindergarten through Year 6, was represented by a fifth to a quarter of responding parents, showing good representation across all student years.

Teachers

Thirty seven intervention (90%) and all nine control teachers taught at the schools throughout all, or almost all, the intervention period, with good representation across all student years.

Implementation of, and Attitudes Towards, the TFV Project Overall

The process results from the various surveys, which are detailed more thoroughly elsewhere, consistently demonstrated, that most key TFV strategies were well implemented, reached the vast majority of their target groups and were positively received²⁰. The most memorable activities for intervention school children were *Kids in the Kitchen* cooking classes, canteen promotions and classroom lessons. The most enjoyed activities were cooking classes, school trips to growers/markets, fruit and vegetable tastings and growing fruits and vegetables²⁰.

From the teachers' and principals' surveys, the cooking classes, fruit and vegetable tastings, gardens and visits to growers and markets were consistently considered the most successful strategies at

improving children's fruit and vegetable knowledge, attitudes and skills. Their fun and practical nature, parental involvement and whole-of-school approach were seen as key factors in their success. These four activities were also among those rated the most successful at achieving teachers' goals in relation to the Personal Development /Health /Physical Exercise component of the curriculum²⁰.

All principals felt the project met or exceeded their expectations, rating it as excellent or very good for: providing teaching resources and training, teacher motivation, organisation of activities, response to requests, communication to parents and level of funding²⁰.

Impact on Children

Children's knowledge about recommended fruit and vegetable intakes

Significantly more intervention than control school children correctly identified the recommended daily intake of two serves of fruit (69% vs 48%; continuity-adjusted $\chi^2 = 11.302$, $p < 0.001$). Although more intervention school children also identified the correct recommended daily intake of three serves of vegetables, this difference was not significant (30% vs 21%). No gender or age differences in fruit and vegetable knowledge were found among intervention children. Parents perceived larger impacts, with significantly more intervention than control school parents reporting that, since participating in fruit and vegetable promoting activities at school, their children seemed to know more about fruits (51% vs 28% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 13.420$, $p < 0.0005$) and vegetables (47% vs 21% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 18.780$, $p < 0.0001$).

Children's attitudes towards fruits and vegetables

When asked their five favourite foods, intervention school children nominated significantly more fruits (41% vs 19% named 2 - 5; $\chi^2 = 15.282$, $p < 0.0005$), vegetables (17% vs 8% named 2 - 5; $\chi^2 = 9.640$, $p < 0.01$) and meals containing them (27% vs 10% named 2 - 5; $\chi^2 = 11.944$, $p < 0.005$) than control school children. In the intervention group: older children were more likely to name meals containing fruits or vegetables (73% vs 58% at least one meal, 33% vs 19% more than one meal; $\chi^2 = 10.816$, $p < 0.005$); younger children were more likely to name two or more fruits (51% vs 34%; $\chi^2 = 9.416$, $p < 0.01$); and girls were more likely than boys to name two or more fruits, vegetables, or meals with them in their top five foods (93% vs 86%; $\chi^2 = 6.221$, $p < 0.05$).

As shown in Table 3, intervention school children also showed more positive attitudes towards fruits and vegetables than control school children. They also reported more changes in these attitudes since doing fruit and vegetable activities at school. The TFV project seemed to have more impact on younger children's attitudes, with significant differences between younger and older intervention school children on three of these eight statements.

INSERT TABLE 3 ABOUT HERE

More intervention than control school parents perceived that doing fruit and vegetable activities at school had increased their children's interest in fruits (46% vs 31% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 5.065$, $p < 0.05$) and vegetables (35% vs 23% "a fair bit / a lot"), although only the former was statistically significant. Similarly, seven of 10 principals considered the TFV project very or extremely successful in creating positive attitudes in children towards fruits and vegetables.

Children's perceived fruit and vegetable preparation skills

Intervention school children reported better self-efficacy at preparing fruits and vegetables than control children: 74% vs 49% agreed "I'm good at preparing fruit and veg" (continuity-adjusted $\chi^2 = 19.130$, $p < 0.0001$) and 93% vs 84% agreed "I can get my own fruit and veg snacks at home" (continuity-adjusted $\chi^2 = 3.751$, $p = 0.05$). No age or gender differences were found among intervention children.

Children's access to fruits and vegetables

As shown in Table 4, more intervention than control school children reported positive changes in access to fruits and vegetables at home and encouragement to eat them, although differences were not statistically significant. Younger children's access seemed more improved, as they were more likely than older children to report: "We have more fruit at home now" (69% vs 54% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 6.326$, $p < 0.05$); "We have more veg with our meals now" (65% vs 53% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 3.791$, $p = 0.05$); and "We are growing more veg or fruit at home now" (54% vs 31% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 14.881$, $p < 0.0005$). Girls' access also seemed more improved, with intervention school girls more likely than boys to report: "We have more fruit at home now" (66% vs 53% "a fair bit / a lot"; continuity-adjusted $\chi^2 = 5.001$, $p < 0.05$).

INSERT TABLE 4 ABOUT HERE

Intervention school children's access to fruits and vegetables in the school environment also seems to have improved. Significantly more intervention than control school children recalled eating fruits and/or

vegetables in school cooking classes (87% vs 19%; continuity-adjusted $\chi^2 = 148.341$, $p < 0.0001$), from school canteen promotions (73% vs 24%; continuity-adjusted $\chi^2 = 68.221$, $p < 0.0001$), at tastings at special school events (64% vs 25%; continuity-adjusted $\chi^2 = 38.979$, $p < 0.0001$) and in classroom tastings (55% vs 14%; continuity-adjusted $\chi^2 = 43.912$, $p < 0.0001$).

Impact on Parents

Parents' knowledge about recommended fruit and vegetable intakes

Significantly more intervention than control school parents correctly identified recommended daily intakes of two serves of fruit (72% vs 63%; continuity-adjusted $\chi^2 = 4.313$, $p < 0.05$) and three serves of vegetables (48% vs 28%; continuity-adjusted $\chi^2 = 17.062$, $p < 0.0001$).

Parents' perceived fruit and vegetable preparation skills and behaviours

Although not significantly different, slightly more intervention school parents reported “ever” and “current” usage of various strategies encouraging children to eat more fruits and vegetables. Yet, in the open-ended question, 36 parents spontaneously commented that the TFV project had made it easier for them to promote fruits and vegetables to their children.

Parents' involvement in fruit and vegetable promoting activities

Significantly more intervention than control school parents reported involvement in planning and/or doing a fruit and vegetable promoting activity at their children's schools during the intervention period: including cooking classes (22% vs 3% involved; continuity-adjusted $\chi^2 = 28.295$, $p < 0.0001$); canteen promotions (21% vs 8% involved; continuity-adjusted $\chi^2 = 11.012$, $p < 0.001$); and special event promotions (26% vs 14% involved; continuity-adjusted $\chi^2 = 9.467$, $p < 0.005$). Consequently, intervention school parents reported involvement in more fruit and vegetable school activities than control school parents (mean 0.69 vs 0.25 activities; $t = 6.502$, $p < 0.0001$).

These results were supported by the principals' surveys: nine of 10 intervention school principals agreed “Parents are keen to help with school fruit and vegetable promotions like cooking classes” and most principals felt volunteers responded more positively to TFV activities than other school activities. Similarly, significantly more intervention than control school teachers agreed “Parents are keen to help with school fruit and vegetable promotions (eg: cooking classes)” (83% vs 22% agreed; Fishers Exact Test, $p < 0.01$) and disagreed that “Parents aren't really interested in fruit and vegetables being promoted to children at school” (76% vs 11% disagreed; Fishers Exact Test, $p < 0.05$).

Impact on Teachers

Teachers' knowledge about recommended fruit and vegetable intakes

No significant differences were found between intervention and control school teachers' knowledge about recommended daily fruit (78% vs 73%, respectively) and vegetable intakes (both 56%).

Teachers' attitudes towards fruit and vegetable promoting activities at school

Although not statistically significant, more intervention teachers (98% vs 78%) reported motivation to teach about fruits and vegetables and felt it an appropriate issue for schools: 80% vs 67% disagreed "I'm irritated about Health Dept agendas in the school environment" and 56% vs 44% disagreed "Encouraging children to eat fruit and vegetables is a family, not a school, responsibility". These views were shared by intervention principals: all disagreed with the former statement and all but one disagreed with the latter. Principals were unanimous that teachers' responded more positively to TFV than to previous school health promotion projects, attributing this to TFV's whole-of-school approach, provision of concrete objectives for the children, classroom manuals, funding and other support²⁰.

Teachers' perceived fruit and vegetable teaching skills

Five of 41 (12%) intervention school teachers completed the nutrition teaching program offered via the National Nutrition Education in Schools Project²³, with all rating it as 'fairly useful'. A further four (10%) reported other nutrition training, via the TFV project, in the last two years, rating it as a little useful (n = 1), fairly useful (n = 2) or very useful (n = 1). No control school teachers undertook any nutrition training in that time. Given the sample sizes involved, these differences were not statistically significant.

As shown in Table 5, although only one difference was statistically significant, more intervention than control school teachers expressed confidence and support for teaching children about fruits and vegetables. Interestingly, the one significant difference was in relation to perceived support from external health professionals, suggesting the teachers appreciated the support of the TFV project staff.

INSERT TABLE 5 ABOUT HERE

Discussion

Our results indicate the TFV project was well implemented and positively received. It significantly improved children's fruit and vegetable knowledge, attitudes, access and preparation skills; parents' knowledge and involvement in fruit and vegetable promoting activities in schools and beyond; and teachers' perceived support for doing school-based fruit and vegetable promotions.

The major limitation of our evaluation is that, due to financial constraints, impact indicators were not collected before the project started. Therefore, post-intervention differences between intervention and control respondents may have existed before, and not as a result of, the intervention. However, information was triangulated across all survey instruments with very consistent results and the magnitude of many intervention-control differences make that explanation unlikely.

The quasi-experimental nature of this project, whereby schools volunteered for the intervention, will also be a concern to some readers. However, the literature indicated that schools taking ownership was important to optimise success^{11, 21, 24}. This was best achieved by voluntary participation, which also allowed clearer behavioural contracting, whereby each partner knew their obligations and expectations and which we feel was a major contributor to the project's success.

Activities other than TFV are unlikely to have contributed to the differences reported. Tri-annual mailed surveys of community health staff identified no other nutrition-related health education in intervention schools during the intervention period.

We are confident that the evaluation survey instruments were valid indicators of project implementation, reach and impact. While formal psychometric testing was not feasible within the project budget, all instruments had face validity and were piloted to check understanding and obvious gaps. Consistent results across instruments indicates convergent validity and consistent differences between intervention and control respondents' answers, where expected, indicate concurrent validity.

While less than optimal, given the need for active parental consent, response rates (parent = 59% and child = 65%) were reasonable and rates were comparable across intervention and control groups. Despite the high teacher (81%) response rate, their small numbers resulted in a lack of power to detect significant differences between intervention and control groups. Another potential sampling issue is the higher proportion of older children in the control group, which could mediate TFV's impact on a few indicators. However, as most indicators showed no significant age-related differences, it is unlikely to impact on most indicators.

Formal cluster adjustments of our results is technically appropriate, given the clustering of respondents within schools. However, such adjustments are complex and time-consuming, especially with many indicators from many target groups. Given the consistency and magnitude of the results presented we considered such adjustments of little practical significance and did not make them with these data.

However, hierarchical multi-level modelling is being used in our analyses of TFV's impact on children's fruit and vegetable intakes.

A strength of the current study is the variety of schools involved and the consistently positive reception to the project. School sizes ranged from under 20 to over 350 students, with government and Catholic-church schools included. Most intervention schools were in areas with relatively low socio-economic profiles and three had substantial proportions of Indigenous families, groups found harder to reach in other studies²⁵.

Confidence in our results (see project report for the full range²⁰) is enhanced by their concordance with similar overseas studies indicating: the importance of quality teacher training, curriculum and canteen components^{12, 25, 26}; the importance and difficulties of achieving high parental involvement^{11, 12, 24-26}; improved parental involvement by using incentives and scheduling activities to coincide with other school events^{11, 25, 26}; higher recall among children having done fruit and vegetable activities at school²⁴; higher awareness among parents of their children having done the fruit and vegetable activities²⁶; and higher recall and enjoyment of hands-on and tasting activities^{12, 24, 26}.

Confidence in TFV's acceptability and sustainability is also enhanced by the fact that all 10 original intervention schools continue implementing TFV strategies, now over three years since the supported intervention ended. Two additional implementation phases of the project within the Northern Rivers region have been over-subscribed with enthusiastic schools and the project is now being implemented in other regions, via 23 health professionals, from three states, who attended a training workshop in 2003.

Conclusions

Primary schools can be supported to establish, implement and sustain the TFV program, which enhanced the quality, diversity and frequency of classroom fruit and vegetable promoting activities, resulting in improvements in many knowledge, attitudinal and behavioural indicators amongst children, parents and teachers. The project was developed and implemented in 10 schools by the equivalent of one full-time Project Officer, making it a very resource efficient investment. Potential long-term public health benefits include reduced cancers, diabetes and cardiovascular disease.

Acknowledgments

This first phase of the Tooty Fruity Vegie project was funded by the Health Promotion Unit, Northern Rivers Area Health Service, with additional support from The Cancer Council NSW. The authors would like to thank Denise Hughes for her tireless efforts in organising the collection, processing and data entry of the many surveys; Jan Reynolds for donating her time, energy and experience to train teachers in the National Nutrition Education in Schools program; the NSW Department of Education, Catholic Education, Parents and Citizens Associations, schools, teachers, students and their parents for participating in the program and the various data collections; the numerous Community Health and Health Promotion Unit staff and Nutrition and Dietetics students who helped with delivering the Tooty Fruity Vegie program in schools and with conducting the various data collections; the Western Australian “Kids in the Kitchen” project, the National Nutrition Education in Schools program, the Queensland Fruit and Vegetable Growers, the NSW Fresh Fruit and Vegetable Industry, the Charge Through Your Day project and the many other organisations who generously shared their resource materials; and the Australian Gardening Industry, the Nurserymen’s Association, Daley’s Nursery, Yates and Mr Fothergills for donating, or providing cost price, seeds, trees and planting kits for use in school fruit and vegetable gardens.

References

1. Joshipura KJ, Ascherio A, Manson JE, Stampfer MJ, et al. Fruit & vegetable intake in relation to risk of ischemic stroke. *JAMA* 1999;282(13):1233-1239.
2. Ness AR. Fruit and vegetables and cardiovascular disease: a review. *Int J Epidemiol* 1997;26:1-13.
3. Block G, Patterson B, Subar AF. Fruit vegetables, & cancer prevention: a review of the epidemiological evidence. *Nutr Cancer* 1992;18:1-29.
4. Australian Bureau of Statistics. *National Nutrition Survey: Selected Highlights, Australia 1995*. Canberra: Australian Bureau of Statistics, 1995.
5. Australian Horticultural Corporation. *Children's Food & Beverage Survey*. Sydney: Research & Development Corporation, 1996.
6. Cashel K, Jeffreson S. *The Core Food Groups: The Scientific Basis for Developing Nutrition Education Tools*. Canberra: National Health & Medical Research Council, 1994.
7. Stickney B. *Food and Nutrition in NSW: A Catalogue of Data*. Sydney: NSW Health, 1994.
8. Commonwealth Scientific and Industrial Research Organisation. *What are Australians Eating? Results from the 1995 and 1990 Victorian Nutrition Surveys*. Melbourne: Food and Nutrition Program Victoria, 1993.
9. Gortmaker SL, Cheung LWY, Peterson KE, Chomitz G, et al. Impact of a school-based interdisciplinary intervention on diet and physical activity among urban primary school children: eat well and keep moving. *Arch Pediatr Adolesc Med* 1999;153(9):975-983.
10. Reynolds KD, Franklin FA, Binkley D, Raczynski JM, et al. Increasing the fruit & vegetable consumption of fourth-graders: results from the High 5 Project. *Prev Med* 2000;30(4):309-319.
11. Baranowski T, Davis M, Resnicow K, Baranowski J, et al. Gimme 5 fruit, juice, & vegetables for fun & health: outcome evaluation. *Health Educ Behav* 2000;27(1):96-111.
12. Story M, Mays RW, Bishop DB, Perry CL, et al. 5-a-day power plus: process evaluation of a multicomponent elementary school program to increase fruit & vegetable consumption. *Health Educ Behav* 2000;27(2):187-200.
13. Stafford H. *A Case for Promoting an Increase in the Consumption of Fruit and Vegetables in NSW*. Sydney: NSW Health, 1997.
14. Contento I, Balch GI, Bronner YL, Lytle LA, et al. The effectiveness of nutrition education & implications for nutrition education policy, programs & research: a review of research. *J Nutr Educ* 1995;27:381-415.
15. National Heart Foundation. *Feasability Study on Food Skills Development*. Melbourne: NHF, 1997.

16. St Leger L. The HIPS project - schools & communities promoting better health for young children. *Health Promotion J Aust* 1993;3(1):6-8.
17. World Health Organization, Health & Welfare Canada, Canadian Public Health Association. *Ottawa Charter for Health Promotion*. Ottawa: WHO, 1986.
18. Adams JK, Huddy AD, Holden L, Newell SA, et al. The Tooty Fruity Vegie Project - a collaboration between education, health and the community. *Health Educ Aust* 2003;3(1):17-21.
19. Adams JK, Huddy AD, Holden L, Newell SA, et al. Tooty Fruity Vegie - A recipe for successful volunteer participation in primary schools. *Health Promotion J Aust* 2003;14:187-191.
20. Miller M, Newell S, Huddy A, Adams J, et al. *Tooty Fruity Vegie Project: Process and Impact Evaluation Report June 2001*
(http://www.nrahs.nsw.gov.au/docs/tooty_fruity/evaluation/tfvreport.pdf). Lismore: Health Promotion Unit - Northern Rivers Area Health Service, 2001.
21. Baranowski T, Stables G. Process evaluations of the 5-a-day projects. *Health Educ Behav* 2000;27(2):157-166.
22. SAS Institute. *The SAS System for Windows version 8.02*. Cary NC: SAS Institute, 2001.
23. Reynolds J, Dommers E. Translating a theoretical framework for food and nutrition education into classroom education. *J Home Economics Inst Aust* 1995;2(4):7-13.
24. Nicklas TA, O'Neil CE. Process of conducting a 5-a-day intervention with high school students: gimme 5. *Health Educ Behav* 2000;27(2):201-212.
25. Reynolds KD, Franklin FA, Leviton LC, Maloy J, et al. Methods, results, and lessons learned from process evaluation of the high 5 school-based nutrition intervention. *Health Educ Behav* 2000;27(2):177-186.
26. Davis M, Baranowski T, Resnicow K, Baranowski J, et al. Gimme 5 fruit and vegetables for fun and health: process evaluation. *Health Educ Behav* 2000;27(2):167-176.

Table 1: Tooty Fruity Vegie project's key strategies

<u>Classroom-oriented strategies</u>	<u>Parent -oriented strategies</u>
<ul style="list-style-type: none"> • Teacher training via the National Nutrition Education in Schools program. • Classroom Activity Manuals promoting innovative ways of teaching about F&V across all key learning areas –tailored for different age groups (Kindy – Year 2, Years 3 & 4, Years 5 & 6). • Additional resources to help teachers incorporate F&V related learning activities into the curriculum. • Non-teachers trained to run fun F&V cooking classes (Kids in the Kitchen) in schools (+ given apron and recipe book). • Posters listing web sites with F&V information or activities for teachers and/or students. • Age-specific F&V related competitions. 	<ul style="list-style-type: none"> • Cooking classes to increase knowledge and strategies for healthy eating . • F&V promoting flyers and newsletter articles, prepared by TFV staff, distributed via school newsletters. • Promotional F&V tastings for parents, who were encouraged to participate in planning and implementing of these events. • F&V promoting merchandise (eg: calendars, fridge magnets) – for distributing to all parents. • Competition asking parents to send in their handy hints for getting their children to eat F&V.
<u>School environment-oriented strategies</u>	<u>School canteen-oriented strategies</u>
<ul style="list-style-type: none"> • Resources to establish F&V gardens. • Visiting F&V growers and markets. • Reviewing food policies to promote F&V (eg: using healthier food items for rewards and fund raising). • Appraisal and feedback about F&V in lunchboxes. • Displaying materials promoting F&V as “cool”. • Running healthy breakfast programs, including F&V. • Having F&V tastings at school events. • Reproducing and distributing winning posters from children's competition. 	<ul style="list-style-type: none"> • Gaining and maintaining accreditation with state School Canteen Association. • Canteen Manuals and Workbooks aimed at increasing F&V sales. • Modifying canteen menus to promote healthy foods and drinks. • Networking with schools making good profits from healthy canteen sales. • Helping recruit new canteen workers via school newsletters articles and Project Management Teams.
<u>Sustainability-oriented strategies</u>	
<ul style="list-style-type: none"> • Recruiting and training volunteers to help with implementing many TFV strategies, especially with cooking classes and establishing F&V gardens. • Involving local community health and education support staff, where relevant. • Liaising with local fruit shops, corner stores, after school care services and food outlets associated with children's sporting activities re: promoting F&V sales and sponsoring the TFV project locally. 	

NB: F&V = fruit and vegetable

Table 2: Process and impact indicators included in survey instruments

Survey instrument	Process indicators	Impact indicators
Children's survey (Years 3 – 6)	<ul style="list-style-type: none"> • awareness of TFV and other F&V promoting campaigns • levels of participation in, and enjoyment of, F&V activities at school 	<ul style="list-style-type: none"> • knowledge and attitudes regarding F&V • perceived efficacy at preparing F&V snacks and meals • perceived changes in F&V attitudes and consumption due to activities at school
Parents' survey	<ul style="list-style-type: none"> • awareness of TFV and other F&V promoting campaigns • awareness of their children's participation in, and enjoyment of, F&V activities at school 	<ul style="list-style-type: none"> • knowledge about children's required F&V consumption levels • F&V preparation skills and behaviours for encouraging their consumption • involvement in, and enjoyment of, F&V promoting activities at their children's school • involvement in F&V promoting activities in other settings • perceived changes in their children's F&V knowledge, attitudes and consumption due to F&V activities at school
Teachers' survey	<ul style="list-style-type: none"> • awareness of TFV and other F&V promoting campaigns • utilisation and ratings of the various F&V promoting resources • utilisation and ratings of various F&V promoting activities 	<ul style="list-style-type: none"> • knowledge about children's required F&V consumption levels • attitudes towards teaching about F&V in schools • perceived efficacy at teaching about F&V • perceptions of parents' attitudes towards, and willingness to participate in, F&V promoting activities at school
Principals' survey	<ul style="list-style-type: none"> • reasons for participating in, expectations of and satisfaction with the TFV project overall • perceptions of the level and acceptability of the TFV project's demands on their own time, other teachers' time, school volunteers and the school community generally • perceptions of teachers' and volunteers' reactions to the TFV project 	<ul style="list-style-type: none"> • perceived success of the various TFV strategies in their school • perceived success of the TFV project overall at improving children's F&V attitudes and consumption • intentions to continue with the various TFV strategies and perceived support required to do so
Strategy Implementation Index	<p>For each key TFV strategy:</p> <ul style="list-style-type: none"> • Reach – proportion of the target group (eg: children, parents, teachers) exposed • Frequency – number of times in a year the target group were exposed • Quality – the quality of implementation • Sustainability – likelihood of being implemented again in the school 	N/A

NB: F&V = fruit and vegetable

Table 3: Children's attitudes towards fruits and vegetables

Statement	% of children			
	Agree a little / a lot		Disagree a little / a lot	
	I (n = 307)	C (n = 85)	I (n = 307)	C (n = 85)
General attitude				
Eating fruit and veg every day keeps me healthy ^a	96	92	3	8
Attitudes to vegetables				
I like trying new veg ^d	75	55	21	45
Most veg tastes good ^c	74	58	22	42
I like raw veg	54	45	46	49
My friends eat lots of veg	50	45	42	55
Most of my friends like raw veg as snacks ^b	33	19	59	81
I hate cooked veg	25	21	72	79
Attitudes to fruit				
I like trying new fruit	87	86	8	14
My friends eat lots of fruit ^a	68	61	24	39
Most of my friends like fruit as a snack	65	61	25	39
Most fruit tastes bad	10	15	87	85
% of children reporting being ...				
Perceived changes since fruit & veg activities	affected not at all / a little		affected a fair bit / a lot	
	I (n = 300)	C (n = 58)	I (n = 300)	C (n = 58)
I know that fruit and veg are healthy for me ^f	9	12	90	81
I know that fruit and veg can taste good now ^{c,e}	33	55	66	40
I am interested in trying new fruit ^e	38	36	61	57
I ask for more fruit and veg at home ^a	42	57	57	38
I want to eat more fruit now	45	45	55	50
I think fruit and raw veg are good for snacks ^e	46	53	53	40
I am interested in trying new vegetables ^e	54	55	45	38
I want to eat more vegetables now ^a	59	74	41	21

NB: I = intervention group; C = control group; row percentages may not add to 100% due to missing values and 'don't know's

^a = Significantly different between I & C at p<0.05 ^b = Significantly different between I & C at p<0.01

^c = Significantly different between I & C at p<0.001 ^d = Significantly different between I & C at p<0.00005

^e = Years 3-4 I children significantly more likely than Years 5-6 I children to report being affected a fair bit or a lot, p<0.05

^f = I girls significantly more likely than I boys to report being affected a fair bit or a lot, p<0.05

Table 4: Children's reported changes in access and encouragement to fruits and vegetables at home

Perceived changes since fruit & veg activities	% of children reporting being ...			
	affected not at all / a little		affected a fair bit / a lot	
	I (n = 300)	C (n = 58)	I (n = 300)	C (n = 58)
I get my own fruit or veg snacks at home more often	38	40	62	53
We have more fruit at home now ^{a,b}	40	38	59	50
My parents tell me fruit or veg are healthy for me more often	41	34	58	53
We have more veg with our meals now ^{a,b}	42	36	57	52
My parents encourage me to try new fruits or veg at home	46	33	54	55
My parents let me make their own healthy snacks or help with cooking fruit or veg recipes more often	46	42	53	47
I do healthy cooking with fruit and veg more often at home	56	60	43	33
We are growing more veg or fruit at home now ^a	60	53	40	34
My parents talk to me more about which fruit and veg I like now	73	64	27	24

NB: I = intervention group; C = control group; row percentages may not add to 100% due to missing values and 'don't know's

^a = Years 3-4 I children significantly more likely than Years 5-6 I children to report being affected a fair bit or a lot, $p < 0.05$

^b = I girls significantly more likely than I boys to report being affected a fair bit or a lot, $p < 0.05$

Table 5: Teachers' perceptions of their fruit and vegetable promoting skills and support

Statement	% of teachers			
	Agree / strongly agree		Disagree / strongly disagree	
	I (n = 41)	C (n = 9)	I (n = 41)	C (n = 9)
The principal supports me promoting fruit and vegetables to children	95	67	5	0
The other teachers support me promoting fruit and vegetables to children	90	78	5	0
I get little support from external health professionals to promote fruit and vegetables to children ^a	10	44	85	22
I'm unsure of my ability to teach children to eat plenty of fruit and vegetables	7	11	93	67

NB: I = intervention group; C = control group; row percentages may not add to 100% due to missing values and 'don't know's

^a Significantly different between I and C at $p < 0.01$