

## “INTERVENTIONS AT SCHOOL TO INCREASE FRUIT AND VEGETABLE INTAKE”



## Editorial

### *Interventions in schools to increase Fruit and Vegetable consumption*

Low fruit and vegetable intake is known to be associated with poor health, particularly cardiovascular disease and cancer. With the worldwide increase in childhood obesity, and increased risk of non-communicable diseases, there is recognition that children's diets need to be improved. Schools appear to be an ideal environment to focus interventions designed to increase fruit and vegetable intake.

The studies in this newsletter show that school fruit and vegetable interventions are effective. This is supported by our new literature review of school-based fruit and vegetable interventions and programmes worldwide which includes 37 studies (<http://www.lshtm.ac.uk/ecohost/projects/schoolfv.htm>). A majority of these studies (70%) produced a significant positive effect on children's fruit and vegetable intake in both older and younger age groups. These studies included a range of interventions including increasing fruit and vegetable availability as part of snack or meal programmes, nutrition promotion or integrating education together with increased accessibility to fruit and vegetables. A range of approaches increase intake. The relevant approach will depend on the local context including differences in local education systems and cultural preferences.

As new proposals for an EU School Fruit and Vegetable Scheme are assessed, we hope that the success shown by school schemes are recognised as an important mechanism to improve public health.

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# Promoting Fruit and Vegetable Consumption through Increased Availability and Accessibility at School: A Strategy to Reduce Childhood Obesity

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Obesity is an epidemic affecting nearly all countries (high-income and low-income alike) worldwide<sup>1</sup>. In the more affluent countries not only is adult obesity on the rise, but childhood obesity is emerging as a major public health challenge. While the causes for childhood obesity are complex, poor diet plays a major role. Focusing on interventions to promote healthy eating early in life is one way to reduce the obesity burden by instituting behaviors that result in life-long healthy habits. Adequate daily fruit and vegetable intake is one such healthy eating behavior. It sometimes requires up to 10-15 taste exposures to a food before a child accepts it<sup>2,3</sup>. Increasing access and availability of fruit and vegetables sets up opportunities for children to have repeated exposures to fruit and vegetables, and this impacts preferences<sup>4</sup>. Availability and accessibility of fruit and vegetables, and taste preferences are the consistently and positively related to fruit and vegetable consumption among children<sup>5</sup>.

Fruits and vegetables should be available and accessible both at home and school since these are the places children usually spend most of their time. To date, there are a limited number of studies evaluating school-based environmental interventions in the cafeteria to increase availability and accessibility of fruit and vegetables for children<sup>5-6</sup>. One cafeteria-based intervention in the United States increased opportunities to eat a variety of fruit and vegetables during school lunch, provided new healthful role models, and instituted social support for children to eat fruit and vegetables at lunch<sup>7</sup>. This intervention significantly increased fruit consumption from 0.14 to 0.17 servings during lunch. Although this seems like a small change, it could have public health significance if this intervention was applied to a large population of children. An important limitation of this study is the children were fairly homogenous with 90% of the children being White and only 21% of the children participating in the free or reduced price school meal, a proxy for low-household income.

An observational study with a more diverse student population (non-White population ranging from 45-67%, and 52-59% participation in free or reduced lunch) found no differences in 6-12 year old children's fruit and vegetable consumption among those children who attended schools with self-service salad bars compared to those children who attended schools with pre-portioned fruit and vegetable servings<sup>8</sup>. They did find a positive relationship between fruit and vegetable consumption and the number of fruit and vegetable items offered on the salad bars. However, the study did not control for student ethnicity or participation in free or reduced lunch.

More recently, an evaluation of a pilot salad bar intervention in 3

elementary schools in Southern California showed promising results comparing fruit and vegetable frequencies between a cross sectional sample of pre- and post-intervention children (2.97 to 4.09,  $p < 0.001$ )<sup>9</sup>. Concurrent with the increase in fruit and vegetable consumption was a statistically significant decrease in cholesterol, saturated fat, percent energy from fat, and overall energy intake. The schools in this study served children who were predominately of Latino, African American or Asian, and lived in low-income households. This pilot salad bar program inspired a public private research partnership between Los Angeles Unified School District Food Services (the second largest school district in the US), University of California, Los Angeles, Department of Pediatrics and Blue Cross of California (the largest private health insurer in the US). This partnership is rigorously evaluating the fruit and vegetable bar intervention in combination with nutrition education in elementary schools.

Promoting fruit and vegetable consumption is listed by the WHO as one of the 9 main strategies for the prevention of childhood obesity<sup>1</sup>. Offering fruits and vegetables to children during the school day offers promise as a step to promote fruit and vegetable consumption and in turn prevent obesity and improve overall health. The following outlines the WHO complete list of strategies for the prevention of obesity in infants, young children, children and adolescents.

The main strategies for the prevention of obesity in infants and young children are:

- The promotion of exclusive breastfeeding.
- Avoiding the use of added sugars and starches when feeding formula.
- Instructing mothers to accept their child's ability to regulate energy intake rather than feeding until the plate is empty.
- Assuring the appropriate micronutrient intake needed to promote optimal linear growth.

The main strategies for the prevention of obesity in children and adolescents are:

- Promote an active lifestyle.
- Limit television viewing.
- Promote the intake of fruits and vegetables.
- Restrict the intake of energy-dense, micronutrient-poor foods (e.g. packaged snacks).
- Restrict the intake of sugars-sweetened soft drinks.

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# Getting children to eat fruits and vegetables – lessons from the English School Fruit and Vegetable Scheme

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There is nothing more endearing than watching a young child's face expand in wonder as they taste a strawberry picked straight from a plant or a pea popped straight from a pod. Yet for many children the experience of eating fresh fruits and vegetables is unusual. Research in the UK has revealed that some children don't eat fruits and vegetables during a typical week and others eat so little they compromise their current and future health.

Fruits and vegetables provide a wide range of nutrients and bioactive components which play an important role in keeping children healthy and preventing disease in later life. These foods are low in fat and displace energy dense foods helping to avert the onset of obesity – a disease becoming more common in children in the UK. Fruit and vegetables also provide an important source of non-starch polysaccharides which are useful for promoting gut health.

A national 5 A DAY programme has been introduced in England to encourage eating five daily portions of fruit and vegetable as an essential and enjoyable part of a healthy diet. Part of this programme includes the school fruit and vegetable scheme (SFVS). The SFVS is the largest scale intervention in English children's diet since the introduction of free school milk in 1946.

Since November 2004, a free piece of fruit or vegetable has been provided to children aged four to six years on each school day. The scheme aims to distribute 440 million pieces of fruit and vegetables each year to over two million children in 18 000 schools. It has cost £42 million to set up and the scheme has received a further £77 million from the Department of Health.

By providing free fruits and vegetables for schoolchildren, it was hoped their overall consumption of fruit and vegetables would be increased by up to one portion a day, with subsequent associated improvement in nutrient intake.

We were commissioned to evaluate the impact of this intervention on children's intake of fruit, vegetables, and key nutrients. The evaluation was undertaken using a non - randomised control design. Two random samples were drawn from English primary schools. Fifty schools were recruited from the North East (Intervention) and 45 schools from Yorkshire and Humberside (Control) comprising a sample of 3703 children aged between four to six years (reception, year 1, and year 2).

Diet was assessed using The Child and Diet Evaluation Tool (CADET). CADET is completed by an adult on behalf of the child and records dietary intake over 24 hours. Diet was assessed at baseline (March 2004), June and November 2004.

Multilevel modelling was used to measure the impact of the SFVS on diet. This type of statistical analysis is important because it allows for any effects that may influence children's intake of fruits and vegetables at the class, school and local authority level and adjusts for these where necessary.

This analysis showed the SFVS was associated with an increase in fruit intake across reception and year 1 pupils of 0.4 portions (95% confidence interval, 0.2 to 0.5) and 0.6 portions (0.4 to 0.9), respectively, at three months, which fell to 0.2 (0.1 to 0.4) and 0.3 (0.1 to 0.6) at seven months. In year 2 it was associated with an increase of 0.5 portions (0.2 to 0.7) of fruit at three months, which fell to baseline values at seven months when these children were no longer eligible for the scheme. Overall, at seven months there were no changes in vegetable consumption, no associations between the SFVS and energy, fat, or salt intake, and small changes in carotene and vitamin C intake.

We concluded the SFVS promoted an increase in fruit intake after three months but at seven months the effect remained significant but reduced, and it returned to baseline in year 2 pupils when they entered year 3 and were no longer part of the scheme.

Following the publication of our results in the Journal of Epidemiology and Community Health earlier this year, researchers from the University of Nottingham published similar results in the International Journal of Epidemiology. They too concluded that the SFVS appeared to be an effective means of increasing dietary fruit intake in young children while they participated in the scheme, but when the scheme ends the effect was lost. Clearly the take home message from this research is that further intervention is required to sustain an increased intake of fruit and vegetables in children.

We are currently being funded to explore ways in which we can optimise the effects of the SFVS and sustain its effects. The results of which will be available in 2008.



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# Ethnic differences in one-year follow-up effect of the Dutch Schoolgruiten Project-promoting fruit and vegetable consumption among primary schoolchildren

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## Introduction

In many western countries, including the Netherlands, children often do not comply with dietary recommendations. Notably, fruit and vegetable (F&V) intakes are lower than national guidelines<sup>1</sup>. The Dutch recommendation for F&V intake for 10-12-year-old children is 2 pieces of fruit and 150-200 grams vegetables per day<sup>2</sup>.

In the Netherlands, the Schoolgruiten (a Dutch acronym for 'school fruits and vegetables') Project was developed to promote adherence to the recommendations.

The Schoolgruiten Project targeted availability and accessibility of F&V at school through a F&V scheme. The children in the intervention group received a piece of fruit or ready-to-eat vegetables for free twice a week. Furthermore, this F&V scheme was supposed to increase the children's exposure to F&V. Repeated exposure is an important determinant of taste preferences<sup>3</sup>.

In the Netherlands, especially in the major cities in the western part of the country, a growing minority, in some cities up to 50% of the children, has a non-Western background. For example, at least one of their parents was born in Morocco, Turkey, Surinam or the Netherlands Antilles. Evidence suggests that these children have different eating patterns, including different F&V intakes than children of Dutch ethnicity<sup>4</sup>. Since some of these minority groups have higher mean F&V intake levels, it might be expected that the intervention is less effective in these groups.

The aim of the present study was to evaluate the one-year follow-up effect of the Schoolgruiten Project regarding F&V intake and potential determinants of F&V intake<sup>5-9</sup> i.e. knowledge of recommendation, taste preferences, availability and accessibility. This was done separately for children of Dutch and of non-Western ethnicity.

We hypothesized that the intervention had a significant effect on F&V intakes and that the intervention was less effective among the children of non-Western ethnicity compared to ethnic Dutch children.

## Methods

The design of this study was quasi experimental, with a pre- and post-test, and an intervention and control group.

Separate questionnaires for children and their parents were developed, both based on the validated Pro Children questionnaires<sup>10</sup>. Participating schoolchildren (mean age 9.9 years at baseline) and their parents completed the questionnaires at baseline and one year later, including questions on the child's usual F&V intake, potential determinants, and general demographics, allowing evaluation based on child as well as

parent-reports. Multi-level regression analyses were used to assess differences at follow-up between the control and intervention group, adjusted for gender, child's age, educational level of the parents, and F&V baseline values.

Reports were available for 565 (232 interventions and 333 controls) children of Dutch ethnicity and 388 children (268 interventions and 120 controls) of non-Western ethnicity, and their parents.

## Results

The majority (59%) of the children were of Dutch ethnicity.

At baseline, the total sample of children of Dutch ethnicity reported a fruit intake of 1.58 (SD=1.06) pieces per day and a mean vegetable intake of 97.9 (SD=44.3) gram per day. After adjustments for the potential confounders, it appeared that the intervention group had significantly higher fruit intake than the controls according to the child-reports (difference=0.23 pieces per day, 95% CI=0.07-0.39).

The total sample of children of non-Western ethnicity reported a mean fruit intake of 2.02 (SD=1.17) pieces and a mean vegetable intake of 120.6 (SD=66.3) grams per day at baseline. At follow-up the children in the intervention group reported a significantly higher adjusted vegetable intake than the children in the control group (difference=20.7 gram per day, 95%CI=7.6-33.7).

Significant positive intervention effects were also found for perceived accessibility among children of non-Western ethnicity, and for parent-reported taste preference of their child among children of non-Western ethnicity and among boys of Dutch ethnicity.

## Discussion and conclusion

The present study indicates that the Schoolgruiten Project had a significant effect on fruit intake of children of Dutch ethnicity and on vegetable intake of children of non-Western ethnicity, but these effects were only found in analyses based on the child-reported data. That results could not be confirmed in parent reported data might be due to power issues. In addition, parents did not observe their child during the main part of the project.

Our hypothesis that children of non-Western ethnicity would profit less from the intervention, was only supported in case of fruit intake, but not for vegetable intake. Furthermore, differences according to ethnic background could not be explained by educational levels of the parents.

In conclusion, providing ready-to-eat fruit and vegetables at school seems a promising intervention strategy promoting FV intake among primary schoolchildren.

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