National Foundation for Educational Research

EVALUATION OF THE SCHOOL FRUIT AND VEGETABLE PILOT SCHEME

Final Report

NFER

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1. Introduction

1.1 Background to the evaluation

The Government's national '5 A DAY' programme forms part of the strategy to raise awareness of the health benefits of fruit and vegetable consumption, and to improve access to fruit and vegetables. One aspect of the '5 A DAY' programme is the School Fruit and Vegetable Scheme (SFVS)[1], which provides a free piece of fruit or a vegetable to children aged four to six years, each school day. The scheme was originally piloted in more than 500 schools throughout England in 2000 and 2001, to examine the practicalities of the scheme before rolling it out nationally. It was expanded region by region with funding from the Big Lottery Fund. Since April 2004, the Department of Health has been funding the SFVS which is now operating throughout England, and will distribute around 440 million pieces of fruit and vegetables each year to over two million children in 18,000 schools.

In 2003, the Big Lottery Fund commissioned the National Foundation for Educational Research (NFER), in partnership with nutritionists from the University of Leeds, to evaluate the impact of the SFVS pilot by monitoring changes in consumption and in attitudes to healthy eating in children before and after they receive the free fruit or vegetables. While this report presents findings from the third and final phase of the SFVS evaluation, it also focuses on an exploration of what, if any, change over time has occurred. As before, the data has been analysed to explore significant differences within and between the intervention and comparison groups. This report is divided into four chapters:

- Chapter 1 (this chapter) summarises the background to the evaluation and the methodology employed; it discusses the implementation of the third phase of the evaluation, the administration of research instruments and response rates by research instrument; it sets this data in the context of the previous two phases.
- Chapter 2 describes how CADET data was analysed and presents findings from the analysis of data gathered during Phase 3. Analysis of change over time and the outcomes of multilevel modelling are also presented.
- Chapter 3 describes how the pupil questionnaire data was analysed and presents findings from the analysis of data gathered during Phase 3. Analysis of change over time and the outcomes of multilevel modelling are also presented.

[1] The SFVS was originally known as the National School Fruit Scheme and then the National School Fruit and Vegetable Scheme.

- Chapter 4 presents conclusions and suggests ideas for further research.

1.2 External influences

It is worth noting, as we have done in both previous reports (Teeman *et al.,* 2004a and Teeman *et al.,* 2004b) that since this evaluation began in July 2003, there have been (and continue to be) a large number of school-orientated nutrition and diet stories in the printed and broadcast media.

Worthy of specific mention was the Channel Four series '*Jamie's School Dinners*', which catapulted the issue of children's diet, knowledge of fruit and vegetables and the school's role in this regard to the top of the political agenda, in the lead-up to a general election. Following this high-profile series, there was a government announcement of extra funds for the provision of school lunches, the training of catering staff and a commitment to develop healthy menus for school dinners throughout England and Wales.

As we have stated before, it is likely that such widespread and consistent inputs about health and diet will have an impact across children's and parents' awareness of this area and therefore, potentially on the data collected during this research project.

1.3 Research aims

The overall aim of the research remained consistent across the three phases of the evaluation:

- to evaluate the impact of the Big Lottery Fund's pilot of the SFVS on children and schools.

The scheme was evaluated from two perspectives; the impact on children and the impact on schools.

Impact on children

The research sought to identify changes, resulting from the introduction of the SFVS, relating to:

- children's consumption of fruit and vegetables – for instance, has the daily free fruit and vegetables encouraged them to eat more fruit and vegetables? Or have the free fruit and vegetables functioned as a substitute for what they would eat anyway?

- children's overall dietary patterns – if they are eating more fruit and vegetables, is this in addition to their normal diet, or are they (for example) eating fruit and vegetables instead of less healthy food?
- children's nutrient intake – do any changes in eating patterns have an effect on e.g. intake of calcium, percentage energy derived from fat in the diet?
- children's knowledge, awareness and attitudes relating to the benefits of increased fruit and vegetable consumption – do they know which foods are good for them? Are they willing to try eating unfamiliar fruits and vegetables?

With reference to all of these objectives, we investigated the impact of the SFVS on different subgroups of children, to see whether the impact differed according to age, sex or other pupil- or school-level characteristics.

Impact on schools

In identifying the impact on schools, the research explored:

- any changes in school practice introduced in connection with the SFVS: for example, changes in catering arrangements or in the provision of breaktime drinks and snacks
- whether the introduction of the SFVS had inspired more classroom teaching on healthy eating
- any difficulties encountered in implementing the SFVS.

1.4 Methodology

The evaluation used a quasi-experimental approach, selecting a stratified random sample of intervention schools, and then a comparison group with the same distribution in terms of school type, performance and the percentage of children eligible for free school meals (FSM), with the aim of achieving a sample of 55 schools in intervention group and 45 in the comparison group.

However, because the SFVS was rolled out on a regional basis, it was not possible to undertake a nationally representative evaluation. The intervention schools had to be drawn from a single region (the North East of England), and the comparison schools from a different region (Yorkshire and The Humber). Although we were able to select (from those where the scheme was introduced late) the region that provided the closest match to the intervention area, there are known regional variations in eating patterns; for example, the North East region has the lowest consumption of fruit and vegetables in the country (see Craggs, 2004). Data collected for the evaluation has provided further evidence of regional differences (the proportion of children taking packed lunches to

school is higher in Yorks and Humber than in the North East). Such differences obviously limit to some extent the effectiveness of comparisons between the two groups.

To gather data and meet research objectives, the research employed quantitative and qualitative methodologies.

Quantitative Research

The research employed two quantitative instruments:

1. The Children and Dietary Evaluation Tool (CADET), developed by nutritionists at Leeds University, was used to record the total dietary intake of the sampled pupils over 24 hours. CADET was delivered on three occasions, in March 2004 (Phase 1), June 2004 (Phase 2) and November 2004 (Phase 3). Each was known as a CADET day. Parental consent had been sought for children in selected Reception, Year 1 and Year 2 classes to participate in the research.

2. A simple questionnaire (based mainly on pictures) was administered to Year 2 pupils (in the classes selected for CADET) in treatment and comparison schools on the three 'CADET days', but because pupils had moved up a class between the second and third phases the questionnaire was actually delivered to Year 3 children at Phase 3. The questionnaire was designed so as to measure any change in children's knowledge and awareness of healthy eating, focusing particularly on fruit and vegetables.

Qualitative Research

In October 2004 qualitative research was undertaken in ten schools in the intervention area, in order to complement and interpret the findings from the quantitative analysis. Group discussions (with visual prompts) were conducted with small groups of children, to explore their attitudes to fruit and vegetables and their understanding of healthy eating. Interviews were also conducted with school staff (including where possible the SFVS co-ordinator, the Personal, Social and Health Education (PSHE) co-ordinator and the catering manager) in order to explore the impact of the SFVS on school policy and culture, to investigate the challenges and successes of implementing the scheme in different contexts, and to provide examples of good practice. The findings from these case studies, details about the schools selected and about the activity conducted in each school can be found in our second interim report (Teeman *et al.,* 2004b).

1.5 Phase 3 of the evaluation

As mentioned in the previous section, the research continued to employ two quantitative instruments, the CADET food diary and a pictorial pupil questionnaire. This final report presents comparative analysis of data gathered from all three sweeps of these instruments; we refer to this final sweep and associated activity as Phase 3. In Phase 3 we have:

- retained all but six of the 98 schools that took part in Phase 1[2]
- produced an extended version of the CADET diary to provide data on ethnicity and postcode, so that issues of ethnicity and social deprivation could be explored at the individual level
- administered the third sweep of CADET and the pupil questionnaire (CADET days)
- used multilevel modelling to provide further analysis of data
- used data from all three sweeps to measure change in and between the intervention and comparison groups.

The administration of phase 3

Schools which had participated in Phase 2 of the evaluation were contacted in mid-October 2004 to confirm their agreement to take part in the third phase and to provide them with details about the organisation and timetabling of the third and final sweep, which occurred in the first half of November 2004. Between the second and third phases of the project, a further three schools dropped out of the evaluation. In two cases this was because the schools were infant schools which had provided CADETs to Year 2 pupils only, and, since they had no Year 3 pupils, were no longer appropriate venues for data collection. The third school was not prepared to continue due to burdens on staff time.

The intervention and comparison samples included 13 infant schools (eight in the intervention group and five in the comparison group). Three of these schools withdrew from the evaluation, as explained above, and one combined with a junior school to form a new primary. This left nine schools which returned CADETs only in Phase 3, since their Year 2 pupils had transferred to junior schools.

Rather than lose all these pupils from the project, it was felt that some continued participation (in the pupil questionnaire only) might be achieved where pupils had moved to a junior school on the same or an adjacent site. Using address and postcode information, NFER identified probable associated

[2] Two schools dropped out before the first round, and three between Phase 1 and Phase 2. A further three dropped out before Phase 3, leaving 92 of the original schools drawn in both sample groups.

junior schools for 11 of the 12 remaining infant schools. The relevant LEAs and schools were contacted in September 2004 with information about the evaluation, and headteachers were asked if they would be willing for Year 3 pupils who had taken part previously to do so again. It was felt that asking a new school to undertake the food diary exercise would be too burdensome, but that completing questionnaires with an administrator should be quite straightforward. Nine of the 11 schools in this group agreed to take part, seven in the intervention group and two in the comparison group.

Table 1.1 The numbers of schools returning pupil questionnaires and CADET diaries

	Number of schools returning:			
	pupil questionnaires only	CADETs only	pupil questionnaires and CADETs	N by sample group
Intervention group	7	5	44	56
Comparison group	2	4	39	45
Total	**9**	**9**	**83**	**101**

Table 1.1 shows the number of schools by which instrument they returned and from which evaluation group. While overall 101 schools were involved in the intervention and comparison groups, returning pupil questionnaires and or CADETs, the total number of schools returning pupil questionnaires was 92, as was the total number of school returning CADETs.

For the purposes of allocating materials, a similar procedure was used for Phase 3 as for Phase 2. With the new school year, some pupils would be in new class groups, all pupils would have changed year group and some would have moved schools. Once again the personal data of pupils previously involved was used to pre-print materials and to compile lists of those participating. Copies of the lists were sent in advance to schools and administrators to serve as a reminder of which pupils were expected to participate; the lists were also used to assemble school packs for despatch.

Contrary to our understanding of the arrangement, six schools in the comparison group received SFVS fruit deliveries in October 2004, just before the Phase 3 survey took place. NFER was alerted to the situation, but was also informed that the schools had previously participated in local schemes, similar to the SFVS, which had now been terminated. Asking for fruit not to be distributed would have meant depriving children of fruit to which they were already accustomed, and this would have been ethically unacceptable. Administrators for these schools were therefore provided with the intervention version of the CADET diary, which includes a column for the recording of

SFVS intake. The schools continued to be included in the comparison sample because it was considered unlikely that the switch from local scheme to SFVS would have a significant short-term impact.

CADET day

On CADET day, NFER administrators were again responsible for organising and delivering the Year 2 pupil questionnaire (to pupils now in Year 3) and for coordinating the completion of CADET diaries, from morning break until the end of the school day. An NFER telephone helpline number (staffed from 9.00 am to 6.00 pm) was provided for any teacher, administrator or parent who had any queries about completing the CADET.

The pupil questionnaires themselves were unchanged from the previous phase. However the CADETs were slightly modified and re-printed to include some additional questions on pupils' ethnicity and home postcode (see Appendix A). The opportunity was also taken to include a note thanking participants for their continued support and confirming that this would be the final time they would be asked to help.

Administration in schools

To build on relationships initiated during the second phase of the evaluation, wherever possible, administrators were allocated to the same schools for Phase 3. Letters were sent to schools prior to Phase 3 to remind them of the dates and key features of the project.

Administrator feedback

Generally, the feedback received from administrators indicated that Phase 3 had run more smoothly than either of the previous two phases. Some administrators did, however, point out that the third phase ran through Ramadan and suggested that this may have had an impact on dietary intake (although the number of children affected would have been very small).

CADET and pupil questionnaire response rates

Here we summarise the response rates for Phase 3 of the evaluation for the CADET and pupil questionnaire.

Table 1.2 shows the number of CADETs despatched and the proportion returned completed, in both the intervention and comparison group and across all three phases.

Table 1.2 Response rates for CADET all phases

	Intervention			Comparison		
	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3
Number despatched	3830	2942	2622	3199	2210	2113
% returned used	70	73	78	67	76	78
Average number per school	51	41	42	47	39	38

For the first sweep enough CADETs were sent to schools to cover the total number of pupils in the classes involved, hence the comparatively high number of CADETs despatched, compared to Phases 2 and 3. The 70 per cent response reflects the fact that a number of parents did not consent to their children participating in the evaluation. In subsequent phases, CADETs were sent only for those children who had participated in Phase 1, and whose schools had not subsequently withdrawn from the evaluation. Those not returned were from children who were absent, or whose parents did not complete the CADETs and return them to school.

Overall, despite six schools withdrawing and Year 2 children leaving 13 infant schools, CADETs were returned at Phase 3 for more than half of the children potentially eligible for the evaluation (53 per cent). This was slightly higher than the 50 per cent return achieved in Leeds University trials over just one phase. The number of participating pupils averaged 12–14 per class.

Table 1.3 Response rates for the pupil questionnaire

Total Questionnaires	Intervention			Comparison		
	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3
Number despatched	1316	1317	1309	1133	1092	1031
% returned used	95	92	93	94	93	89
Average number per school	23	23	23	24	24	22

Table 1.3 shows the returns for all three phases of the pupil questionnaire. Since consent was not required, pupil questionnaires were completed by all pupils except those who were absent on the day when they were administered.

2. CADET

In November 2004, CADET diaries were completed on behalf of those children who had participated in Phases 1 and/or 2 of CADET data collection which took place in March and June 2004. A total of 3,703 CADET diaries were completed, but 298 were excluded following the rules applied in Phases 1 and 2.

2.1 Analysis of Data

This chapter of the report is divided into three main sections which present the findings from three different types of analysis. These are:

- **Basic frequencies and descriptive statistics:** based on the 3,405 CADET diaries completed adequately in Phase 3 of data collection.
- **Analysis of change over time:** based on 2,495 pupils for whom data was collected in all three phases of CADET data collection. Means are presented in this report for all three phases to give an indication of change over time. The extent to which change over time varies for different groups (most importantly, the intervention and comparison groups) is explored.
- **Multilevel modelling:**[3] based on 3,539 pupils for whom we received data from at least two phases of CADET data collection. Details of modelling are given below.

Details of modelling

Multilevel modelling can be used to analyse longitudinal data which has been collected from pupils at more than one timepoint, by including timepoint as a level in the model. Irrespective of the impact of an intervention, there is likely to be a certain amount of random fluctuation between timepoints – in this case, children may not eat exactly the same food on separate occasions. A 'repeated measures' model takes into account this kind of variation, and is therefore a powerful way of analysing the kind of data collected as part of this evaluation.

[3] Multilevel modelling is a development of regression analysis which takes account of data which is grouped into similar clusters at different levels (see Goldstein, 2003). For example, individual pupils are grouped into year groups or cohorts, and those cohorts are grouped within schools. There may be more in common between pupils within the same cohort than with other cohorts, and there may be elements of similarity between different cohorts in the same school. Multilevel modelling allows us to take account of the hierarchical structure of the data and produce more accurate predictions, as well as estimates of the differences between pupils, between cohorts and between schools.

A five-level repeated measures multilevel model was set up, with the following levels:

- LEA
- school
- year group (= class)
- pupil
- timepoint.

The modelling was based on pupils for whom data was collected in at least two phases of the CADET data collection. The variable 'timepoint' allowed us to model repeated measures for these pupils. Random variances at this level model 'measurement error' in the instruments, reflecting the fact that each use will yield a different estimate of children's dietary intake.

In Phase 3, three new questions were added to the CADET diary, which enabled us to include additional variables in the analysis. Firstly, a new question asked about ethnic background, which was included in order to explore significant findings relating to English as an Additional Language (EAL) evident in Phases 1 and 2. Pupils in schools with higher proportions of EAL pupils tended to eat fewer snacks and were more likely to achieve the '5 A DAY' goal, which could suggest that dietary habits are linked with ethnicity, and thus a question on ethnic group was included in CADET. Responses were received for 72 per cent of the pupils included in the multilevel modelling.

Secondly, findings from Phases 1 and 2 indicated that children in schools with high proportions of pupils eligible for FSM tended to eat considerably less fruit and vegetables and more snacks, which could suggest a link with deprivation. Therefore, a question which asked parents to record their postcode was added to CADET, and this information was then linked to census data measures of deprivation. It was possible to match postcode information with census data for 58 per cent of the pupils included in the modelling. A number of census variables were explored, and three were chosen on the basis of the correlation being strong enough to explore the relationship between the outcome variable (such as fruit consumption) and the census variable. The variables used are listed below along with other background variables included in the model.

Finally, a question on what pupils **usually** do for lunch (go home for lunch, eat a packed lunch or have school dinner) was added to CADET in Phase 3, in order to explore possible relationships between type of lunch and consumption of fruit, vegetables and snacks. This information was provided for 72 per cent of the pupils included in the multilevel modelling.

The background variables included in the multilevel model, defined at all three timepoints, included:

Pupil-level

- gender (boy or girl)
- year group (Reception, Year 1 or Year 2)
- ethnicity (white UK or minority ethnic)[4]
- timepoint (Phases 1, 2 or 3 i.e. Phase 2 compared with the baseline and Phase 3 compared with the baseline)
- lunch arrangement (whether they usually have a packed lunch, go home for lunch or have a school dinner)
- percentage of people in the postcode area aged 16-74 with no qualifications (census data)
- percentage of people in the postcode area not in good health (census data)
- overall deprivation index (census data).

School-level

- intervention or comparison group
- school type (infant or primary)
- percentage of pupils with SEN
- percentage of pupils with EAL
- percentage of pupils eligible for free school meals
- key stage 1 average attainment (banded).

Also included in the model were certain 'interaction terms', which allowed us to measure whether the change between baseline (Phase 1) and Phase 2, or between baseline and Phase 3, was different for different groups (for example, intervention rather than comparison group; girls rather than boys). The model was designed to allow for the fact that the impact of the SFVS could vary from class to class and from school to school.

Outcomes explored

In our first interim report (Teeman *et al*., 2004a), we reported in detail on the consumption of fruit, fruit juice, vegetables, snacks and desserts, and total fruit, fruit juice and vegetables combined (applying '5 A DAY' rules) among

[4] Eighty-four per cent of the pupils in the total sample belonged to the ethnic group 'white UK'. Other ethnic groups were too small to analyse separately and were therefore categorised as 'minority ethnic'.

children participating in the CADET data collection. In our second interim report (Teeman *et al*., 2004b) we explored the same five outcomes and compared the findings with those reported earlier. In this final report, we firstly summarise the findings from Phase 3 (the final phase) of the CADET data collection, before going on to examine changes over time.

It is important to remember that 'snacks and desserts' refers to a category of food (cakes, crisps, sweets etc), not to the time of day at which it was consumed. It is also important to note that figures quoted for 'fruit', 'vegetable' or 'fruit and vegetable' consumption include (for the intervention group) fruit and vegetables provided under the SFVS.

For the first time, we have looked at fruit and vegetable consumption in the home and at school, as well as overall consumption. The latter includes fruit juice, which is only counted once, even if a child drinks more than one glass of juice (in accordance with the Department of Health guidance, 2003a). Given this guidance, fruit juice was not included in separate analysis of consumption in the home and school.[5] Beans, lentils and pulses were excluded for essentially the same reason. Therefore, total fruit and vegetables consumed at school and in the home do not sum to figures given for fruit and vegetable consumption overall, which should be borne in mind when interpreting the findings reported.

2.2 Basic analysis of Phase 3 data

The following sections are based on Phase 3 CADET data only, collected from 3,405 pupils. This included 1,131 pupils originally in reception classes during Phases 1 and 2 (now in Year 1), 1,159 originally in Year 1 (now in Year 2) and 1,115 originally in Year 2 (now in Year 3, no longer participating in the NSVFS).[6] As approximately one third of the children were no longer participating in the SFVS in Phase 3, this was expected to have an impact on the results reported in this chapter. Fifty-six per cent of the total sample were in the intervention group (1,905 pupils); the remaining 1,500 pupils (44 per cent) were in the comparison group.

Just under half of all pupils (48 per cent) usually had school dinners for lunch and two-fifths (39 per cent) usually had a packed lunch. Twenty-seven pupils (only one per cent) went home for lunch, and those remaining (12 per cent) did not specify their lunch arrangements.

5 If a child had drunk two glasses of fruit juice, one at home and one at school, only one could be counted, and there would be no criterion for deciding whether to classify it as home or school.

6 To avoid confusion when comparing year groups, we refer to pupils by the year group they were in when the evaluation began.

2.2.1 Consumption of fruit

The figures quoted for 'fruit' include fruit provided under the SFVS (for the intervention group only), but exclude fruit juice (juice is reported separately below). At Phase 3, the overall average consumption of fruit was 1.52 portions per day. It was still the case that girls ate more fruit (1.55) than boys (1.48), but this difference was not statistically significant. It was also still the case that children in the intervention group ate more fruit (1.65 portions) than those in the comparison group (1.35 portions), although the difference has greatly reduced (it was 1.95 compared with 1.38 in Phase 2). As before, the amount of fruit eaten decreased with age (Reception 1.68; Year 1, 1.57; Year 2, 1.30 portions).

Pupils from minority ethnic groups ate more fruit than white UK pupils (1.74 compared with 1.52 portions). In our previous report (Teeman *et. al*, 2004b), we found that pupils in schools with high proportions of pupils with EAL were more likely to achieve the '5 A DAY' goal, which led us to hypothesise that diet may be linked with ethnicity; the finding reported here supports this hypothesis, although it was not confirmed by the multilevel modelling (see Section 2.2.3).

There was no significant difference in the amount of fruit consumed between pupils who had packed lunches and those who had school dinners.

2.2.2 Consumption of fruit juice

Mean consumption of fruit juice in November was 0.51 portions. There was no significant difference between girls and boys in relation to the amount of juice consumed (although in June girls drank more than boys, significant at the ten per cent level).

As before, there was no significant difference in consumption between year groups. However, it was still the case that the intervention group drank significantly more (0.56) than the comparison group (0.46).

2.2.3 Consumption of vegetables

At Phase 3, mean consumption of vegetables was 1.60 portions. There was a significant difference between boys and girls in relation to vegetable consumption (although the difference was significant only at the ten per cent level). Children in Year 2 ate significantly fewer vegetables (1.46 portions) compared with children in Year 1 (1.68) or Reception (1.67).

As at Phases 1 and 2, there was no difference in overall consumption of vegetables between the intervention and comparison groups. However, we noted in our report of the baseline survey (Teeman *et al*., 2004a) that children

in the comparison group ate significantly more portions of vegetables at lunchtime. We suggested that this might be because more pupils in the comparison group were having school dinners. This hypothesis has now been disproved, as (in response to an additional question on CADET) parents reported that 52 per cent of children in the intervention group usually had school dinners, compared with 40 per cent in the comparison group.

In order to explore the issue further, we re-examined the baseline data in the light of this information. Children were divided into four groups: intervention group/packed lunch, intervention group/school dinner, and so on. We found that children in the comparison/school dinner group were eating far more vegetables than any other group at lunchtime – more than twice as many as those in the intervention/school dinner group, which accounts for the higher average in the comparison group as a whole. The difference persisted at Phase 3. It seems that, when compared with the North East, either standard school dinners in Yorks and Humber have a higher vegetable content, or staff there are more successful in encouraging children to eat vegetables.[7]

Pupils who usually ate school dinners ate more vegetables overall than pupils who usually had a packed lunch (1.85 and 1.39 portions). It might be assumed that children who eat packed lunches are likely to have their main meal of the day at home, and would compensate by eating more vegetables there, yet they ate considerably fewer vegetables overall. Further analysis indicated that there was no significant difference between 'packed lunch' and 'school dinner' children in terms of vegetable consumption at the evening meal, neither at baseline nor at Phase 3.

There were no differences in vegetable consumption between the white UK and minority ethnic groups.

2.2.4 Total consumption of fruit and vegetables

As in the analysis of the Phase 1 and Phase 2 surveys, total consumption of fruit and vegetables was calculated in accordance with the '5 A DAY' guidance (Department of Health, 2003a): fruit juice was included, but counted only once (even if a child had drunk more than one portion); beans, lentils and pulses were also included but only counted once. For the intervention group, fruit and vegetables consumed under the SFVS were included.

Average total consumption of fruit, fruit juice and vegetables was 3.48 portions in November. Although there was no significant difference between boys and girls in consumption of fruit, fruit juice or vegetables when explored separately, when taken collectively girls ate more fruit, juice and vegetables

[7] The fact that fruit and vegetable consumption is generally low in the North East (see Section 1.4) may influence the content of school dinners.

(3.56) than boys (3.40); this difference was just significant at the five per cent level.

There was a significant difference between the intervention group (3.65) and the comparison group (3.26) in relation to total fruit and vegetable consumption, which reflects the impact of the SFVS on fruit consumption evident in Phase 3, although the difference was less than it was in Phase 2 (3.95 compared with 3.28). In Phase 3, pupils in the intervention group consumed more portions of fruit and vegetables at school than pupils in the comparison group (1.34 and 1.18 portions respectively). They also consumed more portions of fruit and vegetables at home than pupils in the comparison group (1.70 and 1.53 portions).

It may be considered disappointing that the difference in consumption at school is relatively small (no bigger than the difference in consumption at home), given that the fruit and vegetables consumed at school include the SFVS fruit. However, there are two important points which need to be borne in mind. First, the average for the intervention group includes all of the children in the North East, and by the time of the Phase 3 survey, one third of them (those who had moved from Year 2 to Year 3) would no longer be receiving SFVS fruit. Second, at the time of the baseline survey, before the introduction of the SFVS, children in the comparison group were eating more fruit at school than children in the intervention group (Teeman *et al.*, 2004a). There was a particularly large difference at morning break, and we hypothesised that some schools in Yorks and Humber were engaged in independent or local initiatives to promote fruit consumption, either by providing free fruit or by having a 'fruit only' breaktime policy.[8] The fact that children in the North East are now eating more fruit and vegetables at school than those in Yorks and Humber therefore suggests a greater impact of the SFVS than a simple comparison of Phase 3 means might imply.

In accordance with previous findings, consumption of fruit and vegetables decreased with age: children in Year 2 consumed significantly less fruit, juice and vegetables than children in Year 1 and Reception (3.12, 3.61 and 3.70 portions respectively), which reflects the differences in consumption of fruit and vegetables separately. The difference at Phase 3 is particularly large, due to the fact that the former Year 2 pupils were no longer involved in the SFVS.

There were no significant difference between white UK and minority ethnic pupils, or between those who had school dinners and those who had packed lunches.

[8] This has been confirmed, insofar as six comparison group schools were involved in local schemes which provided free fruit (see Section 1.5).

2.2.5 Achieving '5 A DAY'

Overall, 30 per cent of pupils in Phase 3 consumed at least five portions of fruit and vegetables a day. As before, there was a significant difference between girls (31 per cent) and boys (28 per cent). It was also still the case that there was a highly significant difference between the intervention group (32 per cent) and the comparison group (26 per cent), although the difference was slightly less than in Phase 2 (35 per cent compared with 27 per cent). There was also a difference between year groups; pupils in Year 2 (25 per cent) were least likely to achieve the '5 A DAY' goal compared with pupils in Year 1 (32 per cent) and Reception (33 per cent). This is to be expected, as Year 2 pupils were no longer in the scheme by Phase 3.

2.2.6 Consumption of snacks and desserts

Because an increase in consumption of fruit and vegetables might lead to a corresponding decrease in the amount of other foods consumed, a baseline measure of snacks and desserts was undertaken following the Phase 1 data collection, and repeated after Phases 2 and 3.

In Phase 3, the average number of snacks and desserts eaten was 3.09 portions in 24 hours. Boys ate significantly more snacks and desserts than girls (3.16 compared with 3.02 portions), which was also the case in Phase 1 but not Phase 2 (when the difference was smaller and not significant). There was no significant difference in snack consumption between the intervention and comparison groups, or between year groups.

Pupils who usually ate packed lunches ate considerably more snacks than pupils who ate school dinners (3.63 compared with 2.73). Since lunch boxes are likely to contain items such as crisps and chocolate bars, it might be expected that children taking packed lunches would have a higher 'snack count' at lunchtime; however, it is noteworthy that the difference in overall consumption of snacks is so large. Over the course of a day, children taking packed lunches to school were eating one and a third times as many snacks as those having school dinners.

White UK pupils ate significantly more snacks (3.15 portions) than pupils from minority ethnic groups (2.74). In the multilevel modelling analysis in Phase 2, we found that pupils in schools with high proportions of EAL pupils ate fewer snacks, which led us to hypothesise a link between ethnicity and dietary habits (since there is likely to be a link between ethnic group and EAL). This finding supports the hypothesis, although it was not confirmed by the multilevel modelling (reported below in Section 2.4.4).

2.3 Change over time

Table 2.1 illustrates the average total consumption of fruit, fruit juice, vegetables, fruit and vegetables combined (overall, at school and at home), and snacks and desserts for pupils in the intervention group in all three phases of the CADET data collection, which provides an indication of change over time. The table is based on the intervention group only, as we might hope to see a change over time for pupils who had participated in the SFVS. It should be noted that means quoted are based on all pupils who participated in all three phases of the CADET data collection. Any significant differences in change over time are indicated in the table.

Table 2.1 Mean consumption among pupils in the intervention group

Outcome	Mean portions		
	Phase 1	Phase 2	Phase 3
Fruit	1.65	1.99*	1.65**
Fruit juice	0.57	0.63*	0.56**
Vegetables	1.53	1.57	1.62
Fruit and vegetables ('5 A DAY')	3.56	3.98*	3.67
Snacks and desserts	3.35	3.30	3.09**
Fruit and vegetables at home	1.98	1.82*	1.73
Fruit and vegetables at school	0.94	1.53*	1.31**
N = 1391			

** indicates a significant change over time between Phases 1 and 2*
***indicates a significant change over time between Phases 2 and 3*

As shown in Table 2.1, although there was a significant increase in fruit consumption among pupils in the intervention group between Phase 1 and Phase 2, there was a significant decrease between Phases 2 and 3 (back to baseline level). This was also the case for consumption of fruit juice. A similar pattern emerged when exploring consumption of fruit and vegetables combined; there was an initial increase in consumption between Phases 1 and 2, yet a decrease between Phases 2 and 3.

There was a general decrease in the proportion of fruit and vegetables consumed among the intervention group at home. This could be because pupils were consuming more at school (consumption at school remained higher than the baseline level, but not as high as at Phase 2). It must be remembered that approximately one third of the pupils in the sample were no longer receiving free fruit when the data was collected in Phase 3, which could account for a drop in average consumption between Phases 2 and 3. Therefore, it is important to explore the pattern of change over time for pupils in different year groups. For instance, did pupils now in Year 3 sustain any increase in

consumption after Phase 2 or did consumption decline to the baseline level, and did consumption among pupils now in Year 1 and Year 2 remain at the same level as in Phase 2 or did it decrease at all by Phase 3? To illustrate the answers to these questions, Table 2.2 below shows the change in mean consumption of fruit and vegetables for pupils in the intervention group, by year group.

Table 2.2 Mean fruit and vegetable consumption among the intervention group, by year group

Year group	Mean portions		
	Phase 1	Phase 2	Phase 3
Reception (Year 1 in Phase 3)	3.68	4.05*	3.90
Year 1 (Year 2 in Phase 3)	3.64	4.11*	3.85**
Year 2 (Year 3 in Phase 3)	3.35	3.75*	3.24**
N = 1391			

** indicates a significant change over time between Phases 1 and 2*
***indicates a significant change over time between Phases 2 and 3*

The table shows that, among pupils originally in Reception and Year 1, consumption remained higher than the baseline level, although not as high as at Phase 2. The pattern among the comparison group was less clear (pupils in Reception in the comparison group consumed less fruit and vegetables in Phase 3 than they had at baseline or in Phase 2, yet pupils in Year 1 consumed more in Phase 3 than in Phases 1 and 2). It is difficult therefore to infer any conclusions about the impact of the SFVS.

Among intervention group pupils no longer involved in the scheme (now in Year 3), there was a clear pattern of change. There was an increase in consumption between Phase 1 and Phase 2 and then a decrease in Phase 3, when consumption had returned to below baseline level. Among the comparison group, fruit and vegetable consumption by pupils in Year 2 reduced at each phase.

As Table 2.1 shows, there was also a decrease in the number of snacks and desserts consumed among the intervention group. To examine this more closely, we analysed snack consumption by year group (see Table 2.3).

Table 2.3 Mean snack consumption among the intervention group, by year group

Year group	Mean portions		
	Phase 1	Phase 2	Phase 3
Reception (Year 1 in Phase 3)	3.41	3.35	3.06**
Year 1 (Year 2 in Phase 3)	3.29	3.32	3.10**
Year 2 (Year 3 in Phase 3)	3.35	3.21	3.11
N = 1391			

** indicates a significant change over time between Phases 1 and 2*
***indicates a significant change over time between Phases 2 and 3*

As Table 2.3 illustrates, there were no significant differences for any year group between baseline and Phase 2 surveys. However, there was a significant decrease between Phase 2 and Phase 3, for children in Reception and Year 1 (still involved in SFVS), but not for those in Year 2 (no longer in SFVS). The comparison group exhibited a similar pattern: no significant change at Phase 2, but a significant reduction for all year groups at Phase 3. It seems unlikely therefore that the drop is associated with the introduction of the SFVS.

2.4 Multilevel Modelling

Multilevel modelling enables us to consider the impact of a wider range of variables, and to consider them all simultaneously. Models were created in order to further explore seven outcomes:

- consumption of fruit
- consumption of vegetables
- total consumption of fruit, fruit juice and vegetables (calculated according to the '5 A DAY' rules)
- achievement of the '5 A DAY' goal
- consumption of snacks and desserts
- total fruit and vegetables consumed at home
- total fruit and vegetables consumed at school.

The first five outcomes were as defined in the first interim report (Teeman *et al*., 2004a). The final two outcomes were modelled for the first time at Phase 3. It was difficult to apply '5 A DAY' rules in these categories, and therefore fruit juice and beans were excluded from the counts of fruit and vegetables consumed at home or at school (see Section 2.2).

Six of the outcomes were measured in terms of portions[9], but the '5 A DAY' outcome is binary (yes/no) i.e. did pupils reach the '5 A DAY' goal, or not? Tables 2.4 and 2.5 summarise the results for the six outcomes measured in terms of portions. The variables in Table 2.4 relate to overall differences (approximating roughly to the baseline situation), whereas Table 2.5 illustrates change over time (and thus apparent impacts of the SFVS).

Table 2.4 Significant coefficients for background variables relative to food intakes expressed as portions (overall differences)

Variables at each timepoint	Total fruit	Total veg	Total fruit & veg	Snacks	Portions at school	Portions at home
Sex (girl = 2, boy = 1)	0.1		0.2	-0.1	0.1	0.1
Intervention group					-0.3	0.2
Year 1 pupils	-0.3				-0.2	
Year 2 pupils	-0.4				-0.2	
Infant school						
Intervention group Year 1 pupils						
Intervention group Year 2 pupils			-0.3			
% eligible for free school meals*	-0.1	-0.1	-0.2	0.1	-0.1	-0.2
% with SEN*						
% with EAL*						
KS1 overall performance 2002						
Minority ethnic						
School lunch		0.2	0.2	-0.2	0.2	
Packed lunch	0.2	-0.2		0.6		
Home lunch				-0.5		
% of people aged 16-74 with no qualifications*	0.0**		-0.1			-0.1
% of people in OA with not good health*		-0.2				
Mean deprivation index*						

**Value given is the actually expected change for ten percentage points change in the background variable)*

*** Indicates a difference less than 0.05, therefore rounded to 0.0, but nevertheless significant.*

The coefficients in each row indicate the impact of the factor named on the relevant outcome(s). It should be noted that the differences shown in the tables are after controlling for all other factors. The figures quoted should be understood as illustrating significant differences between the category named and the 'base case', i.e. a boy in Reception in the comparison group, whose lunch arrangements were not specified. Thus a 0.5 in the 'sex' row would mean that girls consumed 0.5 more than boys; a 0.3 in the 'Year 1' row would

[9] Note that one tick on CADET counts as a portion, although teachers/parents were asked to tick an item even if just one bite was taken (therefore a tick could represent less than a whole portion, or more than one portion).

indicate that Year 1 pupils ate 0.3 more than Reception pupils. A girl in Year 1 would belong to both groups, and would therefore eat 0.8 more than a boy in Reception.

Table 2.5 Significant coefficients for background variables relative to food intakes expressed as portions (change over time)

Variables relating to change from Phase 1 to Phases 2 and 3	Total fruit	Total veg	Total fruit & veg	Snacks	Portions at school	Portions at home
Timepoint (Phase 2 v. baseline)	-0.1					
Timepoint (Phase 3 v. baseline)	-0.1			-0.4		
Intervention group at Phase 2	0.4		0.5		0.4	-0.2
Intervention group at Phase 3	0.2				0.5	-0.6
Year 1 pupils at Phase 2						
Year 2 pupils at Phase 2						
Year 1 pupils at Phase 3						
Year 2 pupils at Phase 3						
Intervention group Year 1 pupils at Phase 2	0.3				0.3	
Intervention group Year 2 pupils at Phase 2						
Intervention group Year 1 pupils at Phase 3						
Intervention group Year 2 pupils at Phase 3			-0.3		-0.2	
Intervention group Phase 2 by deprivation*						
Intervention group Phase 3 by deprivation*						
Intervention group Phase 2 by sex		0.2				
Intervention group Phase 3 by sex		0.1				
Intervention group Phase 2 by school lunch		-0.2	-0.2		-0.2	
Intervention group Phase 2 by packed lunch						
Intervention group Phase 2 by home lunch						
Intervention group Phase 3 by school lunch		0.2				0.5
Intervention group Phase 3 by packed lunch		0.2	0.2			0.3
Intervention group Phase 3 by home lunch					1.1	

** Value given is the actually expected change for ten percentage points change in the background variable*

Below we discuss, with reference to the tables, the findings for each of the seven outcomes.

2.4.1 Consumption of fruit

In general, girls ate slightly more fruit than boys, while pupils in Years 1 and 2 are less than those in Reception. Children who took a packed lunch to school ate 0.2 portions more fruit than others; children in schools with high proportions eligible for FSM ate less.

Consumption of fruit was generally lower at Phases 2 and 3 than it had been at baseline. However, for the intervention group there was a positive effect of 0.4 at Phase 2. In other words, while the comparison group ate 0.1 portions less, the intervention group as a whole ate 0.3 portions more. There was an additional increase of 0.3 portions for Year 1 pupils in the intervention group. However, the increase at Phase 3 (compared with baseline) was only 0.2, suggesting that only some of the increase observed in Phase 2 had been sustained. This is consistent with the analysis of change over time, which showed a particularly large decrease for the Year 2 children who were no longer receiving SFVS fruit. The model showed a negative interaction for Year 2 children in the intervention group, but this fell just short of statistical significance at the five per cent level, and is therefore not shown in Table 2.5, although there is a negative interaction for fruit and vegetables combined.

2.4.2 Consumption of vegetables

In terms of overall vegetable consumption, children who had school lunches ate 0.2 portions more, while those on packed lunches ate 0.2 portions less (than those whose lunch arrangements were unspecified). Hence, children having school dinners ate 0.4 portions of vegetables more than those on packed lunches. As for fruit, there was a negative association with (school-level) eligibility for FSM; in this case there was also a negative association with living in areas with a high proportion of people not in good health.

There was no general change over time, and no apparent impact on the intervention group as a whole. However, girls in the intervention group increased their vegetable intake at Phase 2 and also (to a lesser extent) at Phase 3. At Phase 2 pupils on school dinners were eating fewer vegetables, while at Phase 3 they and the children having packed lunches were eating more.

2.4.3 Consumption of total fruit and vegetables

Generally, girls ate more fruit and vegetables then boys, and children on school dinners ate more than others. However, Year 2 pupils in the intervention group ate fewer fruit and vegetables, and there were negative associations with (school-level) eligibility for FSM, and with living in an area where a high proportion of residents had no qualifications.

There was a strong positive impact (0.5) on the intervention group at Phase 2, but not Phase 3. Instead, there was a negative effect for Year 2 pupils, meaning that they were eating less fruit and vegetables than at baseline. Changes with reference to dinner arrangements reflect those already noted relating to vegetable consumption.

2.4.4 Consumption of snacks and desserts

Generally, girls ate fewer snacks and desserts than boys, while children from schools with high eligibility for FSM ate more. These findings are in accordance with those reported previously (see Teeman *et al*., 2004b). Data included in the current models indicates that children on packed lunches were eating more snacks and desserts than those whose lunch arrangements were not specified, while those eating school dinners, or going home for dinner, were eating less. Hence the packed lunch children were eating 0.8 portions more of this kind of food than children on school dinners, and 1.1 portions more than those going home.

The only difference relating to change over time was a general decrease in consumption of snacks and desserts at Phase 3; there was no change specifically associated with the intervention group as a whole or any group within it.

2.4.5 Fruit and vegetables at school and home

There were some interesting differences when exploring these two additional outcomes, which help us to pinpoint more closely the differences discussed above. Evidently, girls ate more fruit and vegetables than boys at home and at school. However, the reduced consumption by Years 1 and 2 (compared with Reception) occurred in a school context. Overall, there was no difference in consumption of fruit and vegetables between the intervention and the comparison group, but the intervention group ate more portions at home, and fewer at school.

School-level eligibility for FSM was associated with lower consumption of fruit and vegetables at home and at school. Children having school dinners ate more fruit and vegetables at school, while living in an area with low academic attainment was associated with eating less fruit and vegetables at home.

At Phase 2 and at Phase 3, consumption of fruit and vegetables in the intervention group had increased at school and decreased at home, which may indicate a degree of displacement (although, as noted above, there was an overall increase). The additional increase for Year 1 pupils in the intervention group at Phase 2 occurred in a school context, as did the decrease for Year 2 pupils in the intervention group at Phase 3. Intervention group children on

school dinners ate less fruit and vegetables at school in Phase 2, but those on school dinners and those on packed lunches increased their fruit and vegetable consumption **at home** at Phase 3. Children who went home for dinner increased their consumption of fruit and vegetables **at school** at Phase 3, but it should be noted that this was an extremely small group of children.

2.4.6 Achieving '5 A DAY'

The final outcome to be explored by multilevel modelling was '5 A DAY': did children achieve this goal or not? As this is a binary (yes/no) outcome, it requires a logistic multilevel model, which produces odds ratios indicating the likelihood of various groups achieving the desired outcomes. The results of the analysis are shown in Table 2.6 (overall differences) and Table 2.7 (change over time) below.

Table 2.6 Significant odds ratios for background variables relative to reaching '5 A DAY' standard (overall differences)

Variables at each timepoint	Odds ratio
Sex (girl = 2, boy = 1)	1.204
Intervention group	
Year 1 pupils	
Year 2 pupils	
Infant school	
Intervention group Year 1 pupils	
Intervention group Year 2 pupils	
% eligible for free school meals*	0.981
% with SEN*	
% with EAL*	
KS1 overall performance 2002	
Minority ethnic	
School lunch	
Packed lunch	
Home lunch	
% of people aged 16-74 with no qualifications*	0.992
% of people in OA with not good health*	
Mean deprivation index*	

** Value given is actual expected change for ten percentage points change in the background variable*

Table 2.6 above shows that, overall, only one group of pupils were significantly more likely than average to be eating '5 A DAY', i.e. girls. All the research we have conducted to date has shown consistently that girls eat

more fruit and vegetables than boys. The table shows that there were two groups of children whose chances of achieving the '5 A DAY' goal were below average: pupils in schools with a high proportion eligible for FSM (consistent with our previous findings) and pupils in areas with a high proportion of adults with no qualifications. These findings provide further evidence of a relationship between diet and deprivation.

As shown in Table 2.7, children in the intervention group generally were one and a third times as likely to achieve the '5 A DAY' target, at Phase 2 and Phase 3. However, at Phase 3 the probability of Year 2 pupils in the intervention group achieving the goal was much reduced, so that they were in fact slightly less likely to eat five a day than at baseline. This further suggests that there was no lasting impact once the scheme had stopped.

Table 2.7 Significant odds ratios for variables relative to reaching '5 A DAY' standard (change over time)

Variables relating to change from Phase 1 to Phases 2 and 3	Odds ratio
Timepoint (Phase 2 v. baseline)	
Timepoint (Phase 3 v. baseline)	
Intervention group at Phase 2	1.355
Intervention group at Phase 3	1.345
Year 1 pupils at Phase 2	
Year 2 pupils at Phase 2	
Year 1 pupils at Phase 3	
Year 2 pupils at Phase 3	
Intervention group Year 1 pupils at Phase 2	
Intervention group Year 2 pupils at Phase 2	
Intervention group Year 1 pupils at Phase 3	
Intervention group Year 2 pupils at Phase 3	0.688
Intervention group Phase 2 by deprivation*	
Intervention group Phase 3 by deprivation*	
Intervention group Phase 2 by sex	
Intervention group Phase 3 by sex	
Intervention group Phase 2 by school lunch	
Intervention group Phase 2 by packed lunch	
Intervention group Phase 2 by home lunch	
Intervention group Phase 3 by school lunch	
Intervention group Phase 3 by packed lunch	
Intervention group Phase 3 by home lunch	

** Value given is actual expected change for ten percentage points change in the background variable*

2.5 Summary of CADET findings

Data from Phase 3 provided further evidence that, as reported previously:

- girls eat more fruit and vegetables, but fewer snacks and desserts, than boys
- consumption of fruit and vegetables decreases with age (among the age groups included in the evaluation)
- there is a link between diet and deprivation.

There was some evidence from the basic analysis to support our hypothesis (based on analysis of Phase 1 and 2 data) of a link between ethnicity and fruit consumption, but this was not confirmed by multilevel modelling.

For the first time, we were able to compare the consumption of fruit and vegetables, snacks and desserts of children according to their lunch arrangements. This indicated that children taking packed lunches ate 0.2 portions more fruit, 0.4 portions less vegetables and 0.8 portions more snacks and desserts (over a 24-hour period) than children having school dinners.

Over time, among all the children involved in the evaluation, there was a small reduction in the consumption of fruit, and a larger reduction in the consumption of snacks and desserts. Against this background, there was a significant positive effect on children in the intervention group at Phase 2, meaning that, while the comparison group were eating 0.1 portions less fruit, the intervention group generally were eating 0.3 portions more, and those in Year 1 of the intervention group were eating 0.6 portions more.

At Phase 3, the positive overall impact of the SFVS was not so strong. This was due mainly but not entirely to the fact that one third of the intervention group children were now in Year 3, and no longer receiving the free fruit. Thus for pupils initially in Reception and Year 1, consumption remained higher in Phase 3 than at baseline, although not as high as in Phase 2. For pupils who were no longer part of the scheme (in Year 3 in Phase 3), consumption of fruit and vegetables was below baseline level.

Further analysis indicated that the increase in fruit consumption at school was perhaps greater than the overall figures might suggest, but was offset by a decrease in consumption of fruit and vegetables at home.

2.6 Nutritional analysis

The purpose of this analysis is to identify any changes in the energy and nutrient content of children's diet following the introduction of the SFVS. The

results have been expressed in original units so any changes in intake may be related to the requirements children of this age group have for energy, growth and health. Below we discuss the outcomes of the basic analysis of the Phase 3 data and the results of the multilevel modelling, which aims to shows whether there has been any short- or long-term impact on children's diet and nutrient intake associated with the SFVS, after three and seven months.

2.6.1 Findings from the analysis of Phase 3 data

Table 2.8 shows the mean daily intake of key nutrients approximately seven months after the introduction of the SFVS. The figures presented in this table do not take into account background variables which may impact on the findings; they simply indicate whether the figures obtained fall close to the expected range for the age range of children included in this survey and whether intakes meet population guidelines.

Macronutrient intake

Our data shows that the intake of fat, percentage energy from fat and protein is within the expected range for this age group of children living in the UK. Furthermore, the energy intake of the comparison and intervention groups is similar to the 6.39MJ (males) and 5.87MJ (females) reported for this age group in the National Diet and Nutrition Survey of children (NDNS) (Gregory *et al.,* 2001). However, the energy intake of this group of children falls short of the energy requirements for their age (Department of Health, 1991). Boys, for example, are approximately 0.6MJ below energy requirements for their age. While this data may indicate a degree of under-reporting food intake in CADET, it is reassuringly consistent with that gathered by the NDNS.

Carbohydrate intake appears to be low in comparison to the findings of the NDNS survey where the mean intake of carbohydrate for males and females of this age is 188g per day, approximately 40g higher than figures reported here. However, total daily sugar intakes are slightly higher than figures reported in the NDNS by approximately 10g. This may indicate a particularly low intake of other, more complex carbohydrates in this group. As reported, intake of fibre is close to figures obtained in the NDNS; however, it should be noted there is no specific recommendations for intake of fibre for this age group.

Table 2.8 Mean intake of selected nutrients at Phase 3

	Reception		Mean intake Year 1		
	Comparison	Intervention	Comparison	Intervention	Comparis
Energy kcal	1493	1518	1501	1545	1497
Energy MJ	6.24	6.45	6.27	6.46	6.26
Protein g	50.7	50.7	50.1	51.8	51.16
CHO	143	134	139	140	139
Fibre	9.6	10.2	10.1	10.9	10.1
Fat g	56.8	55.4	56.8	57.3	56.7
Fat (% energy derived from fat)	34.0	32.7	33.8	33.2	34.0
Total sugars g	109.3	115.0	107.0	111.6	101.0
Iron mg	8.1	8.4	8.5	8.7	8.6
Calcium mg	657	670	622	662	641
Potassium mg	2017	2140	2024	2186	2020
Salt g	4.9	5.0	5.0	5.1	5.1
Folate mg	159	171	167	180	168
Carotene µg	1415	1686	1591	1941	1441
Vitamin A (retinol equiv) µg	223	229	224	216	216
Vitamin C mg	67	79	72	82	66
N=	472	659	517	642	511

Micronutrient intake

Overall, micronutrient intakes reported at Phase 3 are similar to those collected at baseline (Phase 1) and at Phase 2. However, for this final report a further nine items were reported on to provide a more detailed view of how the nutrient profile of children's diets may be affected by the SFVS. Two findings in particular are noteworthy. Salt intake continues to be high for the group, and Vitamin A intake appears to be approximately half of what is expected for this age group. The other nutrients listed are within the expected range and meet the nutritional requirements of children of this age group. Table 2.9 summarises the main comments relating to the reported intakes of micronutrients.

2.6.2 Impact on nutrient intake associated with the SFVS: findings from the multilevel modelling

Tables 2.10-2.13 present the impact associated with the introduction of the SFVS at Phase 2 and Phase 3 i.e. three and seven months after the introduction of the scheme. The findings from the multilevel model take background variables into account when calculating the impact the scheme may have had on children's nutrient intake at a particular timepoint.[10] The figures in the columns headed 'Estimate (MLM)' indicate the impact of the intervention at Phases 2 and 3 of the evaluation. The figures are expressed in units appropriate to energy and selected nutrients, except for four outcomes (carbohydrate, iron, carotene and Vitamin A) which were log-transformed before analysis.[11] For these outcomes, the reported figures should be regarded as percentage change associated with the impact of the intervention. The confidence intervals indicate how sure we can be of any changes in energy and nutrient intake which have occurred following the introduction of the SFVS. The section below has been subdivided into the impact associated with the SFVS on macro and micronutrient intake.

Macronutrient intake

Macronutrient intake refers to intakes of nutrients that provide energy in the human body. These nutrients comprise fats, protein and carbohydrates (including sugar and fibre).

[10] Timepoint refers to the different times or phases (March, June and November) at which data was collected.

[11] One of the assumptions of multilevel modelling and other statistical methods is that the data is approximately Normally distributed, and is symmetrical about the mean value; where the distribution of values is highly asymmetrical this can bias the results. All the nutrient outcomes were investigated to test for this situation, and four were found to be relatively non-Normal. To correct this, the data for these outcomes was transformed logarithmically, which produced a much more symmetrical distribution about the mean. In these cases, coefficients should be interpreted as percentage changes, either positive or negative.

Table 2.9 Summary of comments on micronutrient intake at Phase 3

Micronutrient	Comment
Iron	Similar to figures reported in the NDNS and above the RNI of 6.1g for t
Calcium	Similar to figures in the NDNS and above the RNI of 450mg per day
Potassium	Similar to figures reported in the NDNS and approximately twice the RN with no deleterious risk poised to health.
Folate	Similar to figures reported in the NDNS. 150µg required per day (RNI) excess of this figure
Salt	A noticeable and concerning feature of the micronutrient intake reporte salt intake[12] which is approximately twice that recommended by the Foo the Department of Health for both young males and females. Howe survey are close to the findings of the mean figures reported in the NDN
Carotene	Similar to figures reported in the NDNS. There is no recommend component. Carotenes are widely distributed in fruit and vegetables, par highly coloured such as carrots. An increased intake of fruit and vegeta in alterations in carotene intake
Vitamin A (retinol equivalents)	These are approximately half of those reported in the NDNS survey. The is 400 µg per day. Therefore figures reported here do not meet recomme group.
Vitamin C	Similar to figures reported in the NDNS and above the RNI for this widely distributed in fresh fruit and vegetables

[12] Derived from sodium intake

Energy

Table 2.10 shows a small negative, non-significant impact on energy intake, associated with the intervention, in Reception pupils, and a very small positive impact in Year 1 pupils; in effect, this amounts to no significant impact on energy intake in these year groups. A larger but still non-significant negative impact on energy intake (0.63MJ/152kcal) has occurred in Year 2 pupils. Confidence intervals are wide and mean we may be less certain such a large impact has occurred. Any effect is almost certainly due to the negative impact the intervention may have had on total sugar intake reported in Year 2 pupils. An impact of this magnitude on energy intake is equivalent to approximately ten per cent of the energy intake of boys and girls in this age group. This may have been due to a reported decrease in snacks and desserts consumed by children in the intervention and comparison groups (see Sections 2.3 and 2.4.4).

This result echoes the Phase 2 data (Table 2.12) which showed no impact on energy intake in Reception and Year 1 pupils but a significant negative impact on Year 2's energy and sugar intake. The mean value for energy intake of children at Phase 2 was in line with Dietary Reference Values (DRVs) for girls but low for boys (Teeman *et al.,* 2004b). We are slightly surprised to see a drop in energy intake in this group as their baseline intake was low in comparison to their requirements (Department of Health, 1991).

Protein

A small insignificant negative impact on protein intake was observed at Phase 3 (Table 2.10) across all year groups. At Phase 2 (Table 2.12) the impact associated with the intervention on protein intake was nearly 6g per day in Year 2 pupils. At Phase 3 the impact on reduced protein intake was less. Overall, the impact associated with the intervention on protein intake at Phase 3 was very small.

Carbohydrate

There was a significant negative impact on carbohydrate intake associated with the SFVS and across the three year groups at both timepoints in the evaluation (about -5 per cent at Phase 2 and -9 per cent at Phase 3). The negative impact was particularly pronounced for Year 2 pupils (-17 per cent) at Phase 3 (Table 2.10). When energy is controlled for, however, this impact is reduced to -6 per cent (Table 2.11).

Fibre

At Phase 2 there was a small, significant positive impact on fibre intake across Reception and Year 1 pupils (Table 2.12). At Phase 3 this effect had

disappeared (Table 2.10). Fruit and vegetables are normally a good source of dietary fibre and any increase in fruit and vegetable intake would be expected to increase fibre intake.

Fat

A small but significant negative impact in total fat intake (2g) at Phase 2 was observed in children in Reception classes (Table 2.12). This effect was lost at Phase 3 in the Reception class (Table 2.10). The intervention was associated with non-significant increased impact on fat intake in Year 2 pupils of almost 2g at Phase 3 (Table 2.10). Overall the impact associated with the intervention on fat intake has been neutral.

Percentage energy derived from fat

A very small negative impact was observed in the percentage of energy derived from fat in the diet at Phases 2 and 3 in Reception and Year 1 pupils (Tables 2.10 and 2.12). The impact associated with the intervention on Year 2 pupils was greater. A small, significant increase of two per cent in the percentage energy from fat was observed at Phase 2 and four per cent at Phase 3. Overall, there was a small increase in the percentage energy derived from fat at Phase 3 (one per cent).

An increase in the percentage of energy derived from fat is unlikely to be a direct result of eating more fruit/vegetables and may be explained by the impact associated on energy intake recorded in Year 2 pupils i.e. lower sugar intake which translates into decreased energy intake (Table 2.10). When controlling for energy intake, the impact of four per cent persists, which means the pupils are eating food with a higher fat content, relative to its energy composition (Table 2.11).

Sugar

Overall, there has been a significant but modest impact on sugar intake associated with the intervention: a reduction of approximately 10g (Table 2.10), equivalent to approximately two teaspoons of sugar. For Reception and Year 1, there was no significant change, but for Year 2 pupils there was a significant decrease at both Phase 2 and at Phase 3, where the impact on sugar intake is a drop of 38g – the equivalent of approximately eight teaspoons of sugar. This effect is sustained when energy intake is controlled for, which means pupils may be eating food which contains less sugar (Table 2.11).

Micronutrient intake

Micronutrient intake refers to intakes of those nutrients required by the human body in minute quantities. For this analysis a selection of key micronutrients were chosen. They were chosen because changes in fruit and vegetable intake may:

- directly affect the intake of these micronutrients e.g. potassium, Vitamin C, folate, Vitamin A and carotene
- indirectly affect intake of these nutrients by displacing other foods in the diet and have a knock-on effect on nutrient intake such as on sodium and hence salt intake.

In addition, the intake of some micronutrients by young children has been shown to be low in other dietary surveys (e.g. NDNS) and these have been included as a focus of interest e.g. calcium and iron.

Iron

There has been no significant impact on iron intake associated with the intervention, across the three year groups involved in the survey. Children have adequate intake of iron and their intake would not be expected to change as a result of changes in fruit and vegetable intake, unless displacement of other foods has occurred (Tables 2.10-2.13).

Calcium

There has been a small, significant negative impact on calcium intake associated with the intervention and this effect persists when energy intake is controlled for, indicating a reduction in calcium-containing foods in the diet, most probably milk and dairy products. Levels of calcium in the diet do meet DRVs for this age group and this small impact is unlikely to affect this. Calcium is an important nutrient for young children as it is important for the growth and development of the skeleton and teeth.

Potassium

Fruit and vegetables are a major source of potassium in the diet. Potassium has a number of important functions within the body, including the regulation of blood pressure. Overall, a small negative impact on potassium intake has been associated with the intervention. Potassium intake has decreased slightly in Year 2 pupils, which may be associated with a reduction in their fruit and vegetable intake. It is however a small impact which must be considered in the context of high intakes of potassium for this age group of children (Table 2.10).

Salt

The high salt intake of young children has been identified in a number of dietary surveys and is of concern because of the link between high intakes and the development of hypertension in later life. In this study we have observed a very small, non-significant negative impact on salt intake across the groups surveyed. There is no evidence that the SFVS intervention has had a real impact on the high levels of salt consumed by the children surveyed (Tables 2.10 and 2.12).

Folate

There was a small, significant positive impact in folate intake in Reception children at both Phase 2 and 3 (Tables 2.10 and 2.12). A small non-significant negative impact on intake was observed in Year 2 pupils at both Phase 2 and 3, perhaps reflecting the decreased intake of fruit and vegetables in this group. These changes were minute, in relation to requirements for folates by the human body and would be of no clinical significance.

Some vegetables provide a good source of folic acid. These are typically leafy green vegetables. Most fruit is not a plentiful source of folates.

Carotene

Carotenes are most commonly present in the yellow and orange pigment of fruit and vegetables such as mangoes, carrots, red and yellow peppers and green leafy vegetables. The carotene content of apples, bananas and oranges, the most commonly consumed items included in the SFVS, is low in comparison to the above-mentioned and it is unlikely these alone would have much impact on intake.

A significant negative impact on carotene intake was observed at Phase 2 across all groups included in the evaluation. This may have been related to a seasonal decrease in the intake of carrots, for example (carrots are a major source of beta-carotene in the UK diet). At Phase 3, a positive impact of approximately 14 per cent and 21 per cent in carotene intake was observed in Reception and Year 1 pupils. For Year 2 pupils, a negative impact on their intake of approximately 14 per cent was recorded. Overall, there was a small positive six per cent change in carotene intake. It should be noted, however, that the confidence intervals for each of these changes was quite wide.

Vitamin A (expressed as retinol equivalents)

Some carotenes are converted into Vitamin A in the body, therefore coloured vegetables are an important source of this vitamin. In addition, full-cream milk, margarines and liver are important sources of Vitamin A in the diet.

Small negative changes in Vitamin A were observed across the groups at both Phase 2 and 3. For Year 2 pupils this was a significant negative change, albeit a small one. The Vitamin A intake of the children in this study is low in relation to other surveys and in comparison with recommended intakes i.e. approximately 50 per cent of Reference Nutrient Intake (RNI) for the age group (Department of Health, 1991).

Vitamin C

Fruit and vegetables are generally a rich source of Vitamin C. However several fruits including apples and bananas have low levels. A small and significant positive impact on Vitamin C intake was observed in children in Reception and Year 1 classes (Table 2.10). This was offset by a significant negative impact on the intake of Year 2 pupils at both Phase 2 and 3 (Tables 2.10 and 2.12). The change in Year 2 pupils is substantial and equivalent to a decrease in intake of approximately half a small orange. Overall, there was no real impact on Vitamin C intake across the groups, associated with the intervention. Intakes of Vitamin C in the children included in the sample are above the RNI for this nutrient.

2.6.3 Summary of nutrient findings

At Phase 3 (seven months after the introduction of the SFVS), the findings of this evaluation have shown few changes in the nutritional composition of the children's diet. It is important to note that Year 2 pupils were not receiving fruit provided by the SFVS by the time data was collected at Phase 3, which may partly explain the findings for this year group.

Energy intake of the younger children i.e. Reception and Year 1, appeared to be unaffected by the intervention; however the intervention was associated with a significant change in energy intake in Year 2 pupils which was probably related to a reduction in their sugar intake. The impact on energy intake coupled with a slight increase in fat intake in Year 2 pupils increased the percentage of energy derived from fat in their diet. Reception and Year 1 pupils report a very small increase in the intake of fruit and vegetables seven months following the intervention, and their intake of dietary fibre appears to have been unaffected by such a small impact on fruit intake. A small positive impact on carotene intake was recorded in Reception and Year 1 pupils and a negative impact was observed in Year 2. Salt intakes remain universally high and have remained unchanged following the intervention. Overall the intervention was associated with a neutral effect on intake of folates across the year groups.

The nutritional intake of Reception and Year 1 children shows some changes that may be associated with increased intake of fruit and vegetables, e.g. small

changes in carotene, folates and Vitamin C; however, this effect appears to be lost on Year 2 pupils.

Table 2.10 Estimated apparent impact coefficients associated with the intervention, by yea Phase 3

Nutrient	Reception		Year 1		Year 2		C
	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Esti (ML
Energy kcal	-7	-61 to 47	8	-85 to 100	-152	-245 to 60	-5
Energy MJ	-0.03	-0.25 to 0.19	0.03	-.35 to 0.4	-0.63	-1.01 to 0.25	-0.
Protein g	-1.9	4.2 to 0.4	-0.2	-4.2 to 3.7	-3.3	-7.2 to 0.6	-1
*CHO***	*-6*	*-10 to -2*	*-4*	*-9 to 2*	*-17*	*-24 to -10*	-
Fibre g	0.3	-0.1-0.7	0.5	-0.1 to 1.1	-0.2	-0.9 to 0.5	0.
Fat g	-0.6	-2.2 to 0.9	0.1	-2.8 to 3.1	1.7	-1.3 to 4.7	0.
Percent energy derived from fat	-0.9	-1.6 to -0.2	-0.1	-1.2 to 1.0	4.1	2.9 to 5.3	1.
Total sugars g	2.3	-1.9 to 6.4	3.0	-3.1 to 9.1	-38.2	-46.0 to -30.5	-1
*Iron***	*1*	*-2 to 4*	*1*	*-4 to 6*	*-3*	*-8 to 2*	*1*
Calcium mg	-30	-51 to -9	-23	-58 to 13	-136	-180 to -91	-6
Potassium mg	70	5 to 134	98	6 to 191	-212	-335 to -90	-1
Salt g	-0.1	-0.3 to 0.1	-0.2	-0.4 to 0.1	-0.0	-0.3 to 0.3	-0
Folate mg	8	3-13	8	-1 to 17	-9	-20 to 2	2
*Carotene***	*14*	*5 to 24*	*21*	*5 to 40*	*-14*	*-26 to 1*	*6*
*Vitamin A (retinol equiv)***	*-5*	*-9 to 1*	*-4*	*-12 to 4*	*-11*	*-20 to -1*	-
Vitamin C mg	8	3 to 12	9	3 to 16	-23	-32 to -15	-1

**The results from the MLM show the putative effect associated with (but not necessarily caused by) the intervention and take into ac may affect the results of the intervention*

*** These outcomes have been log-transformed before analysis – coefficients should be interpreted as percentage change*

Table 2.11 Estimated apparent impact coefficients associated with the intervention, by yea intake Phase 3 controlling for energy intake

Nutrient	Reception		Year 1		Year 2		C
	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Esti (ML
Protein g	-1.3	-2.6 to 0	-0.3	-2.5 to 1.9	1.4	-0.9 to 3.8	-0
*CHO***	*-5*	*-8 to -2*	*-4*	*-8 to 0*	*-9*	*-14 to-3*	-
Fibre g	0.1	-0.2 to 0.5	0.6	0.1 to 1.0	0.5	-0.1 to 1.1	0.
Fat g	-1.5	-2.5 to -0.4	-0.4	-2.2 to 1.4	7.0	5.1 to 9.0	1.
Percent energy derived from fat	-0.9	-1.6 to -0.3	-0.1	-1.2 to 1.0	4.4	3.3 to 5.6	1.
Total sugars g	3.7	0.3 to 7.0	0.9	-4.7 to 6.4	-27.5	-33.4 to -21.5	-7
*Iron***	*-1*	*-3 to 2*	*-1*	*-4 to 3*	*4*	*0 to 10*	*1*
Calcium mg	-19	-34 to -3	-10	-37 to 17	-69	-102 to -36	-3
Potassium mg	91	40 to 142	48	-41 to 138	-36	-127 to 56	3
Salt g	-0.1	-0.2 to 0	-0.1	-0.3 to 0.1	0.5	0.2 to 0.7	0.
Folate mg	8	4 to 12	13	6 to 20	0	-7 to 8	7
*Carotene***	*2*	*-8 to 12*	*7*	*-7 to 24*	*-23*	*-34 to -9*	-
*Vitamin A (retinol equiv)***	*-8*	*-13 to -3*	*-5*	*-12 to 3*	*-1*	*-8 to 8*	-.
Vitamin C mg	8	3 to 12	9	3 to 16	-19	-28 to -11	-

**The results from the MLM show the putative effect associated with (but not necessarily caused by) the intervention and take into a of the intervention*

*** These outcomes have been log-transformed before analysis – coefficients should be interpreted as percentage change*

Table 2.12 Estimated apparent impact coefficients associated with the intervention, by yea Phase 2

Nutrient	Reception		Year 1		Year 2		Ov
	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Estimate (MLM)*	95% CI for estimate (MLM)*	Estima (MLM)
Energy kcal	-17	-70 to 37	38	-55 to 130	-194	-285 to -103	-58
Energy MJ	-0.07	-0.29 to 0.16	0.16	-0.23 to 0.54	-0.81	-1.19 to -0.43	-0.24
Protein g	-2.4	-4.6 to -0.1	0.1	-3.9 to 4.0	-5.7	-9.6 to -1.8	-2.7
*CHO***	*0*	*-4 to 3*	*3*	*-2 to 9*	*-16*	*-22 to -10*	*-5*
Fibre g	0.7	0.4 to 1.1	1.3	0.7 to 1.8	0.4	-0.1 to 1.0	0.8
Fat g	-1.8	-3.3 to -0.3	-0.8	-3.4 to 1.8	-1.5	-4.1 to 1.1	-1.4
Percent energy derived from fat	-1.2	-1.8 to -0.7	-1.3	-2.2 to -0.5	2.3	1.2 to 3.4	-0.1
Total sugars g	2.9	-1.2 to 7.0	7.1	1.0 to 13.1	-38.0	-45.6 to -30.5	-9.4
*Iron***	*-2*	*-5 to 1*	*1*	*-4 to 6*	*-3*	*-8 to 1*	*-1*
Calcium mg	-11	-32 to 10	-20	-56 to 16	-168	-211 to -124	-66
Potassium mg	114	50 to 178	173	81 to 265	-225	-345 to -106	20.6
Salt g	-0.1	-0.3 to 0	0	-0.3 to 0.2	-0.2	-0.5 to 0	-0.1
Folate mg	6	1 to 11	6	-3 to 14	-5	-15 to 6	2
*Carotene***	*-10*	*-17 to -2*	*-9*	*-21 to 5*	*-28*	*-40 to -14*	*-16*
*Vitamin A (retinol equiv)***	*-3*	*-7 to 2*	*-1*	*-8 to 8*	*-19*	*-27 to -10*	*-8*
Vitamin C mg	13	8.3 to 17	15	9 to 22	-13	-21 to -4	5

**The results from the MLM show the putative effect associated with (but not necessarily caused by) the intervention and take into a of the intervention*

*** These outcomes have been log-transformed before analysis – coefficients should be interpreted as percentage change*

Table 2.13 Estimated apparent impact coefficients associated with the intervention, by yea Phase 2 controlling for energy intake

Nutrient	Reception		Year 1		Year 2		Ov
	Estimate (MLM)*	95% CI for Estimate (MLM)*	Estimate (MLM)*	95% CI for Estimate (MLM)*	Estimate (MLM)*	95% CI for Estimate (MLM)*	Estimat (MLM)*
Protein g	-1.5	-2.8 to -0.2	-0.9	-3.1 to 1.3	0.4	-2.0 to 2.7	-0.7
*CHO***	*4*	*0 to 7*	*3*	*-2 to 8*	*-5*	*-11 to 1*	*0*
Fibre g	0.6	0.3 to 0.9	1.1	0.6 to 1.6	1.4	0.8 to 2.0	1.0
Fat g	-2.0	-2.9 to -1.0	-2.4	-3.8 to 1.0	4.4	2.6 to 6.1	0
Percent energy derived from fat	-1.3	-1.8 to -0.7	-1.4	-2.3 to -0.6	2.8	1.7 to 3.9	0
Total sugars g	3.8	0.5 to 7.1	3.8	-1.7 to 9.3	-24.2	-30.0 to -18.4	-5.5
*Iron***	*0*	*-2 to 2*	*1*	*-2 to 4*	*8*	*4 to 13*	*3*
Calcium mg	1	-15 to 17	-23	-49 to 4	-82	-115 to -50	-35
Potassium mg	113	69 to 158	118	50 to 185	-1	-83 to 81	77
Salt g	-0.1	-0.2 to 0	0	-0.2 to 0.2	0.4	0.2 to 0.6	0.1
Folate mg	6	2 to 10	7	0 to 14	5	-3 to 12	6
*Carotene***	*-7*	*-15 to 1*	*-9*	*-21 to 4*	*-24*	*-36 to -10*	*-14*
*Vitamin A (retinol equiv)***	*-6*	*-11 to -1*	*-5*	*-12 to 3*	*-5*	*-12 to 3*	*-6*
Vitamin C mg	13	9 to 17	14	8 to 21	-7	-16 to 1	7

3. Pupil questionnaire

This chapter focuses on the data from the pupil questionnaire. The pupil questionnaire was administered for the third and final time in November 2004 to one whole Year 3 class in 51 of the intervention and 41 of the comparison schools (see Section 1.5 for details). As noted above, the children who had been in Year 2 (for Phases 1 and 2) were in Year 3 for Phase 3 of the evaluation and therefore were no longer taking part in the scheme.

In total, 2,129 questionnaires were returned to NFER. Thirteen questionnaires were excluded from the analysis based on the exclusion criteria detailed in the first interim report (Teeman *et al*., 2004a). The analysis is therefore based on 2,116 completed responses.

The questionnaire (see Appendix B) employed structured response questions throughout and presented respondents with a series of colour photographs in all but one question, where numbers were used. The first part of the questionnaire assessed pupil attitudes towards fruit and vegetables and snack foods. The second part focused on assessing the children's knowledge of healthy eating and balanced diet, and their awareness of the '5 A DAY' message about fruit and vegetable consumption.

3.1 Analysis of data

The aim of the analysis was to explore change over time, by comparing responses from Phase 1 (March), Phase 2 (June), and Phase 3 (November). Specifically, we wished to investigate:

- whether children reported a greater awareness of, and liking for, different fruits and vegetables (Qs 1-3 on the questionnaire)
- whether their knowledge and awareness of healthy eating had increased (Qs 4-9).

Any identified change over time could be due to maturation, familiarity with the questionnaire and other factors unconnected with the SFVS. However, having a comparison group enables any potential SFVS-related impacts to be assessed, over and above the external influences exerted on both groups.

To begin with, the data from Phase 3 was analysed to provide a summary of the responses and to identify any significant differences between boys and girls, or between the intervention and comparison groups.

For the next stage of analysis the individual responses were matched, and analysis was restricted to those pupils who had responses at each of the three timepoints[13] (a total of 1,028). The mean change in response was calculated for each question and the mean changes for intervention and comparison groups compared.

Finally, multilevel modelling of the data was undertaken. The analysis takes account of all relevant factors simultaneously, and indicates the relevant strength of the impact of each. As detailed in Chapter 2, background information was collected through the CADET instrument at Phase 3 and this was linked to pupil questionnaire data. As a result, we were able to include additional variables (ethnicity and the kind of lunch pupils usually had) in the analysis. Furthermore, we were able to link census variables to individual pupils via their reported postcodes, as recorded on the CADET instrument (for further information see Section 2.1).

It should be noted, however, that not all of the children who completed the pupil questionnaire were involved in the CADET surveys. Accordingly, these background variables were available for only 41 per cent of the pupils included in the analysis of the pupil questionnaire data.

3.2 Basic analysis of Phase 3 data

3.2.1 Fruit tried and liked (Question 1)

Question 1 presented pupils with pictures of 12 different fruits and asked them to indicate which fruits they had tried and which they liked or disliked. Overall, the mean number of fruits which pupils reported having **tried** at Phase 3 was 10.2. The mean number of fruits that pupils reported **liking** was 7.2. For the number of fruits **tried** there was a statistically significant difference between the mean for the intervention group (10.3) and the comparison group (10.1). Girls had **tried** (10.4) and **liked** (7.6) more fruits than boys (10.0 and 6.9 respectively).

3.2.2 Vegetables tried and liked (Question 2)

Question 2 followed the same format as Question 1 but this time pupils were presented with 12 vegetables. Overall, the average number of vegetables that pupils reported having **tried** was 10.0 and the average number that they reported **liking** was 5.7. In relation to the number of vegetables **tried** there were statistically significant differences between girls (10.2) and boys (9.7). For the number of vegetables **liked** there was a statistically significant

[13] Timepoint refers to the different times or phases (March, June and November) at which data was collected.

difference between the mean for the comparison group (5.9) and the intervention group (5.6).

3.2.3 Fruit and preferences for snack foods (Question 3)

Question 3 asked pupils to select their preferred snack from a selection of foods grouped in five pairs, each consisting of one fruit and one other option. Overall, the mean number of fruit options selected by pupils was 3.0. Girls selected more fruit options (3.2) than boys (2.8).

3.2.4 Choosing a healthy snack (Question 4)

Question 4 is the first of the questions that aims to 'test' pupils' knowledge and awareness of healthy eating. For this question the children were again presented with five items, but in this case they were asked to choose the 'healthiest' snack from a selection of three different food combinations. At Phase 3 pupils selected on average 4.2 of the healthiest options. There was a statistically significant difference between the responses of girls (mean 4.4) and those of boys (mean 4.0). There was also a statistically significant difference between the intervention group (4.3) and the comparison group (4.0).

3.2.5 A balanced and healthy diet (Question 5)

Question 5 is based on 'The Balance of Good Health' model (BNF, 2003). The children were asked to indicate whether they should eat lots, some, or a small amount of ten different foods/drinks. Pupils were given one mark (out of ten) for each correct answer. The average score at Phase 3 was 5.6. There was a statistically significant difference between girls (5.7) and boys (5.6) and between the intervention group (5.7) and the comparison group (5.5).

3.2.6 Selecting a healthy balanced packed lunch (Question 6)

Question 6 presented pupils with ten food items and they were asked to choose four items to make up a healthy balanced packed lunch. Pupils were given a score in the range of 0-3. Overall, the mean score for this question was 1.8. There was a statistically significant difference between the scores of girls (1.9) and boys (1.8).

3.2.7 Selecting a healthy balanced lunch (Question 7)

Question 7 followed the same format as Question 6 but this time pupils were asked to choose four items to make up a healthy balanced hot lunch. Pupils were given a score in the range of 0-3. Overall, the average score for this

question at Phase 3 was 1.7. For this question only, boys (1.8) scored significantly higher than girls (1.7). This is the only instance where boys have scored significantly higher than girls during the course of the evaluation.

3.2.8 What counts as a portion of fruit? (Question 8)

Question 8 asked pupils to decide from a selection of nine foods/drinks which items counted as a portion of fruit. Overall, the mean score for Question 8 was 5.1. There was a statistically significant difference between the mean for the intervention group (5.3) and the comparison group (5.0).

3.2.9 Awareness of '5 A DAY' (Question 9)

The final question aimed to test pupils' awareness of the '5 A DAY' message by asking then to indicate how many portions of fruit and/or vegetables they should eat each day. Pupils were provided with a series of individual numbers, in the range 0-8, from which to select their desired response.[14] The mean score for this question at Phase 3 was 1.3. There was a statistically significant difference between the mean for the intervention group (1.4) and the comparison group (1.2).

3.2.10 Aggregated scores

The scores for the knowledge and awareness questions (Questions 4-9) were summed to an overall total out of a possible 32 points. The overall mean score was 19.8. There was a statistically significant difference between the average overall score for girls (20.2) and that for boys (19.5). There was also a statistically significant difference between the average total score for those pupils in the intervention group (20.2) and those in the comparison group (19.4). It should be noted, however, that a similar difference in total scores existed at baseline (see Teeman *et al*., 2004a).

3.3 Change over time

Table 3.1 below illustrates change over time by comparing the average scores for pupils in the intervention group at each phase of data collection. The table presents the data from the intervention group only, as we would hope to see a change over time for pupils who had participated in the SFVS. It should be noted that means quoted are based on those pupils who participated in all three phases of the data collection. Any significant changes over time are indicated in the table.

[14] Pupils were given a score of 2 if they correctly indicated they should eat five portions, a score of 1 if they said more than five and a score of 0 if they said fewer than five.

3.3.1 Fruit tried and liked (Question 1)

As shown in Table 3.1, there was a statistically significant increase in the average number of fruits pupils reported that they had tried at Phase 2 when compared with the number they reported having tried at Phase 1 (for further discussion see Teeman et al., 2004b). The average number of fruits tried had increased further at Phase 3 despite the fact that pupils were no longer participating in the SFVS. However, the number of fruits tried by the

Table 3.1 Mean scores for pupils in the intervention group

Question	Mean score		
	Phase 1	Phase 2	Phase 3
Q1. Number of fruits tried	9.93	10.20*	10.31**
Q1. Number of fruits liked	6.87	7.33*	7.33
Q2. Number of vegetables tried	9.80	9.89	10.06**
Q2. Number of vegetables liked	5.25	5.46*	5.56
Q3. Fruit and preferences for snack foods	2.41	2.93*	3.08**
Q4. Choosing a healthy snack	3.78	4.24*	4.37**
Q5. Balanced and healthy diet	5.79	5.53*	5.76**
Q6. Selecting a balanced and healthy lunchbox	1.70	1.84*	1.83
Q7. Selecting a balanced and healthy lunch	1.67	1.73	1.73
Q8. What counts as a portion of fruit	4.68	4.87*	5.19**
Q9. Awareness of the '5 A DAY' message	1.11	1.20*	1.39**
Aggregated scores	18.72	19.41*	20.28**

N = 1028

** indicates a significant change over time between Phases 1 and 2*
***indicates a significant change over time between Phases 2 and 3*

comparison group also increased at Phase 2 and at Phase 3, and there was no significant difference in the rate of increase.

The mean number of fruits that pupils reported that they **liked** had also increased significantly at Phase 2 for the intervention group, but remained constant at Phase 3. There were significant increases in the number of fruits liked in the comparison group at Phases 2 and 3 which suggests that the SFVS has not had a sustained impact on the number of fruits children like.

3.3.2 Vegetables tried and liked (Question 2)

The change over time data in Table 3.1 indicates that there was an increase in the average number of vegetables pupils reported having **tried** at Phase 2 (although this increase was not significant). The average number of vegetables

tried also increased at Phase 3 and this increase was statistically significant, suggesting that children were continuing to try new vegetables even after they had moved up to Year 3 and were no longer taking part in the SFVS. There was also a significant increase for the comparison group at Phase 2 but this increase was not sustained and the number of vegetables pupils reported trying had actually decreased at Phase 3 for the comparison group. Overall, there was no significant difference between the comparison group and the intervention group in terms of the change over time.

The average number of vegetables that pupils in the intervention group reported **liking** increased significantly at Phase 2; there was a further increase at Phase 3 but this increase was not statistically significant. There were also increases for the comparison group, and no significant difference in the rate of increase.

3.3.3 Fruit and preferences for snack foods (Question 3)

There was a statistically significant increase in the mean number of fruit snack options selected by pupils in the intervention group at Phase 2 and at Phase 3. This suggests there was a change in children's attitudes towards fruit and their preferences for selecting fruit rather than other snack foods. However, there were greater increases for the pupils in the comparison group, suggesting that the changes may be due to maturation or other factors unconnected with the SFVS.

3.3.4 Choosing a healthy snack (Question 4)

As indicated in Table 3.1, there was a statistically significant increase in pupils' average scores for Question 4 at Phase 2 and Phase 3. This rise in average score suggests that there was an increase in pupils' knowledge and awareness of what constituted a healthy snack (it could also be due to familiarity with the question). However, there were greater increases in score observed over time for pupils in the comparison group, suggesting that these changes may be due to factors other than the SFVS.

3.3.5 A balanced and healthy diet (Question 5)

Question 5 was the only question for which the average score at Phase 2 had decreased significantly. In the second interim report we noted that in relation to one of the pictured foods (butter) there had been a dramatic change: at Phase 1 81 per cent said correctly that they should eat only a small amount of butter, but at Phase 2 only 36 per cent gave this response, with 51 per cent saying that they should eat 'some' butter. Average scores for this question increased significantly at Phase 3 but still remained lower than at baseline (Phase 1). On average pupils in the comparison group decreased their score for

this question at Phase 2 (like those in the intervention group) but increased their score at Phase 3 (although this increase was not statistically significant). On this occasion, 40 per cent said correctly that they should only eat a small amount of butter and 55 per cent said they should eat 'some'. The dip in score that was observed at Phase 2 did not pick up at Phase 3, suggesting that the score for this item at Phase 1 was abnormally high; the reason for this remains unclear.

3.3.6 Selecting a healthy balanced lunch box (Question 6)

For Question 6, pupils' scores had significantly increased at Phase 2 for both the intervention group and the comparison group. However, there were no further significant increases at Phase 3.

3.3.7 Selecting a healthy balanced lunch (Question 7)

For Question 7 there were no significant increases in score for the intervention group or the comparison group.

3.3.8 What counts as a portion of fruit? (Question 8)

In the intervention group, pupil scores for the question asking what counts as a portion of fruit increased significantly at Phase 2 and much further at Phase 3. However, there were similar increases within the comparison group suggesting that these changes over time are not related to the SFVS.

3.3.9 Awareness of '5 A DAY' (Question 9)

Scores for Question 9 increased significantly for the intervention group at Phase 2 and at Phase 3. The average score for the comparison group also increased significantly at Phase 2 and at Phase 3; indeed, at Phase 2 the average score for the comparison group increased significantly more than the intervention group. However, the average score for the intervention group at baseline (Phase 1) was significantly higher than the comparison group, so there may be an element of the comparison group catching up (for further exploration see Section 3.4 and Teeman *et al*., 2004a).

3.3.10 Aggregated scores

The scores for the knowledge and awareness questions were aggregated to an overall total and there was a statistically significant increase in the average total score at Phase 2 and at Phase 3 for the intervention group. A similar significant increase was observed within the comparison group suggesting that

these changes may be due to maturation or other factors unconnected with the SFVS.

3.4 Multilevel modelling

Responses from 2,328 children who had completed the pupil questionnaire at two or three of the possible timepoints (Phases 1, 2 and 3) were included in a multilevel model, together with pupil-level and school-level variables (for further information about the variables included in the modelling, see Section 2.1).

Outcomes for each of the questions for the pupil questionnaire were explored individually as well as the aggregated test score (Questions 4-9).

Table 3.2 Significant coefficients for background variables relative to pupils' questionnaire outcomes (overall differences in attitude and awareness)

Variables at all 3 timepoints	Fruits liked	Fruits tried	Veg liked	Veg tried	Prefer healthy options
Sex	0.6	0.5	0.3	0.4	0.3
Minority Ethnic					
Intervention group			-0.4		
Infant school					
% eligible for free school meals*					
% with SEN*					
% with EAL*	0.1				
KS1 overall performance 2002					
% of people aged 16-74 with no qualifications*					
% of people OA with poor health*					
Mean deprivation index*					

**Value given is the actually expected change for ten percentage points change in the background variable*

3.4.1 Attitude and awareness

The results for outcomes related to attitude and awareness are summarised in Table 3.2 and Table 3.3 below. The coefficients in each row indicate the impact of the factor named on the relevant outcome(s). It should be noted that

the differences in the table are after controlling for all other factors, e.g. when all other factors are taken into account, the differences between boys and girls are as shown in the first row.

The multilevel modelling analysis confirmed the differences previously identified relating to gender. Girls reported that they had tried and liked significantly more fruits and vegetables and preferred significantly more healthy snacks than boys.

Overall, the only consistent difference between the intervention group and the comparison group is that the intervention group liked 0.4 vegetables less than the comparison group; this basically represents the situation at baseline (Phase 1).

There was an association between the number of fruits liked and the proportion of pupils with EAL in the school. In the first interim report, we suggested this might be linked with ethnicity (Teeman *et al.,* 2004a). However, now that we have ethnicity data at individual pupil level, analysis has not revealed any relationship between number of fruits liked and belonging to a minority ethnic group. It is therefore difficult to identify the reason for this difference and further research would be needed to explore this issue in greater detail.

Table 3.3 Significant coefficients for background variables relative to pupils' questionnaire outcomes (change over time in attitude and awareness)

Variables relating to change over time	Fruits liked	Fruits tried	Veg liked	Veg tried	Prefer healthy options
Phase 2	0.2		0.2	0.4	0.3
Phase 3	0.3	0.2	0.2	0.2	0.6
Intervention group at Phase 2	0.3	0.2		-0.2	0.2
Intervention group at Phase 3					
Intervention group at Phase 2 by deprivation*					
Intervention group at Phase 3 by deprivation*					

**Value given is the actually expected change for ten percentage points change in the background variable*

The key factor in the multilevel modelling analysis is the change over time after controlling for other relevant factors. As illustrated in Table 3.3 above, at Phase 2 there was a positive change in relation to all of the outcomes except the number of fruits tried. Pupils on average liked an extra 0.2 fruits and 0.2 vegetables; they had tried an extra 0.4 vegetables and they chose 0.3 more healthy snacks.

The row labelled 'Intervention group at Phase 2' refers to additional change at Phase 2 for children in the intervention group. They liked an extra 0.3 fruits, had tried an extra 0.2 fruits and chose 0.2 additional healthy snack options. However, at Phase 2 as previously reported there was also a negative association between the intervention group and the number of vegetables tried.

As illustrated in the Table 3.3 above, at Phase 3 there was a positive change in relation to all of the outcomes. However, there were no significant changes for the intervention group at Phase 3 over and above those observed for all pupils. The additional increases that were found at Phase 2 in relation to the number of fruits tried and liked, and the number of healthy snacks chosen were not observed. Therefore the positive change in pupil attitudes associated with the SFVS did not continue. However, it needs to be borne in mind that the children completing the questionnaires had moved up to Year 3 when Phase 3 data was collected, and they were no longer taking part in the scheme.

3.4.2 Knowledge

The results for outcomes related to knowledge are summarised in Table 3.4 and Table 3.5 below.

Table 3.4 Significant coefficients for background variables relative to pupils' questionnaire outcomes (overall differences in knowledge)

Variables at all 3 timepoints	Scores						
	Q4	Q5	Q6	Q7	Q8	Q9	Total
Sex	0.3	0.3	0.1			0.1	0.7
Minority ethnic							
Intervention group						0.2	
Infant school						0.2	
% eligible for free school meals*	-0.1	-0.1			-0.1	0.0**	-0.4
% with SEN*	-0.4	-0.5			-0.7		-1.4
% with EAL*						0.0**	
KS1 overall performance 2002		0.1				0.1	0.2
% of people aged 16-74 with no qualifications*	-0.2	-0.1					-0.3
% of people OA with poor health*							
Mean deprivation index*				-0.2			

**Value given is the actually expected change for ten percentage points change in the background variable*

*** These differences were significant but less than +0.05 and therefore rounded to 0.0*

As indicated in Table 3.4 above, the intervention group scored on average 0.2 points higher than the comparison group for the question on awareness of the '5 A DAY' message. Awareness of the '5 A DAY' message was also higher (0.2) among pupils attending infant schools when compared with those attending primary schools. The reason for this difference is unclear.

The multilevel modelling analysis confirmed the relationship between score and gender in that girls tended to have higher scores than boys in all of the knowledge questions except Questions 7 and 8.

As would be expected, pupils from high-achieving schools obtained higher test results and those from schools with high proportions of children eligible for FSM or high proportions of pupils with SEN did less well. Pupils living in areas where there are a high proportion of adults with no qualifications also did less well.

There was an association between the overall deprivation index and Question 7; pupils tended to do less well on this question if they lived in areas of deprivation.

Table 3.5 Significant coefficients for background variables relative to pupils' questionnaire outcomes (change over time in knowledge)

Variables relating to change over time	Scores						
	Q4	Q5	Q6	Q7	Q8	Q9	Total
Phase 2	0.3	-0.2	0.1		0.2	0.2	0.6
Phase 3	0.5		0.1	0.1	0.4	0.4	1.5
Intervention group at Phase 2							
Intervention group at Phase 3	0.1					-0.1	
Intervention group at Phase 2 by deprivation*				0.2			
Intervention group at Phase 3 by deprivation*	0.1						

**Value given is the actually expected change for ten percentage points change in the background variable*

As illustrated in Table 3.5, at Phase 2 pupils scored significantly higher on Questions 4, 6, 8, and 9 and in their overall score (Questions 4-9). Pupils' scores decreased significantly for the question testing knowledge and awareness of a healthy balanced diet (Question 5). This issue is discussed in

more detail in Section 3.3 and in our second interim report (see Teeman *at al*., 2004b).

Significant changes over time were also observed at Phase 3; pupils scored significantly higher for all questions except Question 5 (scores for this question were comparable with baseline). There were no additional changes for the intervention group at Phase 2. At Phase 3 the scores of the intervention group increased by an additional 0.1 for Question 4 (identifying healthy snacks). This increase is interesting and suggests that on average pupils who had taken part in the SFVS had a greater awareness of what constituted a 'healthy' snack than the pupils in the comparison group. The reasons for this increased awareness may be related to the fact that the SFVS fruit or vegetables are often distributed to the children during playtime, which is when children can usually eat a snack. Some of the schools taking part in the scheme asked children not to bring in snacks once the SFVS had been introduced and the fruit/vegetables replaced children's usual snack (for further information see qualitative interview data in Teeman *et al.,* 2004b). Over time this change may have helped to raise pupils' awareness of what constituted a healthy snack.

At Phase 3, scores for all pupils increased in relation to awareness of the '5 A DAY' message, but intervention group scores increased significantly less than comparison group scores. It should be noted, however, that the intervention group had a higher score in relation to this question at baseline (Phase 1) so there may be an element of the comparison group catching up.

Pupils in the intervention group living in areas of deprivation increased scores more than others on Question 7 at Phase 2, and on Question 4 at Phase 3. It would seem therefore that the SFVS may have had a greater impact on pupils from more deprived areas.

In terms of aggregated score, the intervention group did not increase significantly more or less than the comparison group.

3.5 Summary of pupil questionnaire findings

The multilevel modelling confirmed that girls tried and liked more fruit and vegetables than boys, and the comparison group liked more vegetables than the intervention group. It also confirmed the association previously identified between the number of fruits liked and the proportion of pupils with EAL. However, there was no significant relationship with ethnicity, so it remains difficult to identify the reason for this difference.

In relation to knowledge about healthy eating, the only overall difference between the intervention group and the comparison group was that the former

scored higher on awareness of the '5 A DAY' message, although the difference between the two groups was significantly reduced at Phase 3.

The multilevel modelling revealed that scores generally increased over time, as would be expected (due to maturation). Over and above the general increase, there was an additional increase for pupils in the intervention group on Question 4, which could be due to the SFVS as it may have helped to raise pupils' awareness of fruit as a healthy snack.

Pupils in the intervention group living in areas of high deprivation increased their scores more than expected for Question 4 at Phase 3, suggesting the SFVS impact was stronger for these pupils. Pupils in the intervention group living in areas of deprivation also increased scores more than others in relation to selecting a healthy balanced lunch (Question 7) at Phase 2.

4. Conclusions

In this chapter conclusions are presented under the following headings:

- Summary of key findings
- Discussion and conclusions
- Areas for further research and evaluation.

The first section summarises the findings from Phase 3 of the evaluation, as detailed in this report, but makes reference (as appropriate) to the case-study visits to ten schools in the intervention area, which were undertaken in October 2004 (see Teeman *et al*., 2004b).

4.1 Summary of key findings

In our last report (Teeman *et al*., 2004b) we said that there was clear evidence that the SFVS had a positive impact on children's **consumption of fruit** and to an extent on their **attitudes, awareness and knowledge.** The findings from the analysis of Phase 3 and combined data have provided a more complex picture. In this section we summarise key findings in relation to consumption, attitudes, awareness and knowledge.

4.1.1 Consumption of fruit and vegetables

Over the course of the evaluation, relationships between consumption and age and gender have remained consistent. Total combined fruit and vegetable intake decreased with age; girls consumed more than boys and were more likely to achieve the '5 A DAY' target.

Additional data collected at Phase 3 revealed that the combined fruit and vegetable consumption of children eating school dinners was greater than those who had packed lunches.

The impact of the SFVS was still evident at Phase 3, but was less strong than at Phase 2. This was connected to the fact that Year 2 children (now in Year 3) were no longer receiving free fruit, and their consumption had dropped to below baseline levels (reflecting a general decrease in fruit consumption, also evident in the comparison group).

For Reception and Year 1 children in the intervention group there had been a significant reduction in consumption of fruit between Phases 2 and 3, but their fruit and combined fruit and vegetable consumption had remained significantly higher than baseline measures. Analysis of change over time showed that, at Phase 3, children in the intervention group (Reception and Year 1) were one and a third times as likely to achieve the '5 A DAY' ideal as those in the comparison group.

Girls in the intervention group ate slightly more vegetables after the introduction of the SFVS, but there was no evidence of differential impact relating to fruit consumption.

As we stated in our last report, it might be hoped that involvement in the SFVS would lead to a positive change in attitudes towards fruit and vegetables, that children might choose to eat more fruit or vegetables over and above what they were consuming in school as part of the SFVS. Analysis showed that, in the intervention group, fruit and vegetable consumption declined at home and increased in school, suggesting that the scheme did not encourage additional consumption outside of the direct influence of the SFVS, and thus there is no evidence of children choosing to eat more fruit in other contexts. On the contrary, it would appear that for some children the SFVS fruit and vegetables had replaced those ordinarily consumed outside school.

4.1.2 Consumption of snacks and desserts

In line with previous analysis we found that snack consumption amongst girls was less than for boys. The Phase 3 analysis also indicated that snack consumption amongst pupils who had packed lunches was much larger than amongst those who had school dinners.

At Phase 3 there was a significant decrease in consumption of snacks, but this applied to the comparison group as well as the intervention group.

4.1.3 Consumption and deprivation

There was evidence of a link between deprivation and diet; factors associated with deprivation were significantly related to lower fruit and vegetable intake and higher snack consumption.

In Phase 2 we reported that the scheme was thought by staff in case-study schools to have had (or they thought had the potential to have) a particularly positive impact among children who came from deprived backgrounds. However, there was no statistical evidence suggesting that the SFVS had had any significant impact on consumption in relation to deprivation indicators.

4.1.4 Consumption, EAL and ethnicity

We have previously reported an apparent relationship between fruit consumption and the proportion of pupils in the school with EAL; we hypothesised that this could be explained by ethnicity. In the final analysis, we were able to include pupil-level ethnicity data, and there was some evidence that pupils from minority ethnic groups ate more fruit (and fewer snacks) than white UK pupils; however, the multilevel modelling did not find a significant link to support this relationship. It should be noted that the number of children in each minority ethnic category was too small for separate analysis; it is possible that further exploration of this question with larger minority ethnic datasets might reveal significant links between fruit consumption and particular groups.

4.1.5 Awareness, attitudes and knowledge

Findings about awareness, knowledge and attitudes derive from data gathered by the pupil questionnaire and interviews. Before summarising the findings it is important to note that we would expect to see improvement in test scores over the period of the evaluation, due to maturation (children learn more as they grow older), and also to the practice effect (children taking the same test three times would be expected to improve). It is also likely that children will try more fruit and vegetables as they grow. The key question therefore is whether the changes observed in the intervention group were greater than those in the comparison group, indicating an impact of the SFVS.

4.1.6 Trying and liking fruit and vegetables

Overall, girls reported trying and liking more fruit and vegetables than boys, and the intervention group liked fewer vegetables than the comparison group. The final analysis also confirmed a link found in previous phases, that pupils from schools with higher proportions of children with EAL reported liking more items of fruit.

General increases in the number of fruit and vegetables tried and liked occurred at both phases. At Phase 2, the increase (for fruit) was greater for the intervention group, indicating a possible impact of the SFVS, but this was not the case at Phase 3.

As noted previously (Teeman *et al.,* 2004b), half of the children interviewed during case-study work reported that they had tried ‘new’ fruits or, in a few cases, vegetables. Staff were pleasantly surprised by the extent to which children had been willing to try new things, and the general consensus was that the SFVS had helped to encourage children to try ‘new’ things and provided many children with their first opportunity to do so. It would be consistent with the statistical evidence to infer that children tried new fruits

when the scheme was introduced, but once it was established, and the same fruits were being provided on a regular basis, there would be fewer opportunities for experiencing new items.

4.1.7 Knowledge of healthy eating

Girls scored consistently better on the test questions, as did children from high-achieving schools; those from schools with higher proportions of pupils with SEN or eligible for FSM did less well. Scores increased generally at Phases 2 and 3. All of this is as would be expected.

Even at baseline, children in the intervention area were more likely than comparison group children to be aware of the '5 A DAY' message; this could not therefore be an impact of the SFVS, although it could reflect information given in preparation for the introduction of the scheme. The gap between intervention and comparison groups had narrowed at Phase 3. On the other hand, scores for Question 4 (what constitutes a healthy snack) increased more for children from the intervention group.

While staff interviews showed that all of the schools visited were already delivering (in differing ways) information about healthy eating, many teachers believed that the SFVS would probably help to reinforce their efforts. These findings may suggest that to a limited extent this had happened.

The final analysis identified two apparent links between the SFVS and factors associated with deprivation. In the intervention group children living in areas of high deprivation increased their score on Question 4 at Phase 3 more than would be expected, suggesting the impact of the SFVS on these children was higher than on others. At Phase 2, the same group of children increased their score on Question 7 more than would be expected. These are limited but nevertheless encouraging observations, with the national '5 A DAY' programme specifically aiming to have positive impacts amongst children in groups associated with deprivation and identified with the 'health inequality' debate.

Overall, at Phase 3 the intervention group achieved a higher aggregate score on awareness and knowledge (Questions 4-9 in the pupil questionnaire) than pupils in the comparison group, although the difference was approximately the same as at baseline.

4.2 Discussion and conclusions

In this section we present some further discussion, exploring possible reasons for the findings in relation to consumption summarised above. It is worth reiterating here that by Phase 3 Year 2 children (now in Year 3) were no

longer receiving SFVS produce and therefore they need to be considered separately from children in Reception and Year 1 who were still participating. For children now in Year 3, consumption of fruit and vegetables at Phase 3 was below baseline levels. They ate more fruit when it was provided by the scheme, but the scheme did not have a lasting impact on their diet. (It is important to bear in mind, however, that they received free fruit for a limited period of time, possibly not long enough to foster habits of regular fruit-eating.)

It may seem surprising that fruit consumption dropped to below baseline level, but this should be seen in the context of a general reduction in fruit consumption observed in the comparison group also. This is no doubt due, mainly if not entirely, to the fact (shown consistently throughout the analysis) that children eat less fruit as they grow older.

This fact may also help to explain why the impact of the SFVS on children still participating in the scheme appeared to be less at Phase 3 that at Phase 2. Other possible factors may include the following:

- Some waning in enthusiasm for the SFVS once the 'novelty' had worn off, and the same fruits were provided regularly.
- Case-study data indicated that the younger children (especially those in Reception) were more likely to be given their fruit in a classroom environment, and encouraged to eat it during a dedicated quiet time when they were supervised by school staff. Older children might be given the fruit as they went out to play, and might be less likely to take and eat it. Since by Phase 3 there was no longer a Reception Year, it may have been the case that fewer children would have been receiving their fruit in a classroom environment, and fewer may have chosen to eat it.
- Connected to the point above is the fact that, when SFVS fruit is provided for children as they go out at playtime it is more difficult for staff to observe consumption accurately.
- Teachers in case-study schools reported that their encouragement and peer influence were key elements in promoting the consumption of SFVS fruit; but were more effective with younger children, in the kind of context described above.

Taken as a whole, our findings show that the SFVS did significantly improve the consumption of fruit by children in the scheme, but did not have any wider impact on diet, and increased consumption was not sustained when children's participation in the scheme came to an end.

It is important to bear in mind that the intervention group was not a nationally representative sample, and the impact of the SFVS could have been different in other regions. Indeed, the North East may be a particularly difficult region

in which to effect change, given that fruit and vegetable consumption there is the lowest in the country (see Section 1.4).

It is also possible that the SFVS will have a longer-term impact on children who are exposed to the scheme for a greater period of time. Further, the potential of the SFVS to positively impact on children's overall diet might well be enhanced, if implemented in the context of a whole-school policy designed to promote healthy eating.

4.3 Further research and evaluation

While our final report provides interesting findings, it also raises questions. We therefore conclude with suggestions for further analysis which could be done, using the data we have already gathered, and further work on topics that we think would benefit from additional and/or new research.

4.3.1 Suggestions for further analysis of existing data

As part of this evaluation we have gathered a wealth of dietary information about a large number of young children. We have also gathered information from schools about the context of trying to implement healthy eating strategies. There is scope to use this data for further exploration in several ways. For example:

- **Healthy diet predictors**. We could identify which background factors make it more or less likely for children to be consuming a healthy diet.
- **Meal composition**. We could analyse meal intakes to examine what kinds of foods are eaten at each meal, and explore the energy and nutrient intakes of the various meals identified.
- **Fruit and Vegetables**. We could conduct further analysis to explore how, when and where children were eating fruit and vegetables, and investigate the higher vegetable consumption we found in the comparison group.
- **Comparing packed lunch and school dinner consumption**. We could analyse the contents of packed lunches and school dinners to identify relationships with overall healthy diets.
- **Seasonal influences**. We could identify seasonal variations in consumption of individual foods, in nutrient and energy intake, and in meal content, time of consumption and place of consumption.
- **Comparisons with national data**. We could explore how data gathered by the SFVS evaluation relates to other national (and regional) consumption data.
- **Urban and rural data**. We could divide samples into urban and rural so that differences in patterns of consumption could be explored.

Detailed analysis of the kind suggested above would add greatly to our knowledge about children's diets, and would enable more effective targeting of future initiatives designed to promote healthy eating.

4.3.2 Suggestions for new research

Our work draws attention to and reflects regional, local and possibly cultural variation in diet and various interactions with regard to factors such as age, gender, meal events, meal types (i.e. packed lunch/school dinner), deprivation and the possible importance of individual school contexts. Further research would be useful in order to explore and explain these various interactions and factors; the outcomes would help inform the considerations and ongoing efforts of policy-makers and practitioners.

Long-term impact evaluation of the SFVS. Although the scheme appeared not to have any enduring impact on Year 2 pupils, it is possible that there could be a lasting impact on children who are involved in the scheme over a longer period. It would therefore be interesting to follow up the children who were in Reception when the scheme was introduced. The research would:

- track matched samples in both intervention and comparison areas
- compare rates of change in diet, attitudes, knowledge and awareness over time.

Ethnicity, culture and diet. It would be useful to explore possible links between cultural/ethnicity factors and diet, specifically fruit consumption. Such analysis would require large samples of children from different minority ethnic groups. It could identify significant relationships between diet and minority ethnic groups/cultures, and the underlying factors involved.

The ability of the SFVS evaluation to explore this issue with existing data was limited by the relatively small number of children from minority ethnic groups. A much larger sample is needed, which would enable exploration of differences between the various ethnic groups and in relation to the white UK population.

Packed lunches and school dinners. While our existing data provides some opportunities for further analysis of packed lunches and school dinners (see Section 4.3.1) we would suggest that this issue would also benefit from additional new research, which would seek to:

- identify and explore examples of practice where schools have active healthy eating policies and explore the way such efforts interact with the content of packed lunches and the overall diets of the children affected

- identify examples of practice from schools which have developed approaches involving parents in attempts to implement policies in relation to packed lunches
- undertake wider research into the impact on diet of those who have packed lunches compared to those children who have school dinners.

Vulnerable children and diet. Research would be useful into various 'target' or 'at risk' groups, which could better identify particular needs and opportunities for effective and informed intervention. For instance, research could:

- explore the consumption of children who experience severe deprivation, and/or looked-after children
- compare findings with those of other children
- where possible, identify examples of interventions that specifically target the diet of 'at risk' groups, and evaluate their impact.

Diet-related interventions and identifying good practice and opportunity. Research would be useful into opportunities for improving diet amongst young children, especially in school but in the context of multi-component coordinated initiatives in the wider community. To do this would mean identifying (and potentially categorising) existing or planned interventions within schools. Research here would explore and provide examples of intervention principles (or process), practice and policy, which could then be disseminated to relevant audiences. The research would address key questions, such as:

- what realistic opportunities are available for interventions inside schools?
- what new resources, if any, would be needed?
- are there examples of proven practice, whose principles and or approaches would be successfully transferable to other locations and or regions?

Links between diet and body size. In the light of current concern about obesity, research into fruit and vegetable intake and its relationship to body size would be useful, with a follow-up after two (or even five) years.

The research would measure the height, weight and diet of children at school entry and explore the relationship between weight gain and levels of fruit/vegetable intake together with other dietary variables over time. Analysis of data would explore whether fruit and vegetable intake was protective against weight gain in young children.

Children's choices and the role of parents. Research would explore in detail how and why children make their dietary choices, and the role of parents in influencing them. It would:

- explore parental input in relation to different groups (i.e. parents of children identified as 'vulnerable' or 'at risk')
- identify and explore ways in which parents might best be influenced towards encouraging (and ensuring) that their children have a healthy diet.

Diet and exercise. Large-scale research could be undertaken to address a key set of questions such as:

- does the diet of children who exercise regularly differ from those who do not?
- if diet does differ, how?
- how do other measures of health (e.g. obesity, asthma) differ between those who exercise and those who do not?
- how does exercise or the lack of it relate to consumption and nutrient intake?

Answers to these questions would yield vital evidence about how best to address deficiencies in children's health, and whether the main emphasis of initiatives should be on diet or exercise.

Preventing obesity. It would be useful to investigate the role of the school in assisting to prevent obesity through the promotion of healthy eating and physical exercise. Specifically, it would be interesting to explore how schools promote healthy eating and physical activity through their policy and practice, and the impact of such promotion on young people's health-related behaviour. An investigation of the most successful school strategies for influencing behaviour would be useful for health and education policy-makers and practitioners. The study could include an exploration of how school strategies influence children's lifestyles in relation to healthy eating, diet and nutrition, their participation in physical activity and their attitudes towards health and health-related behaviour.

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Appendix A. CADET (SFVS Version)

School:

CADET
Child and Diet Evaluation Tool

This is the final time we will be asking you to com
the CADET food diary and we would like to take
opportunity of thanking you for your help and sup
with this important evaluation

When you have filled in this diary please make su
is placed in your child's bag and sent back to sc

This diary belongs to:

Pupil Name:

Year Group:

National Foundation for Educational Research, The Mere, Upton Park
Slough, Berks, SL1 2DQ.

Dear Parent or Carer

This diary will record everything your child eats and drinks over 24 hours (from morning brea tomorrow). All you need to do is to tick the food and drink your child eats while not at schoo questions that we would like you to complete at the end of the diary (pages 12 & 13).

How to fill in the CADET DIARY

◆ Starting with the column headed '<u>Before tea</u>' tick ✓ all the items of food and drink that your child eats and drinks after finishing school today until their evening meal (except fruit scheme fruit which needs to be ticked ✓ in column 8).

◆ In the next two columns, ✓ tick everything your child eats or drinks during their evening meal and afterwards until breakfast the next day.

◆ In the morning, tick ✓ all the items of food and drink your child has eaten at home in the '<u>Breakfast</u>' column (if your child eats anywhere else, this will be filled in by a teacher). If this is a Saturday, all food and drink consumed up to 10.00am needs to be recorded by a parent/carer.

◆ If they do not have anything to eat or drink at a mealtime, please tick ✓ '<u>nothing to eat</u>' and/or '<u>nothing to drink</u>' on page 11.

◆ Make sure you ask your child if she/he ate or drank anything between leaving school and getting home. If your child ate or drank with someone else after school, ask your child or the person they were with what they ate and tick ✓the foods and drinks they consumed (if your child attended an after-school club **on school premises**, any food/drink consumed by your child will have been filled in by a teacher, but you should tick ✓any food or drink your child consumed at any other club).

◆ School staff will have ticked everything your child has eaten and drunk at school today. If your child attends school for only half a day, please ensure you tick all items of food and drink consumed when your child is with you or another carer (and if they are off school sick). You should record all food and drink consumed since your child left the school.

◆ Your child's school is participating in the National School Fruit Scheme, so she/he will be given a free piece of fruit (or vegetable) at school each day. Fruit scheme fruit is usually eaten at school, but if your child eats it at home, please tick ✓ the appropriate box in the last column (column 8).

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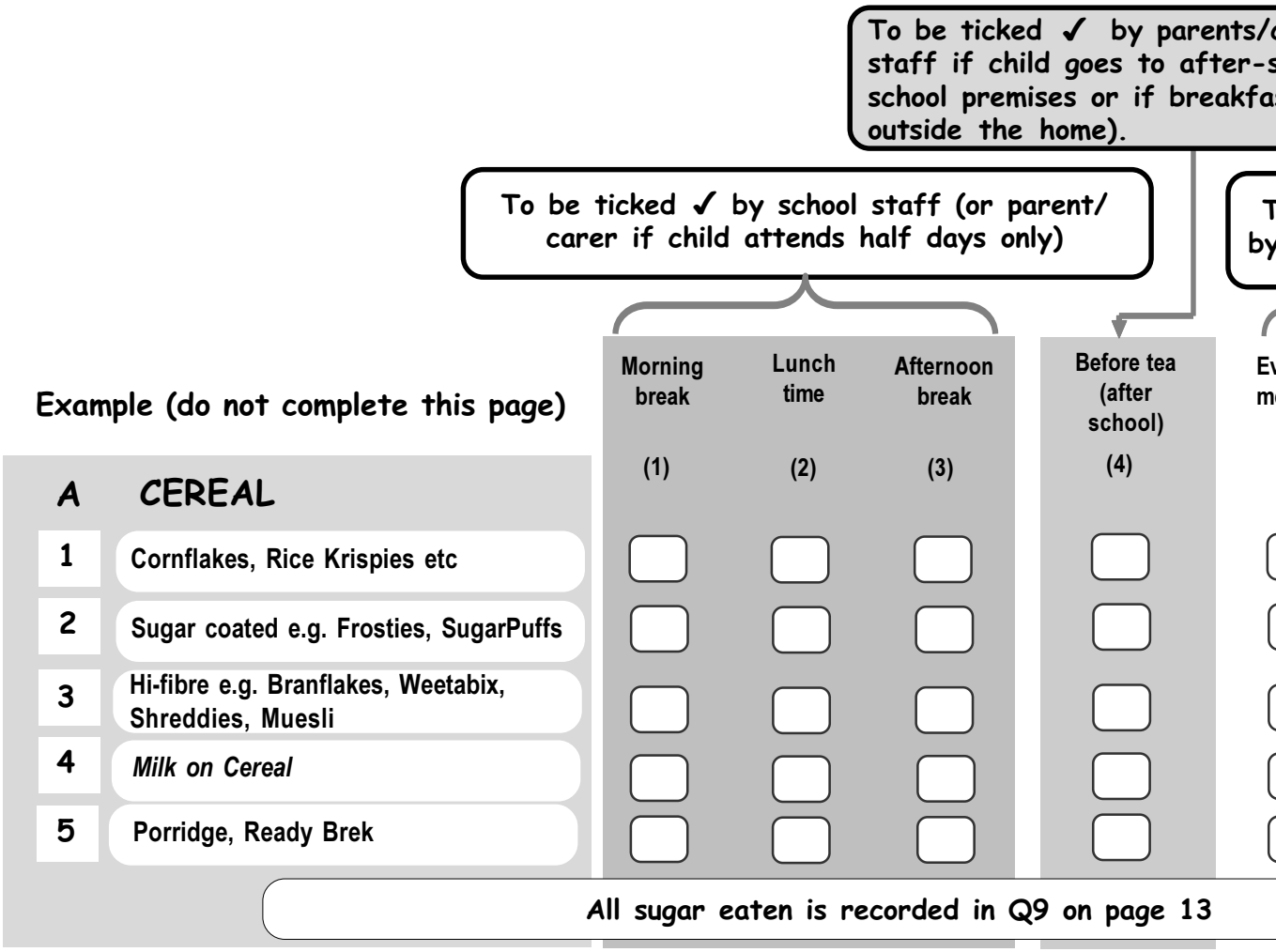
When the diary is completed, please make sure it is placed in your child's bag an

Example

If your child ate a bowl of Rice Krispies with milk and sugar at breakfast - tick ✓ the column labelled **'Breakfast/before school'**. The sugar that was added can be on page 13).



Please look through the pages of this diary and then you are r

1. Please tick in each column the food or drink your child has today.

Remember, anything your child ate or drank at school will have already been ticked (including anythin after-school club on the school premises).

		Morning break (1)	Lunch time (2)	Afternoon break (3)	Before tea (after school) (4)	Evening meal/tea (5)
A	**CEREALS**					
1	Sugar-coated e.g. Frosties, Sugar Puffs	☐	☐	☐	☐	☐
2	Hi-fibre e.g. Branflakes, Weetabix, Shreddies, Muesli	☐	☐	☐	☐	☐
3	Other e.g. Cornflakes, Rice Krispies etc	☐	☐	☐	☐	☐
4	Milk on cereal	☐	☐	☐	☐	☐
5	Porridge, Ready Brek	☐	☐	☐	☐	☐

All sugar eaten is recorded in Q9 on page 13

B	**SANDWICH, BREADS, CAKES, BISCUITS**					
1	Sandwich (tick filling separately), bread, roll, toast, crumpet etc	☐	☐	☐	☐	☐
2	Croissant, sweet waffles, pop tarts	☐	☐	☐	☐	☐
3	Garlic bread, naan	☐	☐	☐	☐	☐
4	Chapatti, pitta bread etc	☐	☐	☐	☐	☐
5	Cracker, crispbread etc	☐	☐	☐	☐	☐
6	Cake, bun, sponge pudding	☐	☐	☐	☐	☐
7	Sweet pies, tarts, crumbles	☐	☐	☐	☐	☐

8	Cereal bar, muesli bar, flapjack	☐	☐	☐	☐	☐
9	Chocolate biscuit	☐	☐	☐	☐	☐
10	Other biscuit	☐	☐	☐	☐	☐
C	**SPREADS, SAUCES, SOUP**					
1	Margarine, butter	☐	☐	☐	☐	☐
2	Tomato ketchup, brown sauce	☐	☐	☐	☐	☐
3	Mayonnaise, salad cream	☐	☐	☐	☐	☐
4	Sweet spread e.g. jam, honey	☐	☐	☐	☐	☐
5	Savoury spread e.g. marmite, paté	☐	☐	☐	☐	☐
6	Gravy	☐	☐	☐	☐	☐
7	Soup	☐	☐	☐	☐	☐
D	**CHEESE, EGGS**					
1	Hard cheese, e.g. cheddar, red Leicester	☐	☐	☐	☐	☐
2	Cheese spread, triangle, string	☐	☐	☐	☐	☐
3	Cottage cheese	☐	☐	☐	☐	☐
4	Quiche - meat, fish or vegetable	☐	☐	☐	☐	☐

D.Continued overleaf

		Morning break (1)	Lunch time (2)	Afternoon break (3)	Before tea (after school) (4)	Evening meal/tea (5)
(D)						
5	Scrambled egg, omelette, fried egg	☐	☐	☐	☐	☐
6	Poached, boiled egg	☐	☐	☐	☐	☐
E	**CHICKEN, TURKEY**					
1	.....sliced	☐	☐	☐	☐	☐
2	.....nuggets, dippers, kiev etc	☐	☐	☐	☐	☐
3	.....in a creamy sauce, curry	☐	☐	☐	☐	☐
F	**OTHER MEATS e.g.**					
1	.....sliced, roast, steak, chops	☐	☐	☐	☐	☐
2	.....stew, casserole, mince, curry	☐	☐	☐	☐	☐
3	.....beefburger, hamburger	☐	☐	☐	☐	☐
4	Bacon	☐	☐	☐	☐	☐
5	Ham	☐	☐	☐	☐	☐
6	Sausages	☐	☐	☐	☐	☐
7	Sausage rolls, meat pie, pasty	☐	☐	☐	☐	☐

8	Corned beef, luncheon meats, salami, pepperoni	☐	☐	☐	☐	☐
9	Offal, e.g. liver, kidney	☐	☐	☐	☐	☐
G	**FISH**					
1	Fish fingers	☐	☐	☐	☐	☐
2	Fried fish in batter (as in fish & chips)	☐	☐	☐	☐	☐
3	White fish (not fried) e.g. cod, haddock, plaice	☐	☐	☐	☐	☐
4	Tuna or other oily fish e.g. salmon (including canned and fresh)	☐	☐	☐	☐	☐
5	Shellfish e.g. prawns, mussels	☐	☐	☐	☐	☐
H	**VEGETARIAN**					
1	Vegetable pie, pasty	☐	☐	☐	☐	☐
2	Samosa, pakora, bhajee	☐	☐	☐	☐	☐
3	Quorn, veggie mince, sausages etc	☐	☐	☐	☐	☐
I	**PIZZA, PASTA, RICE ETC**					
1	Pizza	☐	☐	☐	☐	☐
2	Boiled rice	☐	☐	☐	☐	☐
3	Fried rice	☐	☐	☐	☐	☐
4	Noodles	☐	☐	☐	☐	☐

I. Continued overleaf

		Morning break (1)	Lunch time (2)	Afternoon break (3)	Before tea (after school) (4)	Evening meal/tea (5)
(I)						
5	Pasta - plain	☐	☐	☐	☐	☐
6	Pasta with tomato sauce (no meat)	☐	☐	☐	☐	☐
7	Pasta with cheese sauce	☐	☐	☐	☐	☐
8	Pasta with meat, fish (and sauce)	☐	☐	☐	☐	☐
J	**DESSERTS, PUDDINGS ETC**					
1	Yoghurt, custard, rice pudding	☐	☐	☐	☐	☐
2	Jelly, ice lolly	☐	☐	☐	☐	☐
3	Ice cream, frozen dessert (Vienetta)	☐	☐	☐	☐	☐
K	**SWEETS, CRISPS ETC**					
1	Sweets, toffees, mints	☐	☐	☐	☐	☐
2	Chocolate bar, e.g. Mars, Galaxy	☐	☐	☐	☐	☐
3	Crisps, savoury snacks (e.g. Cheddars)	☐	☐	☐	☐	☐
4	Nuts	☐	☐	☐	☐	☐

L VEGETABLES & BEANS

1	Cucumber
2	Tomatoes
3	Celery
4	Coleslaw
5	Other salad vegetable e.g. lettuce
6	Stir-fried vegetables
7	Broccoli, brussel sprouts, cabbage
8	Carrots
9	Cauliflower
10	Peas, sweetcorn
11	Mixed vegetables
12	Celeriac/swede
13	Peppers, red, green, yellow etc
14	Other vegetable
15	Baked beans

L.Continued overleaf

		Morning break (1)	Lunch time (2)	Afternoon break (3)	Before tea (after school) (4)	Evening meal/tea (5)
L						
16	Lentils, Dahl	☐	☐	☐	☐	☐
17	Other beans, pulses	☐	☐	☐	☐	☐
18	Seeds, e.g. sunflower, sesame	☐	☐	☐	☐	☐
M	POTATO					
1	Boiled, mashed, jacket	☐	☐	☐	☐	☐
2	Chips, roast, potato faces etc	☐	☐	☐	☐	☐
N	FRUIT					
1	Apple	☐	☐	☐	☐	☐
2	Pear	☐	☐	☐	☐	☐
3	Banana	☐	☐	☐	☐	☐
4	Orange, satsuma etc	☐	☐	☐	☐	☐
5	Grapes	☐	☐	☐	☐	☐
6	Melon	☐	☐	☐	☐	☐
7	Pineapple	☐	☐	☐	☐	☐
8	Strawberry, raspberry etc	☐	☐	☐	☐	☐

9	Peach, nectarine, plum, apricot, mango	☐	☐	☐	☐	☐
10	Kiwi	☐	☐	☐	☐	☐
11	Fruit salad (tinned or fresh)	☐	☐	☐	☐	☐
12	Other fruit	☐	☐	☐	☐	☐
13	Dried fruit	☐	☐	☐	☐	☐
O1	NOTHING TO EAT	☐	☐	☐	☐	☐
P	DRINKS					
1	Milk, milky drink	☐	☐	☐	☐	☐
2	Tea, coffee	☐	☐	☐	☐	☐
3	Drinking chocolate etc	☐	☐	☐	☐	☐
4	Fizzy drink (pop), squash, fruit drink (e.g. Ribena)	☐	☐	☐	☐	☐
5	Diet, low calorie drink (including fizzy low calorie)	☐	☐	☐	☐	☐
6	Fruit juice (pure)	☐	☐	☐	☐	☐
7	Water	☐	☐	☐	☐	☐
Q1	NOTHING TO DRINK	☐	☐	☐	☐	☐

R

This section is to be filled in by parents/car

These questions provide us with more detail about the amounts and types of food and your child <u>on an average day</u>. Please tick ✓ the closest answer.

1. **How much milk <u>in total</u> does your child usually have on an average day e.g. on cereal child's beaker = ¼ pint)**

none ☐ 1 ¼ pint ☐ 2 ½ pint ☐ 3 ¾ pint ☐ 4 1 pint ☐ 5

2. **What type of milk does your child usually have? (tick all that apply)**

full cream (silver top, sterilised) ☐ 1 semi-skimmed (half fat) ☐ 2 skimmed

3. **What type of bread/roll/toast does your child usually eat? (tick all that apply)**

none ☐ 1 white ☐ 2 white with added fibre ☐ 3 wholemeal ☐ 4 granary b

4. **What type of fat spread does your child usually eat? (tick all that apply)**

Butter e.g. Anchor, Lurpak	☐ 1
Butter-type spread e.g. Utterly Butterly, Golden Churn, Clover	☐ 2
Soft Margarine e.g. Stork	☐ 3
Polyunsaturated e.g. Flora, Benecol, Vitalite	☐ 4
Olive spread e.g. Olivio, Asda Olive Gold	☐ 5
Low-fat spread e.g. Flora Light, Asda Olive Gold Light	☐ 6
Does not have spread	☐ 7

5. **How much pure fruit juice <u>in total</u> does your child usually drink on an average day? (= ¼ pint)**

none ☐ 1 ¼ pint ☐ 2 ½ pint ☐ 3 ¾ pint ☐ 4 1 pint ☐ 5

6. **How many servings of fruit <u>in total</u>** (fruit eaten at home and school) **does your child us day? (A serving of fruit is classed as a whole fruit e.g. an apple, a banana.)**

none ☐ 1 ¼ ☐ 2 ½ ☐ 3 one ☐ 4 two ☐ 5 three ☐ 6 four ☐ 7

7. **How many servings of vegetables and salad <u>in total</u>** (vegetables eaten at home and scho **have on an average day? A serving of vegetables or salad is classed as a heaped ser vegetable. Potatoes are not included.**

none ☐ 1 ¼ ☐ 2 ½ ☐ 3 one ☐ 4 two ☐ 5 three ☐ 6 four ☐ 7

8. **When your child eats fruit, how much of the <u>whole</u> fruit e.g. apple, banana, orange**

a bite ☐ 1 ¼ ☐ 2 ½ ☐ 3 ¾ ☐ 4 whole thing (excluding skin, pip

9. **How much sugar <u>in total</u> does your child usually have <u>added</u> to food or drink on an a** (2 teaspoons = 1 dessert spoon)

none ☐ 1 1-2 teaspoons ☐ 2 3-4 teaspoons ☐ 3 5-6 teaspoons ☐ 4

10. **Where did your child eat today?** (tick all places)

home ☐ 1 school ☐ 2 friend/relative ☐ 3 childcare ☐ 4

11. **What does your child usually do at lunch time? (tick one box only)**

have a school lunch ☐ 1 take a packed lunch to school ☐ 2 go home for lun

We would be very grateful if you could give us the following information. This inform survey responses into groups and will not be used for <u>any</u> other purpose.

12. **What is your postcode? (please write your postcode in the box below, for example S**

13. **How would you describe your child's ethnic background? (tick one box only)**

White
British ☐ 1
Irish ☐ 2
Any other White background ☐ 3

Mixed
White and Black Caribbean ☐ 4
White and Black African ☐ 5
White and Asian ☐ 6
Any other Mixed background ☐ 7

Asian or Asian British
Indian ☐ 8
Pakistani ☐ 9
Bangladeshi ☐ 10
Any other Asian background ☐ 11

Black or Black British
Caribbean ☐ 12
African ☐ 13
Any other Black background ☐ 14

Chine
group
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Any o

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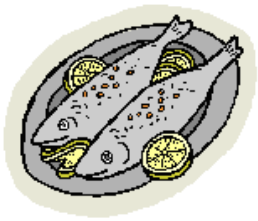
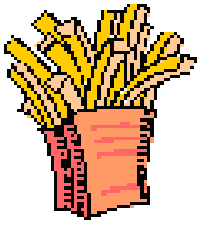
Thank You

Thank you for taking the tim
to fill in this final CADET diary
Please don't forget to give it t
your child to bring back t
school tomorrow ready to han
in to his/her class teacher.





If you would like to ask any questions about completing this questionnaire please contact:

Jennie Jupp

on 01753 637356

between 9.00am and 6.00pm

Appendix B. Pupil questionnaire

School:

Thinking about Food

We would like to know what you think about different foods. No one in your school or at home will read your answers.

Pupil Name:

Class:

Example question

Here are some pictures of things to eat.
Have you tried any of these foods before?

if you haven't, circle the cross ✖
if you have,
circle the smiley face ☺ if you liked it
circle the sad face ☹ if you didn't like it
circle the straight face 😐 if you are not sure.

bread roll

✖ ☺ ☹ 😐

cheese

✖ ☺ ☹ 😐

Fruit salad

✖ ☺ ☹ 😐

National Foundation for Educational Research, Milestone House, Upton Park, Slough, Berks, SL1 2DQ.

Here are some pictures of different fruits.

Have you tried any of these fruits before?

if you haven't, circle the cross ✖
if you have,
circle the smiley face ☺ if you liked it
cicrle the sad face ☹ if you didn't like it
circle the straight face 😐 if you are not sure.

apple

✖ ☺ ☹ 😐

bananas

✖ ☺ ☹ 😐

oranges

✖ ☺ ☹ 😐

raspberries

✖ ☺ ☹ 😐

kiwifruit

✖ ☺ ☹ 😐

grapes

✖ ☺ ☹ 😐

strawberry

✖ ☺ ☹ 😐

peaches

✖ ☺ ☹ 😐

cherries

✖ ☺ ☹ 😐

pear

✖ ☺ ☹ 😐

plums

✖ ☺ ☹ 😐

satsuma

✖ ☺ ☹ 😐

Here are some pictures of different vegetables.

Have you tried any of these vegetables before?

if you haven't, circle the cross ✖
if you have,
circle the smiley face ☺ if you liked it
circle the sad face ☹ if you didn't like it
circle the straight face 😐 if you are not sure.

broccoli

✖ ☺ ☹ 😐

carrots

✖ ☺ ☹ 😐

celery

✖ ☺ ☹ 😐

cabbage

✖ ☺ ☹ 😐

tomatoes

✖ ☺ ☹ 😐

sweetcorn

✖ ☺ ☹ 😐

peas

✖ ☺ ☹ 😐

mushroom

✖ ☺ ☹ 😐

green beans

✖ ☺ ☹ 😐

cucumber

✖ ☺ ☹ 😐

pepper

✖ ☺ ☹ 😐

lettuce

✖ ☺ ☹ 😐

Here are some pictures of foods that you might eat as a snack between meals.

Which of these do you prefer to eat as a snack?

circle the smiley face ☺ under 1 picture in each box.

apple ☺

or

crisps ☺

cake bar ☺

or

pear ☺

banana ☺

or

digestive biscuits ☺

satsuma ☺

or

yoghurt ☺

cheesy biscuits ☺

or

grapes ☺

Here are some more pictures of foods that you might eat as a snack between meals.

This time, tell us which of these you think is healthier.

*circle the **smiley face** ☺ under 1 picture in each box.*

cheese and apple ☺

or

fruit cake and cheesy puffs ☺

or

mini swiss roll and cheesy biscuits ☺

cheesy biscuits and fruit-snack roll ☺

or

breadsticks and cheese dip with grapes ☺

or

Chocolate fingers and cheesy puffs ☺

jam doughnut and crisps ☺

or

carrot sticks and popcorn ☺

or

onion rings and fruit chews ☺

cheese triangles and crisps ☺

or

fruit cake and chocolate buttons ☺

or

flapjack and raisins ☺

chocolate bar and jellie teddies ☺

or

banana sandwich ☺

or

cake bar and potato sticks ☺

5 Here are some pictures of different foods and drinks.

How much of these foods do you think a person should eat to have a healthy balanced diet?

if you think a person **should** eat lots, circle the 3 green ticks ✔✔✔

if you think a person **should** only eat some, circle the 2 blue ticks ✔✔

if you think a person **should** only eat a small amount, circle the 1 red tick. ✔

vegetables

✔✔✔ ✔✔ ✔

milk

✔✔✔ ✔✔ ✔

chocolate

✔✔✔ ✔✔ ✔

butter

✔✔✔ ✔✔ ✔

bread

✔✔✔ ✔✔ ✔

rice

✔✔✔ ✔✔ ✔

eggs

✔✔✔ ✔✔ ✔

tuna fish

✔✔✔ ✔✔ ✔

fruit

✔✔✔ ✔✔ ✔

cheese

✔✔✔ ✔✔ ✔

6 Here are some pictures of different foods that you might have in a packed lunch.

Which **4** foods would make a healthy balanced packed lunch?

*circle the **smiley faces** ☺ under only 4 of the pictures*


cheese sandwich ☺


mini swiss roll ☺


apple ☺


fruit yoghurt ☺


chocolate bar ☺


tuna pitta pocket ☺

crisps ☺


chocolate mousse ☺


cheesy biscuits ☺


banana ☺

7 Here are some pictures of different foods that you might have for a lunch.

Which **4** foods would make a healthy balanced lunch?

*circle the **smiley faces** ☺ under only 4 of the pictures.*


chips ☺


peas ☺


rice ☺


chicken ☺


boiled potatoes ☺


salad ☺


fish fingers ☺


carrots ☺


pasta ☺


cauliflower cheese ☺

Here are some pictures of different foods and drinks.

Which of these do you think would count as a portion of fruit?

circle the smiley face ☺ if you think it does count
circle the sad face ☹ if you think it doesn't count
circle the straight face 😐 if you are not sure.

strawberry lolly ☺ 😐 ☹

banana sandwich ☺ 😐 ☹

blackcurrant squash ☺ 😐 ☹

orange juice ☺ 😐 ☹

raisins ☺ 😐 ☹

raspberry jelly ☺ 😐 ☹

fruit cake ☺ 😐 ☹

fruit salad ☺ 😐 ☹

fruit pastilles ☺ 😐 ☹

How many portions of fruit and/or vegetables do you think you should eat every day?

(circle the number)

0 1 2 3 4 5 6 7 8

Thank you for completing this questionnaire. ☺

Appendix C. Technical appendix

In this appendix we outline the methods used in analysing the evaluation data, and provide brief summaries of findings relating to CADET and the pupil questionnaire.

1. Analysis methods

Multilevel modelling

Multilevel modelling is a development of a common statistical technique known as regression analysis. This is a technique for finding a straight-line relationship which allows us to predict the values of some measure of interest ('dependent variable') given the values of one or more related measures. For example, we may wish to predict schools' average test performance given some background factors, such as school size and the percentage of pupils eligible for free school meals (these are sometimes called 'independent variables').

Multilevel modelling takes account of data which is grouped into similar clusters at different levels. For example, individual pupils are grouped into year groups or cohorts, and those cohorts are grouped within schools. There may be more in common between pupils within the same cohort than with other cohorts, and there may be elements of similarity between different cohorts in the same school. Multilevel modelling allows us to take account of this hierarchical structure of the data and produce more accurate predictions, as well as estimates of the differences between pupils, between cohorts, and between schools.

Census-based pupil-level measures

For the analysis of possible changes in diet associated with the SFVS and other factors, it is useful to have pupil-level data related to deprivation. For this reason, one of the additional questions on CADET asked for the postcode of the child's home; valid responses enabled 2,371 pupils (58 per cent of the total) to be matched to the local area census data.

This local area census data contains a large number of different measures which might be applied to individual pupils – too many to be feasible to include in the modelling with any hope of sensible or significant results. To address this problem, a two-element strategy was adopted:

1. Combining closely related measures: One set of census variables gives the percentages of individuals in the local area with zero to four 'dimensions of deprivation'. These were combined into a single 'deprivation measure' by

multiplying each percentage by the relevant number of dimensions and summing. The result is an 'average number of dimensions', times 100.

2. Correlational analysis: The whole set of census measures available, including the derived measure described above, was correlated with one of the principal CADET outcomes (total fruit and vegetable intake) and the three measures with the strongest correlations were included in the modelling.

   The final three measures included, with their correlation values, were:

   - percentage of people aged 16-74 with no qualifications (-0.16)
   - percentage of people not in good health (-0.13)
   - overall deprivation index (-0.14).

   Pupils who could not be linked to census data were imputed as having the mean value of each.

   As numbers of minority ethnic pupils were small, they were combined in a single category. The complete list of background variables included in the modelling is found in Section 2.1 of this report.

2. Multilevel analysis of changes in CADET from baseline to Phase 3

Modelling CADET outcomes

The following outcomes, available at each timepoint in a consistent manner, were included in the models:

- portions of fruit
- portions of vegetables
- portions of fruit and vegetables (including juice once)
- portions of snacks and desserts
- total fruit and vegetables, consumed at school
- total fruit and vegetables, consumed at home
- '5 A DAY' fruit and vegetables (yes/no).

All outcomes **included** the SFVS fruit or vegetables at Phases 2 and 3, to allow for the possibility that some of this intake had been recorded but not attributed to the SFVS. Six outcomes were measured in terms of portions, and the seventh was a binary indicator of whether or not the intake reached the '5 A DAY' standard.

Tables C1 and C2 below show the 'quasi effect sizes' which are statistically significant at the five per cent level for each outcome. (In all the tables which follow, only values which are statistically significant at the five per cent level are shown.)

Table C1. Significant quasi effect sizes for background variables relative to food intakes (overall differences)

Variables at each timepoint	Total fruit	Total veg	Total fruit & veg	Snacks	Portions at school	Portions at home
Sex (girl = 2, boy = 1)	8		9	-5	8	6
Intervention group					-23	12
Year 1 pupils	-21				-17	
Year 2 pupils	-28				-21	
Infant school						
Intervention group Year 1 pupils						
Intervention group Year 2 pupils			-13			
% eligible for free school meals	-8	-14	-15	9	-10	-13
% with SEN						
% with EAL						
KS1 overall performance 2002						
Minority ethnic						
School lunch		13	11	-12	14	
Packed lunch	12	-14		36		
Home lunch				-30		
% of people aged 16-74 with no qualifications	-5		-9			-8
% of people in OA with not good health		-6				
Mean deprivation index						

Using the total fruit column as an example, we find that the largest positive effect is 27 for the whole intervention group at Phase 2 (relative to that for comparison group pupils) followed by positive values of 20 for the intervention group Year 1 pupils at Phase 2 (relative to that for Reception) and 16 for the whole intervention group at Phase 3, all of which might plausibly be ascribed to the impact of the SFVS. The largest negative effects are for Year 2 pupils and Year 1 pupils (both compared with Reception). There was also a relative decline in fruit consumption from baseline to Phase 3 across both intervention and comparison groups.

Similar interpretations can be made for each of the outcomes, but it is also interesting to look across the rows, especially for the variables related to changes over time. For these variables we need to view the rows 'Intervention group at Phase 2' and 'Intervention group at Phase 3' as 'default' groups for each timepoint. This group would refer to a pupil who was in the intervention

Table C2. Significant quasi effect sizes for background variables relative to food intakes (change over time)

Variables relating to change from Baseline to Phases 2 and 3	Total fruit	Total veg	Total fruit & veg	Snacks	Portions at school	Portions at home
Timepoint (Phase 2 v. baseline)	-7					
Timepoint (Phase 3 v. baseline)	-9			-23		
Intervention group at Phase 2	27		22		37	-7
Intervention group at Phase 3	16				42	-31
Year 1 pupils at Phase 2						
Year 2 pupils at Phase 2						
Year 1 pupils at Phase 3						
Year 2 pupils at Phase 3						
Intervention group Year 1 pupils at Phase 2	20				22	
Intervention group Year 2 pupils at Phase 2				18		
Intervention group Year 1 pupils at Phase 3						
Intervention group Year 2 pupils at Phase 3		-15			-21	
Intervention group Phase 2 by deprivation						
Intervention group Phase 3 by deprivation						
Intervention group Phase 2 by sex		11				
Intervention group Phase 3 by sex		9				
Intervention group Phase 2 by school lunch		-13	-11		-20	
Intervention group Phase 2 by packed lunch						
Intervention group Phase 2 by home lunch						
Intervention group Phase 3 by school lunch		15				27
Intervention group Phase 3 by packed lunch		15	11			19
Intervention group Phase 3 by home lunch					99	

group but had all the 'base case' qualities i.e. a boy in Reception whose lunch arrangements were unknown. Therefore the row headed 'Intervention group Phase 3 by school lunch' represents the additional apparent impact of the intervention on those having a school lunch at Phase 3 compared with the

default group. There is a significant apparent positive impact on both consumption of vegetables and the number of portions of fruit and vegetables consumed at home. The row headed 'Intervention group Phase 2 by sex' represents the apparent additional impact of the intervention on girls at Phase 2 compared to the default group.

The same results can be presented in a different way, in terms of portions rather than dimensionless values, and this is done in Section 2.2.3 of the report (Tables 2.4 and 2.5).

Tables C3 and C4 below give the estimated impact of the SFVS from the above models for each year group for Phases 2 and 3, with 95 per cent confidence intervals for these estimates. They also show the overall estimated impact across all three year groups. Value in bold are statistically significant.

Table C3. Estimated SFVS impact values at Phase 2

Outcome	Reception	Year 1	Year 2	Overall
Total fruit	**0.36 (0.19 to 0.53)**	**0.63 (0.36 to 0.90)**	**0.45 (0.19 to 0.72)**	**0.48 (0.24 to 0.72)**
Total vegetables	0.03 (-0.15 to 0.21)	-0.01 (-0.28 to 0.27)	0.04 (-0.24 to 0.31)	0.02 (-0.23 to 0.27)
Total fruit & vegetables	**0.50 (0.27 to 0.72)**	**0.67 (0.31 to 1.03)**	**0.54 (0.18 to 0.90)**	**0.57 (0.25 to 0.89)**
Total snacks	-0.06 (-0.21 to 0.09)	0.09 (-0.17 to 0.36)	-0.10 (-0.37 to 0.16)	-0.02 (-0.26 to 0.21)
Portions at home	-0.12 (-0.26 to 0.02)	-0.10 (-0.33 to 0.12)	-0.17 (-0.40 to 0.05)	-0.13 (-0.33 to 0.07)
Portions at school	**0.43 (0.25 to 0.60)**	**0.68 (0.42 to 0.93)**	**0.58 (0.32 to 0.83)**	**0.56 (0.33 to 0.79)**

(Values in brackets are 95 per cent confidence intervals; values in bold are statistically significant.)

Table C4. Estimated SFVS impact values at Phase 3

Outcome	Reception	Year 1	Year 2	Overall
Total fruit	**0.21 (0.05 to 0.37)**	**0.31 (0.05 to 0.56)**	0.04 (-0.22 to 0.29)	0.18 (-0.04 to 0.41)
Total vegetables	-0.19 (-0.45 to 0.06)	-0.17 (-0.51 to 0.17)	-0.29 (-0.63 to 0.06)	-0.22 (-0.53 to 0.10)
Total fruit & vegetables	0.20 (-0.02 to 0.41)	0.21 (-0.17 to 0.59)	-0.15 (-0.53 to 0.23)	0.09 (-0.25 to 0.42)
Total snacks	0.02 (-0.02 to 0.05)	0.16 (-0.10 to 0.42)	0.13 (-0.13 to 0.39)	0.10 (-0.11 to 0.32)
Portions at home	**-0.55 (-0.80 to -0.30)**	**-0.56 (-0.86 to -0.25)**	**-0.67 (-0.98 to -0.36)**	**-0.59 (-0.88 to -0.30)**
Portions at school	**0.49 (0.32 to 0.65)**	**0.64 (0.40 to 0.88)**	**0.25 (0.00 to 0.49)**	**0.46 (0.24 to 0.68)**

(Values in brackets are 95 per cent confidence intervals; values in bold are statistically significant.)

'5 A DAY' analysis

The analysis of the binary variable representing whether or not each child reached the '5 A DAY' standard was carried out using a logistic multilevel model. Logistic regression is a form of regression analysis in which the outcome of interest is binary, i.e. takes two possible values (for example: passing an exam or not; going into further education or not; applying to a university or not). A set of background variables can be used to predict the probabilities of the binary outcome, as in conventional regression analysis, but the coefficients relate to increasing or decreasing the probability that an outcome occurs.

Logistic regression deals with the relative odds associated with an event, which are equal to:

$$\frac{\text{Probability of event occurring}}{\text{Probability of event not occurring}}$$

The procedure gives an **odds ratio***,* which compares the odds of an event (e.g. eating five portions of fruit per day) associated with one group of students, with the odds for another group. An odds ratio close to one shows there is little difference between two groups, whereas an odds ratio significantly greater or less than one indicates differences in rates between the groups.

The background variables for this model were identical to those used above, and the results are shown in Tables 2.6 and 2.7 of this report.

3. Multilevel analysis of changes in pupil questionnaire from baseline to Phase 3

Modelling pupil questionnaire outcomes

The following outcomes, available at all three timepoints in a consistent manner, were included in the models:

- number of fruits liked (Q1)
- number of fruits tried (Q1)
- number of vegetables liked (Q2)
- number of vegetables tried (Q2)
- score for Q3 (number of healthy options preferred)
- total score for Q4-Q9
- individual scores for Q4 to Q9 inclusive.

Since the pupil questionnaire was only administered to Year 2 pupils, many of the interaction variables included in the modelling of CADET were omitted.

Only 41 per cent of pupils could be matched to census data (via CADET postcodes). Correlational analysis (as described in Section 1 of this appendix) was undertaken, and as a result it was decided to use the same three census measures as for CADET.

Tables C5 and C6 below show the 'quasi effect sizes' which are statistically significant at the five per cent level for each outcome.

Table C5. Significant quasi effect sizes for background variables relative to main pupil questionnaire outcomes

Variable	Fruits liked	Fruits tried	Veg liked	Veg tried	Prefer healthy options
Variables at all 3 timepoints					
Sex	20	23	9	17	18
Minority ethnic					
Intervention group			-14		
Infant school					
% eligible for free school meals					
% with SEN					
% with EAL	8				
KS1 overall performance 2002					
% of people aged 16-74 with no qualifications					
% of people OA with poor health					
Mean deprivation index					
Variables relating to changes over time					
Phase 2	6		6	14	21
Phase 3	11	11	7	8	39
Intervention group at Phase 2	11	9		-9	11
Intervention group at Phase 3					
Intervention group at Phase 2 by deprivation					
Intervention group at Phase 3 by deprivation					

Looking at the significant coefficients in the tables, it seems that scores tended to rise from baseline to Phase 2 in all outcomes except total fruits tried, Q7 and Q5 (for which they declined). Scores appeared to rise overall from baseline to Phase 3 in all outcomes, except for Q5 (for which there was no significant change). Girls tended to have higher scores than boys in everything except Q7 and Q8. Total vegetables liked has a significant difference between the groups at all timepoints, with the intervention group tending to like fewer vegetables than the comparison group. The score on Q9 was higher for the intervention group at baseline (though the difference seemed to decline by

Phase 3). Pupils in infant schools tended to have higher scores on this question.

Table C6. Significant quasi effect sizes for background variables relative to pupil questionnaire scores (Q4 to Q9)

Variable	Q4	Q5	Q6	Q7	Q8	Q9	Total score
Variables at all 3 timepoints							
Sex	21	16	16			11	19
Minority ethnic							
Intervention group						29	
Infant school						24	
% eligible for free school meals	-17	-13			-11	-9	-16
% with SEN	-7	-6			-9		-8
% with EAL						10	
KS1 overall performance 2002		8				12	10
% of people aged 16-74 with no qualifications	-15	-8					-10
% of people OA with poor health							
Mean deprivation index				-7			
Variables relating to changes over time							
Timepoint 2	23	-14	13		14	20	16
Timepoint 3	33		16	8	24	45	38
Intervention group at Phase 2							
Intervention group at Phase 3	8					-12	
Intervention group at Phase 2 by deprivation				7			
Intervention group at Phase 3 by deprivation	6						

Other background factors had some relationship with certain outcomes, although this was not the case for the minority ethnic indicator or the percentage of people not in good health. Percentages of pupils eligible for free school meals and with SEN were negatively associated with the total score on Q4 to Q9, and within this specifically with Q4, Q5 and Q8. The percentage of EAL pupils was positively associated with number of fruits liked. The key stage 1 achievement measure was positively associated with total score, and within this with Q5 and Q9. Similarly, the percentage of people with no qualifications was negatively associated with total score, and within this with Q4 and Q5. The overall deprivation index was negatively associated with Q7.

The main 'headline' factors of interest are the estimated impacts of the intervention at Phases 2 and 3. At Phase 2 the impact was only significant in four cases: positively so for total fruits liked and tried, and preferring healthy options in Q3, and negatively for total vegetables tried. At Phase 3 there was an apparently significant positive effect with Q4 and a negative one for Q9, leading to no overall relationship with total score. It should be noted, however,

that the 'intervention' group apparently started off with higher scores on Q9, so there may be an element of the comparison group catching up.

There were two significant and positive interactions between the intervention group and the deprivation index: with Q7 at Phase 2, and Q4 at Phase 3. The interpretation is that in these cases the SFVS impact was apparently stronger on pupils from more deprived areas.

Table C7 below gives the estimated impact of the SFVS from the above models for Phases 2 and 3, with 95 per cent confidence intervals for these estimates. Value in bold are statistically significant.

Table C7. Estimated SFVS impact values at Phases 2 and 3

Questions	Phase 2	Phase 3
Q1 – fruits liked	**0.33 (0.16 to 0.51)**	0.16 (-0.04 to 0.35)
Q1 – fruits tried	**0.20 (0.03 to 0.37)**	0.16 (-0.01 to 0.33)
Q2 – vegetables liked	0.08 (-0.14 to 0.30)	0.10 (-0.13 to 0.32)
Q2 – vegetables tried	**-0.22 (-0.42 to -0.03)**	0.06 (-0.14 to 0.27)
Q3 score	**0.17 (0.04 to 0.30)**	0.03 (-0.11 to 0.16)
Q4 score	0.11 (-0.01 to 0.23)	**0.12 (0.01 to 0.22)**
Q5 score	0.00 (-0.16 to 0.15)	-0.02 (-0.18 to 0.14)
Q6 score	0.03 (-0.04 to 0.09)	0.00 (0.00 to 0.00)
Q7 score	0.06 (-0.02 to 0.14)	0.00 (-0.08 to 0.08)
Q8 score	-0.04 (-0.21 to 0.13)	0.11 (-0.07 to 0.29)
Q9 score	-0.08 (-0.17 to 0.01)	**-0.10 (-0.20 to -0.01)**
Total score Q4-Q9	**-0.01 (-0.37 to 0.35)**	**0.02 (-0.37 to 0.40)**

(Values in brackets are 95 per cent confidence intervals; values in bold are statistically significant.)