INTERVENTION TABLE 11

Provision of Fruits and Vegetables

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
United States						
Williamson, Copeland (2007) No location specified	Wise Mind Study-Physical activity component: Teacher supplies (bean bags, balls) to promote play during class time/ recess, lesson plans for academic games involving the equipment ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School policies to modify school menus to include: 1. Five fruit and vegetable servings per day 2. <30% of dietary energy from total fat 3. <10% of dietary energy from saturated fat 4. 20 to 30 g fiber per day *Complex:* 1. Family component: Newsletters, weight gain prevention website, school assemblies for families promoting healthy eating, increased PA/ decreased sedentary behavior. 2. Posters promoting physical activity centers	***DESIGN:*** Group randomized trial ***DURATION:*** 2 academic years ***SAMPLE SIZE:*** 586 students in grades 2-6 (313 intervention- healthy eating & exercise [HEE], 348 control- alcohol/ drug/tobacco use prevention [ADT]) from 4 private schools (2 HEE, 2 ADT) ***PRIMARY OUTCOME:*** Overweight/ obesity ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], percent body fat) 2. Digital photography (food selections, plate waste, food intake) 3. Self-administered physical activity checklist [SAPAC] (one day recall of physical activities and sedentary behaviors) 4. Godin-Shephard Leisure Time Physical Activity Questionnaire (intensity and frequency of physical activity during a usual week) 5. Child Depression Inventory-Short Form (mood) 6. Rosenberg Self Esteem Scale (self-esteem) 7. Children's Eating Attitudes Test (eating disorder symptoms) ***DATA COLLECTION:*** Body mass index (BMI) and BMI z-scores were calculated using height and weight. Percentage of body fat was collected using the Tanita body composition analyzer. Plate waste was photographed and analyzed by dietitians using the Pennington Biomedical Research Center nutrient database. The Godin-Shephard Leisure Time PA Questionnaire and the SAPAC are valid and reliable. ***LIMITATIONS:*** The number of schools was insufficient to allow controlled cluster randomization with adequate statistical power; small sample size; sample was predominantly white and middle class; self reported measures	6-11 year olds 94.9% White, 2.4% African American, 2.7% other racial groups (evaluation sample) ***ELIGIBILITY:*** Written consent from parents and students. ***EXPOSURE/ PARTICIPATION:*** All children at the 2 HEE schools were exposed to the school lunch changes and physical activity intervention.	***LEAD AGENCY:*** The research team and the schools ***THEORY/FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** An executive committee composed of school staff and research team members served as a policy and planning board during the planning phase. ***IMPLEMENTATION:*** The research team developed the intervention; worked with schools to garner support; trained cafeteria staff for meal preparation, portion size control and presentation of healthy food selections; trained teachers in healthy eating and exercise (6 sessions); and delivered the family component. The schools changed their menus, developed the health promotion program, and developed more opportunities for safe exercise. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Personnel (trainers, school staff) 2. Posters 3. Handouts 4. Menu boards 5. Parent newsletter 6. Physical activity equipment 7. Resources for events, incentives 8. Funds/ personnel to create/ maintain internet program ***FUNDING:*** National Institutes of Health ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Analysis of change in body mass index (BMI) z-scores from baseline as a function of treatment arm (intervention or control) indicated no significant effects related to treatment arm, (p=0.5458). 2. There was a negative correlation (r= -0.18) between baseline BMI z-scores and changes in BMI z-scores at 18 months for intervention and control, indicating that at risk for overweight and overweight children tended to either lose weight, relative to changes in height and age, or gain modest amounts of weight. 3. The success rates for weight gain prevention at month 18 for the intervention group were 51% and 54.7% for control. There was a positive correlation (r= 0.17) between baseline BMI z-scores and success of weight gain prevention for intervention and control, indicating that children with higher BMI z-scores at baseline were more likely to decrease or maintain their BMI z-score in comparison with children with lower baseline BMI z-scores. 4. Baseline % body fat (BF) was significantly associated with changes in % BF at 18 months, with lower levels of %BF at baseline being associated with greater increases in %BF during intervention period (r= -0.09, p<0.02). This indicates that fatter children (in both groups) at baseline tended to lose fat during the intervention at rates that were lower than those for children who were lean at baseline (r= -0.12, p <0.05 for control, r= -0.07, p>0.05 for intervention). ***PHYSICAL ACTIVITY:*** 5. Marginally significant effects of the intervention were observed for the physical activity checklist measure of physical activity. The intervention group was associated with increased minutes of physical activity (22 ± 4.8), while control group had a non-significant decrease in physical activity. The effect size for this difference was 0.23, (p=0.06). ***NUTRITION:*** 6. After 18 months, the intervention group was consuming fewer total calories (-59 ± 13.3, d=0.55) and lower percentages of calories from total dietary fat (-41 ± 3.4, d=0.61), saturated fat (-17 ± 1.2, d=0.49) and protein (-11 ± 4.0, d=0.60). The dietary changes were determined primarily by changes in food selections. ***OTHER:*** 7. Improvement in measures of depression, self-esteem and eating disorder symptoms were observed in both intervention and control groups (p<0.05).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Jamelske, Bica (2008) Wisconsin	United States Department of Agriculture (USDA) Fresh Fruit and Vegetable Program (FFVP) - Fresh fruits and vegetables provided at no cost to students in schools ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Nutrition education included in classroom curriculum to promote fruit and vegetable consumption.	***DESIGN:*** Non-randomized trial ***DURATION:*** March 2006 through the 2007 school year ***SAMPLE SIZE:*** 1,127 participants from subset of 10 intervention public schools (25 schools participated in the intervention) and 10 control schools ***PRIMARY OUTCOMES:*** Fruit and vegetable consumption and attitudes ***MEASURES:*** 1. Surveys included dietary recall (behavior) and students' willingness to try new fruits and vegetables at home and school, and as a snack over less healthy alternatives (attitude). ***DATA COLLECTION:*** School personnel administered pre-test surveys before the program began in March 2006 and post-test surveys after the end of the first school year (3 months later). Students reported their eating patterns using a list of 39 F&V for 3 consecutive days (average was calculated). Students answered questions regarding 23 foods they would, might, or would not eat (attitude). The research team conducted the data analysis. ***LIMITATIONS:*** Limited generalizability of results since not a random sample; use of self-report measures	9-15 year olds Lower income >70% White (evaluation sample) ***ELIGIBILITY:*** The schools were selected based on interest in the Wisconsin Fresh Fruit and Vegetable Program, geographic location, and number of students qualifying for free/reduced lunches ***EXPOSURE/ PARTICIPATION:*** 13,500 students from 25 public schools received the intervention	***LEAD AGENCY:*** School personnel (data collection), University of Wisconsin- Eau Claire Research Team (data analysis) ***THEORY/FRAMEWORK:*** Not reported Evidence-based: Study is built off previous effective school-based interventions that have provided students with fruits and vegetables at school ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The USDA Fresh Fruit and Vegetable Program provided the fruit and vegetables to students in schools. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Free fruit and vegetables from the USDA 2. Materials for nutrition education sessions 3. Places and equipment to store fruits and vegetables ***FUNDING:*** The USDA Fresh Fruit and Vegetable Program (intervention), University of Wisconsin-Eau Claire (evaluation) ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. 62.8% of intervention students with low initial consumption (<1 F&V per day) reported increased fruit and vegetable intake compared to 47.1% of control students (p=0.13). 2. Difference in reported fruit and vegetable consumption was 19.5% between intervention and control schools (p=0.07) after controlling for demographic and physical activity behaviors 3. Low consuming 4th grade students in the intervention schools (n=40) were 29.7% more likely than control students (n=17) to have increased their average daily fruit and vegetable intake (p=0.05). ***WILLINGNESS TO TRY F&V:*** 4. Intervention students were more willing to try a new fruit and vegetable at school than control students (24.8% vs. 12.8%, p<0.01 for fruits, 25.1% vs. 18.4%, p=0.01 for vegetables). 5. The multivariate probit regression model predicted that intervention students were 12.1% more likely to have experienced an increase in willingness to try a new fruit at school relative to control students (p<0.01), while the difference for a new vegetable was 6.7% (p=0.02). 6. When restricted to 4th grade students only (because these programs have the greatest potential to influence the behavior of younger children) there was greater willingness to try new fruits and vegetables compared to control (25.1% vs. 11.1%, p<0.01 for fruits; 26.7% vs. 12.2%, p<0.01 for vegetables). 7. Among 4th grade students, there was a significant difference in increased willingness to choose a vegetable as a snack instead of chips/candy for intervention students (24.3%) versus control students (14.8%), p=0.02. 8. When restricted to only those students most in need (with <1 F&V initial consumption) there was greater willingness to try new fruits and vegetables in intervention students compared to control (32% vs. 15% for fruits and vegetables, p=0.03 and 0.04, respectively).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Schneider, May (2006) Mississippi	Mississippi Fresh Fruit and Vegetable Pilot Program- Provision of free fruits and vegetables at school ***OTHER INTERVENTION COMPONENTS:*** *Multi-component*: Not reported *Complex:* 1. Nutrition education activities to promote and support consumption of fruits and vegetables	***DESIGN:*** Before and after study ***DURATION:*** 1 school year (2004-2005) ***SAMPLE SIZE:*** 660 students (grades 5, 8, and 10 from sample of 5 schools out of 25 total that participated in the pilot study) ***PRIMARY OUTCOMES:*** Fruit and vegetable consumption ***MEASURES:*** 1. Survey (variety of fruits and vegetables ever eaten, attitudes toward fruits and vegetables, willingness to try fruits and vegetables, degree of preference for and familiarity with fruits and vegetables, intention to eat fruits and vegetables) 2. 24 hr dietary recall interview (n=191) adapted from CATCH (changes in student consumption of fruits and vegetables during school year) ***DATA COLLECTION:*** The research team collected both measures at baseline (fall 2004) and at follow-up (spring 2005). 24 hr recall was conducted on a random sample of 191 students in grades 8 and 10 from 3 of the schools. The survey was administered during the school day to 600 students in grades 5, 8 and 10. ***LIMITATIONS:*** One group pretest-posttest design; limited sample size for the dietary recall interviews; self-reported measures; inability to attribute results to the program alone; limited generalizability - sample not representative of students in the pilot program or students in the entire state	10-16 year olds Grade 5: 53% Black, 35.1% White, 11.9% other Grade 8: 76.5% Black, 18.4% White, 5.1% other Grade 10: 71.2% Black, 27.4% White, 1.4% other (evaluation sample) ***ELIGIBILITY CRITERIA:*** Parental consent and student agreement was required ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools received the intervention	***LEAD AGENCY:*** The Mississippi Dept of Education Child Nutrition Program (intervention) and the research team from Mississippi Dept of Education, University of Mississippi, USDA and CDC (evaluation) ***THEORY/FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The Mississippi Department of Education-Child Nutrition Program initiated the Mississippi Fresh Fruit and Vegetable Pilot Program. The schools distributed fresh fruit and vegetables free of charge during the school day and provided the nutrition education activities. It was not reported who provided the fruits and vegetables. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Fresh fruits and vegetables 2. Materials for educational program 3. Places and equipment to store fruit ***FUNDING:*** Fresh Fruit and Vegetable Pilot Program through the Mississippi Department of Education ***STRATEGIES:*** Not applicable – pilot program	***NUTRITION:*** 1. Student consumption of fruit in school and overall increased significantly by 0.34 and 0.61 servings per day, respectively ($p<0.01$ for both) among the 8th and 10th grade students who participated in the dietary recall interviews. 2. Student consumption of vegetables in school decreased significantly (0.38 servings per day; $p=0.05$) but consumption of vegetables overall did not change among 8th and 10th grade students. 3. Intake of vitamin C increased overall, and intake of dietary fiber increased in school among 8th and 10th grade students (not significant). ***OTHER:*** 4. 8th grade students had significant increases in positive attitudes toward eating fruits and vegetables (+0.11, $p<0.01$), in their beliefs that they could eat more fruit (+0.20, $p<0.01$), and in their willingness to try new fruit (+0.17, $p<0.01$). 5. The willingness of 5th grade students to try new fruit and vegetables declined significantly (-0.17, $p=0.01$ and -0.20, $p=0.03$, respectively), as did their belief that they could eat more vegetables (-0.20, $p=0.04$). 6. Degree of preference for fruit increased significantly among 8th and 10th grade students (+0.03, $p=0.01$ and +0.05, $p<0.01$, respectively) but decreased significantly among 5th grade students (-0.05, $p=0.03$). 7. Degree of preference for vegetables decreased significantly among 5th and 8th grade students (-0.17, $p<0.01$ and -0.05, $p=0.01$, respectively) but remained unchanged among 10th grade students. 8. Intention to eat fruit increased among 10th grade students (+0.12, $p=0.01$) but not among 5th and 8th grade students.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
International						
Wind, Bjelland (2008); Klepp, Perez-Rodrigo (2005); Te Velde, Brug (2008); Perez-Rodrigo, Wind (2005) Norway, Spain, The Netherlands	Pro Children Study- Provision of fruits and vegetables (F&V) for free or paid subscription to students at school in Norway, the Netherlands and Spain ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Classroom component: 16 activities and web-based computer program to increase knowledge, preference for F&V and skills to ask for and prep F&V 2. Family component: Parent homework, newsletters and web-based computer program 3. Optional component: Community participation in Pro Children study encouraged through local media (Norway & Netherlands), schools (Spain) and grocery stores (Norway)	***DESIGN:*** Group Randomized Trial ***DURATION:*** 2 years ***SAMPLE SIZE:*** 1,472 students from 62 schools (Netherlands: 12 Intervention, 12 comparison; Norway: 9 intervention, 9 comparison; Spain: 10 intervention, 10 comparison). ***PRIMARY OUTCOME:*** Fruit and vegetable (F&V) intake ***MEASURES:*** 1. 24-H fruit and vegetable recall 2. Food frequency questionnaire [valid and reliable] (used to verify findings from 24-H recall) 3. Child and parent questionnaires ***DATA COLLECTION:*** Data collected at baseline, end of year 1 and end of year 2. 24-H recall measured total intake of F&V and intake of F&V separately during the previous day using 3 time intervals: 1) before school, 2) school time and lunch and 3) after school, supper and after supper. The food frequency questionnaire measured usual F&V intake and was used to verify the findings from the 24-H recall. The child questionnaire was completed during school hours in the presence of a project worker. Children received another questionnaire to take home for completion by one of their parents. ***LIMITATIONS:*** Distribution of F&V differed between the 3 countries; differential implementation of school curriculum and family components between and within countries; use of self-reported data; differences between intervention and control groups at baseline; significant differences between those who participated and those that dropped out of the intervention at first and second follow-up	10-13 year olds 28% children from Norway, 36.8% from Spain, 35.2% from the Netherlands ***ELIGIBILITY CRITERIA:*** Schools who responded to the invitation were included. Students were excluded if absent on day of data collection, transferred schools, lacked informed consent, returned unreliable questionnaires or did not return 24-H recall. ***EXPOSURE/ PARTICIPATION:*** All students in the intervention schools were exposed to the intervention. Parental questionnaires assessed involvement in the intervention	***LEAD AGENCY:*** School teachers (intervention) and research teams from each country (intervention development, evaluation) ***THEORY/FRAMEWORK:*** Social Cognitive Theory, the "attitude, social influences, self efficacy model," Theory of Triadic Influence ***EVIDENCE-BASED:*** Study builds off similar interventions conducted in the US and Europe, but investigates effectiveness of similar programs across countries ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Norway students received pre-existing F&V subscription program (Yr 2 Jan-June students received free F&V), Netherlands students received free F&V 2 days a week and Spain students received free fruit during first 2 months and then were asked to bring fruit from home 1-5 days/week. A special fruit break was implemented in all intervention schools in between one to five schooldays per week. In Spain, where children were able to eat school lunches, F&V were part of the school lunch at both the intervention and control schools 1-4 days per week. The research team developed the intervention and trained the teachers (1-day training), and the teachers implemented the intervention. The first year of the intervention was most intensive. During the second year, the school curriculum and the activities involving parents were much less extensive than compared with the first school year. ***FORMATIVE EVALUATION:*** Surveys of national representative samples of 11 year old children and parents in 9 European countries (determinants of F&V intake), literature review, focus groups with children and parents, pilot testing of intervention components, teacher panels, school staff survey (opportunities/ barriers). ***PROCESS EVALUATION:*** Classroom observations, school observation (foods available), community observations (proximity to food outlets, avail. of F&V), questionnaires/teacher logbooks, student assessments (appreciation of program), cost assessment (development, training, implementation)	***RESOURCES:*** 1. Nutrition curriculum 2. Funds for F&V 3. Newsletters 4. Computers for web-based tool 5. Places and equipment to store fruits and vegetables ***FUNDING:*** Commission of the European Communities ***STRATEGIES:*** Not Reported	***EATING BEHAVIOR:*** *Year one follow-up:* 1. The intervention group reported a 56.9 g/d higher intake of F&V than the control group (95% CI: 28.0-85.9). These increases were not due to higher intakes during school hours (except for Dutch schools). 2. Children with the highest appreciation of the intervention had higher increases in F&V intake (+0.28 portions fruit, +0.37 portions vegetable) compared with children who scored medium (no change in portions fruit, -0.02 portions vegetable) and low (-0.13 portions fruit, -0.09 portions vegetable), $p<0.01$. 3. Children who completed >10 lessons had higher increases in F&V intake (+0.18 portions fruit, +0.21 portions vegetable) compared to those who completed 7 to 10 lessons (no change in portions fruit, +0.12 portions vegetable), or less than 7 lessons (-0.02 portions fruit, -0.05 portions vegetable), $p<0.05$. 4. Adjustments for family educational level attenuated the intervention effect at first follow-up, but differences between the intervention and control group were still significant ($p<0.01$ for total fruit and vegetable intake and fruit intake, and $p<0.05$ for vegetable intake, data not shown). *Year two follow-up:* 5. Multilevel modeling indicated the intervention effect was higher than at 1st follow up for total F&V intake and fruit intake alone in Norway (from 56.9 g/ day to 91.5g/day, $p=0.044$; and from 34.1 g/day to 87.8g/ day, $p<0.002$; respectively). In Spain and the Netherlands, the intervention effect for total F&V intake decreased. 6. At second follow-up the intervention effect for Norway became even stronger after adjustment for family educational level (regression coefficient= 95.2, 95% CI: 52.3-138.0 g/d for total fruit and vegetable intake).

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Reinaerts, de Nooijer, Candel (2007); Reinaerts, Crutzen (2008); Reinarts, de Nooijer, de Vriesr (2007) The Netherlands	Provision of free fruits, vegetables and fruit juice at school – students received one serving of fruit twice a week, fruit juice once a week and raw vegetable twice a week (Group 1) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Children provided lunchbox to bring fruits and vegetables (F&V) from home (Group 2) 2. Classroom curriculum tailored to different age groups (pre-school, 1st -3rd grade, 4th – 6th grade) promoted F&V intake (Group 2) 3. Homework activities and newsletters for parents (Group 2) 4. Posters displayed at local supermarkets to remind parents to buy F&V (Group 2)	***DESIGN:*** Group randomized trial ***DURATION:*** October 2004 – June 2005 ***SAMPLE SIZE:*** 939 students from 12 primary schools (3 F&V distribution, 3 lunchbox and curriculum, 6 controls) ***PRIMARY OUTCOME:*** F&V consumption ***MEASURES:*** 1. 24 hr food recall (# times any food consumed the previous day) 2. Food frequency questionnaire (F&V intake) ***DATA COLLECTION:*** Both assessments completed 2 weeks prior to intervention start and at the end of the school year. Parents completed both dietary assessment methods for their children. Follow-up measurements were taken one year after termination of the 2 interventions to explore sustainability of short-term effects. The research team evaluated the interventions. ***LIMITATIONS:*** Self-reported data; measures never validated in target populations; schools not randomly assigned -matched based on size and ethnicity; 21% of invited schools participated; significant baseline differences between groups, limited generalizability	4-12 year olds ***ELIGIBILITY CRITERIA:*** Schools with ≥ 200 students were invited to participate. Informed consent was required from parents. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the intervention	***LEAD AGENCY:*** Distributors (intervention), teachers (intervention) and The Regional Health Service Noorden Midden Limburg and the Universiteit Maastricht (development and evaluation) ***THEORY/FRAMEWORK:*** Diffusion Theory and Theory of Planned Behavior ***EVIDENCE-BASED:*** Study builds off previous interventions that have provided F&V to students at school, but attempts to evaluate the single components of the intervention ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Regional Health service and University developed the interventions and trained the teachers (1 meeting at the beginning of each period). Food distributors brought the F&V to school (Group 1). Teachers implemented the classroom activities and parents were responsible for providing F&V for their children (Group 2). ***PROCESS EVALUATION:*** Questionnaires assessed how much time teachers spent distributing F&V, how often they consumed F&V in front of students and their evaluation of the total program. Monitoring Reports collected data on the implementation of the lessons that were part of the group two curriculum intervention.	***RESOURCES:*** 1. Funds for F&V 2. Lunchboxes 3. Classroom activities 4. Newsletters 5. Homework activities 6. Supermarket posters 7. Places and equipment to store fruits and vegetables ***FUNDING:*** Netherlands Organization for Health Research and Development (ZonMw) ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. Both interventions were effective in increasing fruit intake with an increase of 0.2 portions (+15%, net increase in consumption compared with baseline intake of the intervention group, p<0.001) per day, including weekends. 2. The F&V distribution intervention was effective in increasing vegetable intake at dinner for 4-6th graders (+22%, p<0.01) and for non-native children (+32%, p<0.01). 3. Regarding vegetable snack intake from baseline to follow-up, the distribution intervention was effective for 4-6th graders (+33%, p<0.01), and the curriculum intervention for 1st – 3rd graders (+50%, p<0.05) and for girls (+50%, p<0.01). 4. Native children in the curriculum intervention increased their consumption of fruits, juices and vegetables by 0.2 times per day (+8%, p<0.05) and non-native children by 1.6 times per day (+60%, p<0.01). Fruit, juice and vegetable consumption also increased in the distribution intervention group for 4-5 year olds by 0.1 times per day (+4%, p<0.05) and for 4-6th graders by 0.5 times per day (+15%, p<0.01). 5. The distribution intervention was more effective than the curriculum intervention in increasing vegetable intake at dinner for 4-6th graders (β=-1.34, p<0.001) and for non-native children (β=-1.41, p<0.01), and in increasing vegetable snack intake for 4-6th graders (β=-0.08, p<0.05) and boys (β=-0.06, p<0.05). ***MAINTENANCE:*** 6. The F&V distribution intervention group increased F&V intake 1 year after the intervention with a net effect of 0.13 times /day fruit, juice and vegetable consumption [24hr recall] (d=0.09), 0.09 more portions fruit/ day (d=0.15), and 0.07 more vegetable snacks/day (d=0.29), compared to controls (p<0.05 for all). 7. The uncorrected data showed that children from the distribution group consumed 3.25 g more vegetables during dinner (d=0.14). 8. The curriculum group increased F&V intake 1 year after the intervention with a net effect of 0.32 times/day fruit, juice and vegetable consumption [24hr recall] (d=.22) and 0.19 portions fruit/day (d=0.29) compared to controls (p<0.05 for both). 9. Both interventions showed similar effects in increasing 24 hour fruit, juice and vegetable consumption and fruit consumption, but the distribution intervention had significantly higher intakes of vegetable snacks (0.40 vs. 0.26 times per day, p<0.05) and vegetables at dinner (49.6 vs. 48.4 g/day, p<0.01) compared to the curriculum intervention.

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Ashfield-Watt, Stewart (2008) New Zealand	Provision of a variety of free export-quality, seasonal fruits at school (apples, pears, nashi pears, oranges, plums, and bananas) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Group randomized trial ***DURATION:*** 10 weeks ***SAMPLE SIZE:*** 2032 students ages 7-11 (1035 exposed, 997 unexposed) from 20 primary schools (10 intervention, 10 control) ***PRIMARY OUTCOME:*** Fruit consumption ***MEASURES:*** 1. "Day in the Life Questionnaire" (diet recall) prompted children to record activities/ foods eaten during the previous day. ***DATA COLLECTION:*** Teachers administered the questionnaire in class at baseline 1 week prior to start of intervention (A1), during the last week of the intervention (A2), and 6 weeks post-intervention (A3). Only 7-11 year-olds were included in the evaluation due to the cognitive limitations of younger children. The classroom teachers administered the surveys and the research team collected and analyzed the data. ***LIMITATIONS:*** Questionnaires were administered by teachers which may have led to some data loss; more intervention group students (61%) than controls (51%) returned questionnaires at all assessments (P<0.001); individual food preferences are likely to have affected intake regardless of success of the intervention; extent of displacement (replacing existing fruit in school with free fruit provided) cannot be accurately determined from available data; intervention period may have been too short for habituation to occur	Pacific Islander New Zealand Maori Lower income 5-13 year olds 45% of children living in the school district were classified as the most deprived in the country Intervention – 57.8% Pacific people, 23.3% New Zealand Maori, 11.3% mixed/other, 5.5% European and 2.1% Asian. Control – 57.3% Pacific people, 22.8% New Zealand Maori, 15.1% mixed/ other, 3.5% European and 1.2% Asian (evaluation sample) ***ELIGIBILITY CRITERIA:*** 7-11 years old, informed written parental and child consent ***EXPOSURE/ PARTICIPATION:*** All children attending each intervention school received free fruit	***LEAD AGENCY:*** Classroom teachers (intervention), research team from the Institute of Food Nutrition and Human Health in Massey, New Zealand (evaluation) ***THEORY/FRAMEWORK:*** Not Reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Fruits were provided to the intervention schools during the first school term of 2004 (10 weeks). Quality control of fruit deliveries was coordinated by the national "5+ a day" fruit and vegetables program. Children distributed the fruits within the schools under the supervision of a nominated teacher. The provider for the fruit was not reported. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Funds to purchase fruits 2. Teachers and students to distribute fruits 3. Places and equipment to store fruits ***FUNDING:*** The intervention and evaluation were funded by the New Zealand Ministry of Health ***STRATEGIES:*** Not reported	***NUTRITION:*** *End of the intervention (A2)* 1. At Assessment 2 (A2), the intervention group increased their fruit intake at school by 0.39 pieces/school day and were significantly greater than the control group's intake which remained unchanged from baseline (p<0.001). 2. 68% of the control group who had eaten no fruit at baseline continued to eat no fruit at the end of the intervention (A2), compared with only 36% in the intervention group (p<0.001). 3. Of the remaining 64% of intervention group subjects who had eaten no fruit at baseline, approx. two-thirds increased school fruit intake to 1 piece/school day and a third had increased to ≥2 pieces/school day at end of intervention (p<0.001). 4. Intervention children who had eaten fruit at school at baseline (1 or ≥2 pieces/school day) were also more likely to continue eating or increase school fruit intake than control children at the end of the intervention (p<0.001). The probability of intervention students who consumed 1 piece of fruit/school day at baseline to continue consuming 1 piece or increasing to ≥2 pieces was 0.43 and 0.38, respectively; compared to 0.36 and 0.22 for controls. The probability of intervention students who consumed ≥2 pieces of fruit/school day at baseline to continue consuming ≥2 pieces was 0.45 compared to 0.31 for controls. *6 weeks post-intervention (A3)* 5. Mean total fruit and fruit at school intakes at A3 in the intervention group fell compared with A2 (from 1.22 pieces/school day to 0.61 pieces/school day total and from 0.93 pieces/school day to 0.37 pieces/school day at school) and were lower than intakes in the control group at A3, p≤ 0.01. 6. Intervention children who had consumed 1 or ≥ 2 pieces of fruit/school day at A2 were more likely to be eating no fruit at A3 than control group students (event probability for consuming 0 pieces at A3 among those consuming 1 piece at A2= 0.62 vs 0.45, p=0.001 and event probability for consuming 0 pieces at A3 for those consuming ≥2 pieces at A2= 0.56 vs 0.31, p<0.001, respectively). 7. 9% of the intervention group had increased fruit intake at school from A1 to A2 and maintained their A2 intakes through to A3. 32% of the intervention group had increased fruit intake at school during the intervention but reduced their intakes by A3. 5% of the intervention group children maintained their fruit intake at school at all 3 assessments. 13% of intervention group children ate no fruit at any time point.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Moore, Tapper (2008); Moe, Roberts (2001) United Kingdom	Established fruit tuck shops and offered at least one choice of fruit per day at 15 pence per item. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Schools refrained from stocking sweets, crisps, and other unhealthy items in the tuck shops 2. Letters sent to parents explaining the tuck shops and prices	***DESIGN:*** Group randomized trial ***DURATION:*** 9 months ***SAMPLE SIZE:*** 1612 students (921 exposed, 691 unexposed) from 43 schools (23 intervention, 20 control) ***PRIMARY OUTCOME:*** Fruit consumption ***MEASURES:*** 1. Computerized 24-hr recall questionnaire (# servings of fruit, sweets, chocolate, biscuits, and crisps consumed during past 24 hr) – previously validated 2. Questionnaire-secondary outcomes (influence of tuck shops on preference for fruit, peer norms regarding fruit, small changes in fruit consumption). 3. Weekly record of fruit tuck shop sales ***DATA COLLECTION:*** 24-hr recall was given to a random sample of year 5 & 6 children at baseline and follow up. Secondary outcomes questionnaire was given to random sample of children at follow-up. The schools' weekly records of tuck shop sales were collected throughout the 9 month intervention. The research team was in charge of conducting formative, process, and outcome evaluations. ***LIMITATIONS:*** Self-reported consumption; measures had relatively poor validity at the individual level over a 24 hr period (although reasonable when restricted to fruit consumption in school); quality and timeliness of weekly sales record data not strictly enforced; consumption measures only taken with children 9-11 years old	5-13 year olds Lower income 5,600 students enrolled in the intervention schools at the time of the study ***ELIGIBILITY CRITERIA:*** Schools identified as having a free school meal entitlement higher than the national average (17%) were invited to participate in the study (255 schools). Schools were excluded if they had an existing tuck shop. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools had access to the tuck shops	***LEAD AGENCY:*** Schools (intervention), research team (evaluation) ***THEORY/FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** School staff, governors, parents and students assessed demand, planned, developed and implemented the fruit tuck shops. ***IMPLEMENTATION:*** Schools were divided into 3 groups based on existing food policies on snacks at morning break: no food allowed, only fruit allowed, or no restrictions. Schools planned, organized and ran the fruit tuck shops. Schools recruited an adult within the school community to be in charge of finding a local retailer for fruit or buying fruit directly from the supermarket, choosing the location of the tuck shop, delegating responsibility for working the tuck shop, and sending letters home to parents explaining the tuck shops and the price of fruits to be sold. The research team provided limited assistance with setting up and maintaining shops. ***FORMATIVE EVALUATION:*** Direct observation of the school environment and focus groups ***PROCESS EVALUATION:*** Project officers visited schools and tuck shops to document the methods for implementing the shops and models of good practice	***RESOURCES:*** 1. Funds to purchase fruits 2. Resources for setting up tuck shops 3. 50 pound donation for schools 4. Adult from community to run tuck shop 5. Letters to parents 6. Promotional materials 7. Places and equipment to store fruits ***FUNDING:*** UK Food Acceptability and Choice Research and Development and Health Promotion Wales (intervention), Food Standards Agency Food Choice Programme (evaluation) ***STRATEGIES:*** Over 80% of schools sustained tuck shops without researchers' help or funding.	***POLICY CHANGE:*** 1. Several schools changed their policy so that children could only eat healthy snacks post intervention. ***USE:*** 2. Children in intervention schools were more likely than children in control schools to state that they would use a tuck shop (OR=2.00, 95% CI: 1.28 to 3.12; p<0.002). ***EATING BEHAVIOR:*** 3. School level regression models found that there were no significant differences in children's intake of fruit or other snacks. 4. There was a significant interaction with school food policy only for fruit consumed at school (F[2, 32]= 4.55, p<0.02) for the intervention group. Where students were only allowed to bring fruit to school, fruit intake was 0.37 portions per day (95% CI: 0.11 to 0.64), compared to 0.14 portions per day (95% CI:-0.30 to 0.58) where no food was allowed and -0.13 portions (95% CI: -0.33 to 0.07) where there were no restrictions. 5. Children in intervention schools were more likely than control schools to report eating fruit as a snack at school "often" (OR=1.49, 95% CI: 1.15-1.95, p<0.005).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Bere, Veierod (2005); Bere, Veierod (2006); Bere, Veierod (2006); Bere, Veierod (2007) Norway	Provision of fruits and vegetables (F&V) for free or paid subscription to students at school ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Classroom curriculum component 2. Parental involvement	***DESIGN:*** Non-randomized trial ***DURATION:*** October 2001- June 2002 ***SAMPLE SIZE:*** 795 participants from 38 primary schools 222 participants free F&V group 157 participants paid F&V group 416 participants no F&V group ***PRIMARY OUTCOME:*** Fruit and vegetable consumption ***MEASURES:*** 1. 24 hour fruit and vegetable recall 2. Food frequency questionnaire (FFQ) 3. Parent demographic and health behavior questionnaire ***DATA COLLECTION:*** Parents and/or students completed the 24 hour F&V recall and food frequency questionnaire to assess eating behavior. An additional questionnaire assessed potential correlates of the students' F&V intake, demographics and other health behaviors. Student and parent assessment of the school F&V program occurred at follow-up. Trained researchers collected the data and completed the analysis. Data provided from baseline to follow-up is for sample of 7th graders (n=795), 1 year follow-up is for sample of 6th graders (n=517) and 3 year follow-up is for sample of 6th and 7th graders (n=1602). ***LIMITATIONS:*** Low participation; differences in diet between study participants and non-participants; free fruit schools not chosen randomly; 28% of the students lost to follow-up and observations from students attending the same schools were positively correlated	11-13 year olds ***ELIGIBILITY CRITERIA:*** Students who did not complete the questionnaire were excluded ***EXPOSURE/ PARTICIPATION:*** All students in the free F&V group received F&V; only those students in the paid group who subscribed to the F&V program received F&V	***LEAD AGENCY:*** The Norwegian Fruit and Vegetable Marketing Board and the Directorate for Health and Social Affairs Department for Nutrition (intervention) and research team (evaluation) ***THEORY/FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Study utilized intervention components from previous school-based F&V interventions found to be successful ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported Implementation: Students in the intervention schools received a piece of fruit or a carrot every school day (usually in connection with their lunch). Nine schools received the F&V for free, nine schools paid for the F&V (NOK 2.50 [EUR 0.30] per school day, subsidized by NOK 1.00 per student per school day from the Norwegian Government; only students who subscribed to the program in these schools received F&V) and 20 control schools did not receive F&V. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Funding for free F&V 2. Teachers to provide the classroom curriculum 3. Materials to support the curriculum 4. Partnerships with local F&V distributors and farmers 5. Places and equipment to store fruits and vegetables ***FUNDING:*** Free F&V provided by the Norwegian Fruit and Vegetable Marketing board through collective agricultural agreement between Norway's farmers and the agricultural authorities. The evaluation was funded by the Norwegian Research Council ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. Free fruit group (mean 1.1 portions/day) had higher intake of F&V at school than paid (mean 0.4 portions/day) or no fruit groups (mean 0.2 portions/day) at follow-up, p<0.001. 2. Paid fruit group (mean 0.4 portions/day) had higher intake of F&V at school than the no fruit group (mean 0.2 portions/day) at follow-up, p=0.003. 3. Free fruit group (mean 2.4 portions/day) had higher intake of F&V all day than the paid (mean 1.8 portions/day) or no fruit groups (mean 1.8 portions/day) at follow-up, p=0.009. 4. Free fruit group (mean 7.0 portions/day) had lower intake of soda/candy/chips than no fruit group (mean 8.4 portions/day) at follow-up, p=0.01 5. Classroom curriculum component had no effect on F&V intake. 6. Students in the paid fruit group who purchased fruit and had low baseline habitual fruit and vegetable intake had higher fruit intake at school (0.8 vs. 0.1 portions/day, p<0.001), all day (2.2 vs. 1.5 portions/day, p<0.03) and lower intake of soda/candy/chips (5.9 vs. 8.9 times/week, p<0.007) at follow-up compared to those with low baseline habitual fruit and vegetable consumption who did not purchase fruit. *One year follow-up (n=517 6th graders):* 7. After one year, significant differences between free fruit and paid/no fruit groups were sustained for all day F&V intake (effect size= 0.5 portions, p=0.03). Intervention students also still ate more F&V at school than control students (effect size =0.2 portions, P=0.07). 8. Paid fruit group ate 0.4 more portions of F&V at school than no fruit group, p=0.04. *3-year follow-up (n=1602 6th and 7th graders):* 9. Sustained significant effects on F&V intake three years after the end of the intervention were observed. The estimated change in F&V intake from baseline to May 2005, compared to the control group, were 0.13 portions for boys and 0.15 portions for girls for F&V at school, 0.38 portions for boys and 0.44 portions for girls for F&V all day and 1.6 times/week for boys and girls for usual F&V intake, p<0.001 for all. 10. There was no significant intervention effect for consumption of soda/candy/chips.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Day, Strange (2008) British Columbia	Action Schools! British Columbia- Healthy Eating – Schools set goals across six Action Zones: school environment, physical education, classroom action, family and community, extra-curricular and school spirit ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. School policy to increase the availability of fruits and vegetables in class through two weekly classroom activities and a once a month fruit and vegetable taste testing *Complex:* 1. Monthly newsletters and voluntary take-home activities 2. Presentations (for parents and advisory committees) 3. Menu of classroom activities and materials for implementation provided to the teachers	***DESIGN:*** Group randomized trial ***DURATION:*** 12 weeks (March through May 2006) ***SAMPLE SIZE:*** 444; 4th and 5th grade students from 10 schools (5 school districts) assigned to one of two conditions; 5 healthy eating intervention schools (N=246) and 5 usual practice schools (N=198). ***PRIMARY OUTCOME:*** Nutrition ***MEASURES:*** 1. 24-hour food recall questionnaire (number of servings of fruit and vegetables consumed) – used Canadian Nutrient File serving sizes 2. Food Frequency Questionnaire adapted from the Eating at America's Table Study Quick Food scan (frequency of fruit and vegetable consumption) 3. Food Choices Scale for Children drawn from the validated Food Neophobia Scale and the Food Neophobia Scale for Children (willingness to try fruits and vegetables) 4. Knowledge, Attitudes, and Perceptions (KAP) survey based on the 5-A-Day for Better Health Program survey and the 1990 Behavioral Risk Factor Surveillance System survey (health knowledge, feelings about fruits and vegetables, perceptions of the social environment) 5. Canadian Census (socio-economic status) 6. Teacher focus groups (feasibility of implementing the intervention) ***DATA COLLECTION:*** Trained researchers measured student-level outcomes at baseline (Nov. 2005-Feb. 2006) and follow-up (May 2006). Five focus groups with a total of 19 teachers were conducted in June 2006. ***LIMITATIONS:*** Primary variables were assessed through self-report which introduces response bias; baseline differences in age, ethnic origin, and fruit and vegetable consumptions between conditions; family and community component was minimal; study design prevented focus outside of the classroom on fruits and vegetables; there was little agreement between 24 hour recall and food frequency questionnaire results because they did not share a referent period; the study offered limited tasting opportunities, which may not have been able to change preferences	9-11 year olds ***ELIGIBILITY:*** Informed consent was required for the study. Teachers identified barriers to sustainability as the decrease in monetary and human support that may occur in large-scale implementation of the intervention. ***EXPOSURE/ PARTICIPATION:*** All 4th and 5th grade students at the intervention schools were exposed to the classroom fruit and vegetable component, and all students at the schools were exposed to the Action Zone changes.	***LEAD AGENCY:*** Researchers from the University of Victoria and University of British Columbia, Vancouver ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** School committees identified needs and set goals (2 per Action Zone) across the 6 Action Zones. ***IMPLEMENTATION:*** Schools received resources (a menu of classroom activities and materials for implementation), training (1.5 hours) and support from the research team. The teachers delivered the intervention activities in the classroom. School committees identified needs and set school goals across the 6 Action Zones. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** 1. Review of year end reports (June 2006) completed by the school committee to identify the number of action zones with completed goals. 2. Teacher weekly activity logs used to assess fidelity to implementation of classroom activities.	***RESOURCES:*** 1. $12.50 given to teachers for purchase of fruits and vegetables 2. Menu of classroom activities and implementation materials 3. Training resources 4. Monthly newsletter 5. Take-home activity resources 6. School committees to set goals 7. Teachers to carry out the classroom activities ***FUNDING:*** British Columbia Ministries of Health and Education, and the 2010 Legacies Now Society. ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. From baseline to follow-up there was an increase of 0.24 serving of fruit for the intervention group while the usual practice schools decreased their fruit intake by -0.68 serving ($p \leq 0.05$). 2. There was a significant increase from baseline to follow-up in the variety of fruits and vegetables consumed in the intervention group (+0.47), while there was a decrease in the variety of fruits and vegetables consumed in the usual practice schools (-0.10; $p \leq 0.05$). 3. Servings of fruits and vegetables decreased from baseline to follow-up in the usual practice schools (-0.79 serving), while there was a small increase (+0.18 serving) in intervention schools ($p \leq 0.05$). 4. The percentage of fruits and vegetables tried increased from 78% to 83% in intervention schools, while there was little change in usual practice schools ($p \leq 0.05$). 5. No effect was found for servings of vegetables. 6. No effects were found for typical daily frequency of fruit and vegetable consumption. ***OTHER:*** 7. No effects were found for willingness to try new fruits and vegetables.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Angelopoulos, Milionis (2009) Greece	Two 45 minute physical education sessions per week; playgrounds and school yards at intervention schools accessible after the end of the curricular program. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Daily provision of fresh fruits and juices in school cafeterias *Complex:* 1. Nutrition component: Parents were encouraged to have more fruits and vegetables at home. 2. Class curriculum component: 1-2 hours/week was integrated into existing school curriculum including self-esteem, body image, nutrition, physical activity, fitness and environmental issues. 3. Parental component: Fruit and vegetable bazaars were held where parents were given results of children's medical and nutritional assessment.	***DESIGN:*** Group randomized trial ***DURATION:*** 12 months ***SAMPLE SIZE:*** 646 5th grade students (321 exposed, 325 unexposed) from 26 schools; 13 intervention and 13 control (8 urban and 5 rural in each group). ***PRIMARY OUTCOMES:*** Overweight/obesity, physical activity, and nutrition ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Blood pressure 3. 24-hour Recall (dietary assessment) 4. Questionnaire (physical activity assessment) ***DATA COLLECTION:*** BMI and BMI z-scores were calculated using the Nutstat module of EpiInfo and the CDC 2000 growth charts. Blood pressure was measured during a 5 minute rest using an automated sphygmomanometer. Students completed the 24 H recall for 2 consecutive week days and 1 weekend day by describing the type and amount of food and beverages consumed during the previous day. Data was analyzed using the nutritionist V diet analysis software which included traditional Greek recipes. Children completed the standardized questionnaires for 2 consecutive weekdays and 1 weekend day. The researchers trained the teachers and 24 H recall interviewers, and conducted the outcome evaluation. ***LIMITATIONS:*** Not reported	Lower income 10-11 year olds ***INTERVENTION SCHOOLS:*** 90.3% Greek, 9.7% immigrant ***CONTROL SCHOOLS:*** 88% Greek, 12% immigrant 75% Urban population, 25% rural population (evaluation sample) Loannina (site of the intervention) is one of the poorest prefectures in Greece with some of the highest obesity rates. ***ELIGIBILITY:*** Urban and rural schools, located in Loannina ***EXPOSURE/ PARTICIPATION:*** All 5th graders at the 13 intervention schools were exposed to the intervention. The mean rate of parent attendance at meetings was 86%.	***LEAD AGENCY:*** Research team from University of Athens ***THEORY/FRAMEWORK:*** Theory of Planned Behavior ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team from the University of Athens conducted formative research and developed the intervention. The school teachers delivered the curriculum intervention. School food staff ensured that fresh fruit and freshly made juices were available in the school canteens throughout the whole intervention. ***FORMATIVE EVALUATION:*** Four focus groups (information on the effect of children's behavioral, normative and control beliefs of certain health behaviors such as diet and exercise), the results from which the questionnaire was developed. ***PROCESS EVALUATION:*** Measures not reported	***RESOURCES:*** 1. Classroom curriculum 2. Funds to organize fruit and vegetable bazaars 3. Funds to provide fresh fruit and fruit juices in the intervention schools 4. Materials for physical education sessions 5. Staff to supervise school yards after the curriculum program ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. The mean BMI increase observed in the control children (+0.1, 95% CI -0.03 to 0.2) was significantly different compared to the decrease observed in intervention children (-1.1, 95% CI -1.2 to -0.9), p=0.047. ***PHYSICAL ACTIVITY:*** 2. There was an increase in the intervention group for mean time spent in moderate to vigorous physical activity [MVPA] (+2.2, 95% CI -2.6 to 7.1) compared to decreases in MVPA in the control group (-16.4, 95% CI -21.1 to -11.7), p=0.041. ***NUTRITION:*** 3. Mean daily consumption of fruits increased in the intervention group (0.4, 95% CI 0.1 to 0.7) but decreased in control group (-0.2, 95% CI -0.4 to 0.1), p<0.05. 4. Intervention children decreased mean consumption of total fat/oils and sweets/beverages (fats and oils -1.6, 95% CI -2.4 to 0.9; sweets and beverages -0.8, 95% CI -1.3 to -1.4), while increases were found for control children (fats and oils +0.7, 95% CI 0.05 to 1.4; sweets and beverages +0.2, 95% CI -0.2 to 0.6). p<0.05 for all. 5. Intervention children decreased mean consumption of dairy products (-0.2, 95% CI -1.4 to 0.1), while increased consumption was found for control children (0.2, 95% CI 0.02 to 0.5), p=0.008. ***OTHER:*** 6. Mediating variable analysis revealed that the effect of the intervention on BMI, systolic blood pressure (SBP) and diastolic blood pressure (DPB) was no longer significant (β=-0.08, p=0.123; β=-0.11, p=0.065; β=-0.13. p=0.053, respectively) after controlling for possible mediators, such as the changes observed in MVPA, food intake and BMI. 7. SBP and DSP levels increased in the control children (systolic +1.9, 95% CI 1.0 to 2.9); diastolic +2.3, 95% CI 1.6 to 3.1) and decreased in the intervention children (systolic -1.6, 95% CI -2.7 to -0.6; diastolic -0.5, 95% CI -1.3 to 0.3), p=0.016 and p=0.005, respectively. 8. The significant associations between the change observed in BMI and the changes observed in fruit intake and fats and oils intake indicate that the effect of the intervention on BMI mediated via the changes in fruits, fats and oils intakes. 9. Similarly, the significant associations between the change observed in BMI and the changes in SBP and DBP indicate that the effect of the implemented intervention on SBP and DBP was mediated by the change induced in BMI.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Ransley, Greenwood (2007) England	School policy offering a daily piece of fruit or vegetable to students in reception (4 year olds), year 1 (5 year olds) and year 2 (6 year olds) classes ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Educational materials and activities relating to the benefits of eating fruit and vegetables (training video for teachers, wall charts, cooking activities and games for children) 2. Information related to the benefits of eating fruit and vegetables made available to parents	***DESIGN:*** Non-randomized trial ***DURATION:*** 3 years (evaluation only for the first 7 months) ***SAMPLE SIZE:*** *Baseline:* 98 schools (53 intervention, 45 control) and 4,824 students (2,681 intervention, 2,143 control) *3 month follow-up:* 95 schools (52 intervention, 43 control) and 3,827 students (2,148 intervention, 1,679 control). *7 month follow-up:* 92 schools (49 intervention, 43 control) and 3,693 students (2,045 intervention, 1,648 control). ***PRIMARY OUTCOME:*** Fruit and vegetable consumption ***MEASURES:*** 1. Child and Diet Evaluation Tool [CADET] (usual dietary intake over 24 hours including portions of fruits and vegetables, energy, and nutrients) - validated for use with young children between the ages of 4 and 7 years (correlation coefficient comparing CADET with 24 hour food diary ranged from 0.44 to 0.89 for foods and from 0.41 to 0.68 for nutrients; ICC between CADET and diary for change in fruit and vegetable consumption was 0.72, 95% CI: 0.54 to 0.89) ***DATA COLLECTION:*** Data was collected at 3 phases: March (baseline), June (3 months), and November (7 months) of 2004. The parent or guardian completed the CADET for their child. ***LIMITATIONS:*** The study was not a randomized controlled trial and therefore it is uncertain whether biases could have skewed the results, there may be some residual confounding that could not be accounted for; could not measure the full impact of the program as students were not followed through the whole 3 years of the program	4-6 year olds *Intervention schools:* 18% of children with free school meals eligibility *Control schools:* 20% of children with free school meals eligibility ***ELIGIBILITY:*** Schools were excluded if they were involved in formal pilots of the school fruit and vegetable scheme. Only pupils for whom a signed consent form was received from a parent or guardian were eligible to take part in the evaluation. ***EXPOSURE/ PARTICIPATION:*** All children in reception, year 1 and year 2 classes were exposed to the intervention	***LEAD AGENCY:*** The research team from the University of Leeds ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The federal government provided funds for the free fruit and vegetables through the school fruit and vegetable scheme. The teachers provided the students with daily fruits and vegetables and utilized the educational materials. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Fruits and vegetables 2. Educational materials (training video, wall charts, cooking activities, games) 3. Informational materials for parents 4. Places and equipment to store fruits and vegetables ***FUNDING:*** The study was funded by the Big Lottery Fund ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. The intervention was associated with an increased fruit and vegetable intake across reception and year 1 students of 0.5 portions (95% CI: 0.3-0.7) and 0.7 portions (95% CI: 0.3-1.0) at 3 months, which fell to 0.2 (95% CI: 0-0.4) at 7 months in reception and to 0.2 (-0.2-0.6) in year 1. 2. The impact of the intervention on year 2 students was associated with an increased fruit and vegetable intake of 0.5 portions (95% CI: 0.2-0.9) 3 months after the introduction of the intervention. This fell to -0.2 (95% CI: -0.5-0.2) at 7 months. By this time, year 2 students were no longer eligible to receive free fruit and vegetables. 3. There were no associations between the intervention and change in energy, fat, or salt intake across the year groups. 4. Carotene intake at 7 months increased in reception and year 1 by 14% (95% CI: 5%-24%) and 21% (95% CI: 5%-40%), respectively, but declined in year 2 by 14% (95% CI: -1%-26%). 5. Vitamin C intake at 7 months increased in reception and year 1 by 8 mg (95% CI: 3-30 mg) and 9 mg (95% CI: 3-16 mg), and decreased in year 2 by 23 mg (95% CI: 15-32 mg). 6. There was a non-significant increase in sugar intake in reception and year 1. 7. Year 2 had a decrease in sugar intake associated with the intervention, by 38.2 grams (95% CI: 46.0-30.5 g) at 7 months. 8. At 7 months, there was no long-term impact on vegetable intake in any of the groups.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Eriksen, Haraldsdottir (2003) Denmark	Provision of fruits and vegetables for paid subscription to students during 10 o'clock recess at school ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Non-randomized trial ***DURATION:*** 5 weeks ***SAMPLE SIZE:*** 445 students in grades 0-3 from 7 schools (4 intervention, 3 control) ***PRIMARY OUTCOME:*** Fruit and vegetable intake ***MEASURES:*** 1. Pre-coded 24-hour recall (intake of fruits and vegetables during schooldays) 2. Short food-frequency questionnaire (intake of fruits and vegetables for a month) ***DATA COLLECTION:*** Questionnaires were distributed to intervention and control students in class 2 weeks prior to the intervention and after the intervention (5 weeks), to be completed at home and returned by mail. Due to limitations in reading and writing skills of the children, parents were asked to help complete the questionnaire. The researchers developed the questionnaires and collected the data. ***LIMITATIONS:*** Only 24-hour recall was adequately sensitive to detect the effect of the intervention among intervention students; low response rate (31%); possible that study includes larger proportion of children with high intake of F&V at baseline and are over-represented; no reminders sent to parents and children to answer and return the questionnaires; short duration (5 weeks)	6-10 year olds ***ELIGIBILITY CRITERIA:*** Primary schools who responded to the invitation were included. Only children in grades 0-3 were included in the study due to likelihood to participate in subscription program. ***EXPOSURE/ PARTICIPATION:*** All children at the intervention schools were offered the fruit and vegetable subscription	***LEAD AGENCY:*** The research team from Copenhagen, Denmark ***THEORY/FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Intervention students received either a piece of fruit or vegetable during the 10 o'clock recess. Mondays and Wednesdays they received a vegetable (small bag of carrots or a small cucumber). Tuesdays and Fridays they received an apple and on Thursdays a second variety of fruit. Parents paid a subscription price of 180 DKK/4months. The actual price was 3.00 DKK per school day, one-third of the price being subsidized by the researchers. The researchers identified the food provider that gave out the fruits and vegetables. Teachers informed families of program. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Fruit & vegetables 2. Subscription subsidy (3.00 DKK per school day) 3. Places and equipment to store fruits and vegetables ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. According to the 24-hour recall form, students in the intervention group increased their intake of fruit by 0.4 pieces/school day (p=0.019) on days they received fruit as part of the subscription. 2. Children who did not participate in the intervention at the intervention schools also increased their fruit intake (0.3 pieces/school day, p=0.008) 3. No change for students in the intervention group for intake of vegetables on days they received vegetables, or in total intake when "fruit and vegetable" days were combined. 4. Changes in intake occurred at the different meals during the day. Intervention group increased their fruit intake by 0.5 pieces/school day during the morning snack on fruit days (p<0.001) and increased their vegetable intake by 0.4 pieces/school day during the morning snack on vegetable days (p<0.001). Students, however tended to eat slightly less fruit and fewer vegetables during the rest of the day. 5. Children who did not participate in the intervention at the intervention schools also increased their intake of fruit in the morning by 0.2 pieces/school day (p=0.015) but no change was observed later in the day for fruit intake and no change in intake of vegetables during the school day was observed. 6. The food frequency questionnaire showed no difference in intake for children who subscribed to the fruit and vegetable program between baseline and 5 weeks, whereas there was a significant increase in intake observed for children who did not subscribe (0.1 pieces/school day, p=0.046). 7. There was no difference in fruit and vegetable intake from baseline to follow up in control schools.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Laurence, Peterken (2007) Melbourne, Australia	Fresh Kids Program –School policy providing scheduled class-time fruit breaks ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Encouragement to drink water during class (and prohibition of sweet drinks), students were provided water bottles *Complex:* 1. Nutrition education in association with seasonal "Fresh Fruit Weeks" 2. Monthly nutrition newsletter distributed to parents	***DESIGN:*** Time series ***DURATION:*** 2 years ***SAMPLE SIZE:*** The number of students participating in the study over the 2 years ranged from 94-260 in School A, 146-175 in School B, 325-360 in School C, and 71-84 in School D. Schools A and B were followed 3 years post-baseline, while Schools C and D were only followed 1 year post-baseline. ***PRIMARY OUTCOME:*** Fruit, water and sweet drink consumption ***MEASURES:*** 1. Lunchbox audits (valid and reliable, detected changes in students dietary intake) ***DATA COLLECTION:*** Teachers performed the lunchbox audits by using a simple audit template with written instructions as designed by the program coordinator. Teachers directly observed the students' lunch boxes at the beginning of the day or before recess, and recorded the frequency of children observed with the following food and drink items: fruit (fresh, not dried or fruit bars), water (not including flavored mineral waters or water that was consumed from water fountains) and sweet drinks (fruit juice, soft drinks, flavored mineral waters). The researchers performed the evaluation and analyzed the data. ***LIMITATIONS:*** Lack of a control group; actual fruit and drink consumption was not measured; limited capacity to monitor reliability of audits; school A's baseline audit used a convenience sample not a survey of all eligible students in the school as designed	5-10 year olds Urban Lower income Schools A,B & D were 60-90% culturally/ linguistically diverse (mainly Vietnamese) ***ELIGIBILITY CRITERIA:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children in the 4 primary schools were exposed to the intervention	***LEAD AGENCY:*** Western Region Health Centre (intervention and evaluation), lead teacher at each school (intervention) ***THEORY/FRAMEWORK:*** The Health Promoting Schools (HPSs) framework ***EVIDENCE-BASED:*** Not reported ***ADAPTATION/REPLICATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The intervention included formal school fruit and water policies developed in consultation with school staff and formalized by school management/ council, class-time fruit breaks where children consumed fresh F&V brought from home, along with encouragement of drinking water during class (and prohibition of sweet drinks) and nutrition education activities initiated by teaching staff in association with seasonal "Fresh Fruit Weeks." A community dietician was appointed to coordinate the program planning, implementation and evaluation. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Dietician to coordinate the program 2. Teachers to implement the class breaks and deliver the curriculum 3. Nutrition education materials 4. Newsletters 5. Water bottles ***FUNDING:*** The intervention and evaluation was supported through the National Child Nutrition Programme, Commonwealth Dept. of Health and Ageing and the Telstra Foundation ***STRATEGIES:*** Fresh Kids continues to be supported by the Telstra Foundation. Fresh Kids program has been expanded to over 35 primary schools across Melbourne's west suburbs.	***NUTRITION:*** 1. 41% mean increase (increases between 25-50%) in proportion of children bringing fresh fruit for up to 2 years after initial implementation of Fresh Kids program ($p<0.001$), across all schools observed. 2. All schools recorded increases between 15% and 60% in the proportion of children bringing filled water bottles to school for up to 2 years ($p<0.001$). 3. The increases in the proportion of children drinking water were inversely related to the reductions observed in the proportion of children with sweetened drinks, including cordials, soft drinks, and fruit juices. Reductions between 8% and 38% were observed among all schools in proportion of children bringing sweet drinks or ordering them through canteen lunch (School A and D: $p<0.001$; School C: $p<0.01$; School B: not significant).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Wells, Nelson (2005) London, England	National School Fruit Scheme (NSFS) that provides one free piece of fruit to students each school day ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** 2002-2004 school year (study only looks at a snapshot of students in fall 2003) ***SAMPLE SIZE:*** 1517 infant school students (4-6 year olds) attending schools in the NSFS program and junior school students (7-8 year olds) who had participated in the NSFS as infant school students; 17 schools (8 intervention, 9 control) ***PRIMARY OUTCOME:*** Fruit consumption ***MEASURES:*** 1. Questionnaire completed by parents regarding their children (a 24 hour food tick list, food frequency questions, food attitude questions, questions about the NSFS and personal data). The tick list of foods was adapted from the Food Assessment in Schools Tool (FAST), validated by Adamson et al., (2003). Questions regarding factors influencing parents' purchase of fruit were based on questions in the 5 A Day Consumption and Evaluation Tool (FACET). ***DATA COLLECTION:*** The questionnaire was completed by parents on behalf of their child during the 2003 summer term. Each school was provided with a sufficient number of questionnaires to hand out to every pupil in Reception through Year 4. Questionnaires were distributed to students with an information sheet and an envelope to return the questionnaire. Completed questionnaires were collected from schools 9 days later. ***LIMITATIONS:*** Questionnaire data was self-reported; low response rate; cooperation rates varied between the schools, socioeconomic rates varied, and employment varied	Lower-income, 4-6 year olds, 7-8 year olds ***ELIGIBILITY:*** Schools that had joined the pilot of the NSFS in February 2001 and continued in the main scheme in October 2002 were eligible for selection. Schools were selected from areas where the electoral wards were in the bottom 20% of the distribution of IMD2000 (Index of Multiple deprivation; Department of Transport, 2000). Schools had to have a minimum of 15% of pupils receiving free school meals. ***EXPOSURE/ PARTICIPATION:*** All infant school students received a free piece of fruit each day.	***LEAD AGENCY:*** Researchers from King's College London ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The National School Fruit Scheme, developed by the United Kingdom government, provided one free piece of fruit to infant school students each school day. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Funds for fruits and vegetables 2. Personnel to distribute the fruits and vegetables 3. Places and equipment to store the fruits and vegetables ***FUNDING:*** The New Opportunities Fund and King's college in London. ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. Median total fruit consumption (excluding fruit juice) in infant school students receiving free fruit was 117 grams per day compared with 67 grams per day in infant school students not receiving free fruit ($p<0.001$). 2. Median consumption in junior students who had received free fruit at school as infant students did not differ from those who had not (83 grams per day vs. 86 grams per day), but junior students had significantly higher levels of consumption than did infant students in schools not in the scheme. 3. Among the infant students eligible to receive free school fruit, only 12% reported not having consumed fruit on the day of the survey, compared with 22% in the group not receiving free fruit ($p=0.02$). 4. If fruit juice was excluded, 17% of infants in schools in the NSFS reported not having any fruit on the day of the survey, compared with 27% of infants in control schools ($\chi^2 = 12.04$, $p=0.001$), and the differences between the distributions of the number of portions were significant (Kolmogorov-Smirnov two-sample test, $p=0.019$). 5. Among the junior students, a higher percentage who had received fruit as infants reported consuming no fruit (32%) compared with students in the control schools (26%), but the differences were not significant.

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