Building solutions for preventing childhood obesity

Module 4

Interventions to promote eating breakfast
Building Solutions for Preventing Childhood Obesity

Module 4

Interventions to promote eating breakfast

Prepared on behalf of the Prevention Research Centres:
NSW Centre for Overweight and Obesity
NSW Centre for Physical Activity & Health
NSW Centre for Public Health Nutrition

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This is one of a set of modules in the series Building solutions for preventing childhood obesity. Other modules are:

Overview module
Module 1: Interventions to promote consumption of water and reduce consumption of sugary drinks
Module 2: Interventions to increase consumption of fruit and vegetables in children
Module 3: Interventions to reduce consumption of energy-dense, nutrient-poor foods
Module 5: Interventions to increase physical activity in children 5 - 12 years
Module 6: Interventions to increase physical activity in adolescents
Module 7: Interventions to reduce sedentary behaviours

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1 Background and methods

1.1 Overview
This research report is one of a series presenting a synthesis of the recent evidence on the effectiveness of interventions to prevent weight gain and promote healthy weight among children and adolescents. This series of reports is designed to update the proposed approaches for children and families presented by the Centre for Public Health Nutrition report, ‘Best options for promoting healthy weight’.

The “Building solutions for preventing child obesity” report has been presented as a series of modules to reflect clusters in the evidence base, allow clear comparisons between similar interventions, and highlight promising approaches as well as gaps in the evidence. The methods used in preparing the report are also described in the ‘Overview Module’. The specific methods used in preparing this module on interventions to promote consumption of breakfast are outlined below.

1.2 Search strategy
Studies and interventions to increase the frequency of consumption and/or improve the nutritional content, or “healthiness”, of breakfast in children and adolescents, published between January 1997 and September 2007 in peer-reviewed journals, were identified by searching Medline, Pubmed and CINAHL databases, and by consulting systematic reviews.

The databases were searched using the following terms to identify intervention evidence for this module:
Breakfast AND (intervention OR program OR promotion)
Limits: children and adolescents 0-18 years, humans, English language

The same terms were also included in a GOOGLE search to identify any evaluated programs in the non-peer reviewed literature.

1.3 Exclusion and inclusion criteria
The following exclusion and inclusion criteria were applied to research papers identified through the search strategy:

o Exclusion criteria
  - Studies published prior to 1997
  - Interventions targeting adults or young people aged over 18 years
  - Sample size <16 participants
  - Studies focused on the treatment or management of overweight/obesity
  - Studies based in a clinical setting

o Inclusion criteria
  - All studies which had intake (consumption) or nutritional content of breakfast consumed as an outcome measure(s), with or without a weight-related outcome measure
  - Studies targeting children aged 0-18 years
  - Studies with randomised controlled trial (RCT) or quasi-experimental designs
  - Post-only designs or studies with no controls were considered on a case-by-case basis
2 Problem analysis and rationale for intervention

A number of studies have shown that poor nutrient and energy intake in the morning contribute to an increased body weight. Particularly, adolescents who skip breakfast have poorer dietary intakes (less calcium, less fibre), less regular eating patterns, and have a higher body mass index (BMI), compared to those who eat breakfast. The skipping of meals such as breakfast, which typically provide more nutrient-dense foods, might contribute to weight gain by leading to subsequent hunger and snacking, and snacks tend to be the energy-dense nutrient poor foods. However, a number of studies have reported higher total daily intakes of food energy and key nutrients among those who consume breakfast than those who do not; that is, students who skip breakfast do not compensate by increasing nutrient intake at other meals.

Data on the consumption of breakfast in Australian children and adolescents is limited. A small study from ten years ago indicated that approximately 12% of 13-year-olds skipped breakfast, with females skipping at over three times the rate of males. In a follow-up telephone survey as part of this study, the reasons given for skipping breakfast were almost exclusively lack of time and not being hungry in the morning. While North American school nutrition programs have considered poverty to be a key issue in breakfast skipping, these findings suggest that, for Australian adolescents, skipping breakfast is a matter of individual choice. Similarly, another study reported that reasons offered for skipping breakfast were mainly related to personal choice and convenience rather than dieting and concern about body shape.

The most recent data on frequency of consumption of breakfast in Australia comes from the 2004 NSW Schools Physical Activity and Nutrition Study (SPANS) which sampled approximately 5400 NSW school students. This study showed that the prevalence of eating breakfast daily amongst the year 6, 8 and 10 students surveyed declined with increasing age and was higher among boys than girls in each year group. As such, approximately 80% of boys and girls in year 6 reported eating breakfast every day, declining to 67% of year 10 boys and 59% of year 10 girls. Not regularly eating breakfast was positively associated with BMI category in some year/sex groups (year 8 and 10 boys and year 6 girls), but not in others. No significant associations were observed between socioeconomic status (SES) or rurality and the prevalence of eating breakfast daily, and no apparent consistent associations were observed between cultural background and the prevalence of eating breakfast daily.

Contrary to the SPANS findings, low SES has previously been associated with skipping breakfast. In 2000, it was reported that almost half a million children in the UK skip breakfast and that these children are mostly lower SES. A cross-sectional survey of 4441 Australian school students in 2000 indicated that low SES contributed to high BMI, mediated by the low nutritional quality – as opposed to frequency of consumption – of breakfast. The authors of this study identified literature indicating that regularly missing breakfast and poor nutritional quality of breakfast are both associated with higher BMI and overweight, particularly among adolescents, and that this trend increases with age. Introducing a breakfast meal in school was suggested as a potential strategy for fighting obesity among adolescents and young adults.

Benefits of breakfast extend beyond the potential link to higher BMI. Many previous studies have suggested that children’s regular consumption of breakfast, for example through participation in breakfast clubs, results in improvement in nutrition, psychosocial and educational performance, attendance and punctuality at school, and behaviour.
3 Available intervention evidence

Seven intervention studies were identified that aimed to increase the frequency of consumption and/or improve the nutritional content, or “healthiness”, of breakfast in children. Five of these studies involved the provision of breakfast at school, while one involved a preschool breakfast program and one examined increasing the intake of ready-to-eat cereal for breakfast and snacking in the community setting.

The details of the interventions are summarised in Appendix A, in alphabetical order. A summary and brief appraisal of each study is presented below. The interventions are organised according to type as follows:

- School breakfast programs
- Preschool breakfast programs
- Family-based programs

All reported effect sizes are statistically significant (see summaries of interventions in tables in Appendix for degree of significance) unless otherwise indicated.

3.1 School breakfast programs

3.1.1 Healthy eating education with and without free school breakfast

A small-scale study conducted in one 10th grade class in rural Norway evaluated the impact of free school breakfast provision on dietary habits and school performance. A one-off healthy eating education session was provided separately to parents and students prior to the start of the breakfast intervention. Free healthy breakfasts and dietary supplements were provided at the beginning of each school day for 4 months. A second class in the same grade and school acted as a control group and received the education component but not the free breakfast program. Student-completed food frequency questionnaires and measured height and weight were collected pre- and post-intervention. A healthy eating index increased significantly in male students in the intervention group. Male students in the intervention group also reported increased satisfaction with school. However, one week post-intervention, students in the intervention group were observed to have returned to their pre-intervention breakfast habits. Improvements in student attendance and behaviour in the intervention group were reported by teachers, but these findings were not statistically significant. Median weight and BMI increased significantly in male and female students in the control group. BMI did not change significantly in the intervention group, although median weight did increase significantly in males in the intervention group.

Appraisal

This study does not inform the evidence base as it was poorly implemented and conducted on a very small scale, thus lacking sufficient statistical power. It appears that there was a lack of commitment to proper implementation of the breakfast program, with feedback from teachers regarding the program largely negative. The participating school received the intervention due to requesting assistance with poor student attendance and anti-social behaviour and therefore may not have been representative of other schools.
3.1.2 Universal free school breakfast

The impact of school breakfast programs was evaluated in 153 matched elementary (primary) schools in the USA. In this intervention all participating schools provided breakfast programs over three consecutive school years however in control schools the breakfasts were only available to lower SES children. In the intervention schools a free school breakfast was provided regardless of family income level. One year into the intervention, significant increases in school breakfast participation were observed in treatment schools but the rate of skipping breakfast did not differ between groups (4% overall). Treatment school students were more likely to consume a nutritionally substantive breakfast at home and at school, but dietary intakes over the 24 hours were essentially the same. In both groups, students’ usual daily energy intakes exceeded their requirements. There were no differences in BMI at follow-up (17% overweight in treatment schools versus 18% in control schools).

Appraisal

This study achieved increased participation in breakfast programs by opening up the free breakfast program to all children regardless of family income, however daily energy intakes exceeded requirements in all students. No improvements in overall energy intake or BMI were observed.

3.1.3 School breakfast clubs and children’s behaviour

A national evaluation of breakfast clubs in schools in deprived areas of England examined their effect on children’s behaviour in schools and included some dietary measures. Results were very mixed. Reduced truancy and increased fruit consumption was observed in primary school children who attended a breakfast club versus non-attendees. In addition, parents believed their children were more receptive to a greater diversity of foods since attending the breakfast clubs. On-the-other-hand, teachers also indicated that attendee children were less well-behaved and more energetic after attending a breakfast club. Boisterousness and a lack of discipline within the clubs were reported.

Appraisal

Unfortunately this study was largely corrupted by the fact that many schools that said they did not have a breakfast club running (designated control schools) in fact did, resulting in 77.0% (due to variable rate of implementation) of students in the control arm participating in breakfast clubs compared with only 72.2% of students in the intervention arm. Also, many schools implemented the breakfast club before baseline data could be collected. Thus, data were analysed by intention-to-treat and observationally and should be viewed with caution.

3.1.4 School breakfast clubs and nutrient intake

An observational study examined three schools in the UK to determine whether breakfast club attendance affected high school children’s nutrient intakes. Three-day weighed food diaries were kept and BMI measured (although BMI data were not published). Unfortunately the three schools offered very different foods for breakfast and in two of the schools in particular the foods served for breakfast were markedly unhealthy (for example, pastries and sausage rolls). Thus, consistent with previous results of participation in the US school breakfast program\(^2\), attendees had significantly higher daily absolute intakes of fat, and saturated fat energy; and lower intakes of carbohydrate energy. The study concluded that the children attending clubs may have habitual diets that are unhealthier than non-attendees, or that the breakfast itself was contributing to poorer nutrient intake.

Appraisal

This observational study can largely be discounted from the evidence base as the breakfasts provided were markedly unhealthy, particularly in two of the three schools. The poor quality breakfasts provided resulted in higher fat intakes in students receiving school breakfast.
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3.1.5 PATHWAYS Program

Provision of a healthy breakfast at school was a component of the extensive ‘PATHWAYS’ program conducted in the US and aimed at improving the healthy eating and physical activity of American-Indian school children. The aim of the intensive three-year intervention with school food service staff was to reduce the fat content of school meals (breakfast and lunch – see Module 3 for information on the lunch component) to 30% or fewer calories from fat, without compromising dietary quality. The intervention succeeded in reducing the percentage of calories from total fat, percentage of calories from saturated fat and reduced total grams of saturated fat consumed. Fat content of school breakfasts was reduced from in intervention schools, compared with no change in control schools. Intervention schools provided generally more healthy foods, such as non-fat and low-fat milk, more servings of fruit, fewer pastries and donuts, less peanut butter, fewer fats and gravies. In keeping with the aim of the intervention, total energy from breakfast remained the same.

Appraisal

PATHWAYS is an example of a well implemented and evaluated project, with a large sample size and long intervention duration. However, observed improvements in the nutritional quality of breakfast foods served were not supported by changes in BMI and percentage body fat among intervention children. In addition, approximately 6% of intervention students reported eating breakfast at home before eating another at school during the program, introducing the risk that individual children’s overall energy intakes may have increased as a result of the breakfast program. Unfortunately only data on foods served (from school menus and recipes) was available from the breakfast component of PATHWAYS, therefore the program’s impact on actual dietary intake is not clear.

3.2 Preschool breakfast programs

3.2.1 Preschool breakfast program

A US study aimed to determine whether middle-class pre-school children would eat a more nutrient-dense and well-balanced breakfast at preschool (in a school breakfast program), particularly lower amounts of refined sugar, than they would at home. The intervention – provision of healthy foods and multivitamins, in a preschool breakfast program – was carried out for one semester in two consecutive years in only one pre-school. 7-day food diaries showed that although mean intake of calories was the same from home and preschool settings, the intervention resulted in a reduction in refined sugar intake (16% during intervention semesters versus 8% during ‘home-breakfast’ semesters) and increased percentage of calories from starch and fibre (53% during ‘intervention’ semesters versus 48% during ‘home’ semesters).

Appraisal

The only preschool-based intervention identified, this study resulted in improved dietary quality among participating children, however overall energy intake remained unchanged. A strength of this study was the measurement of actual intake by 7-day food diaries, however the findings are limited by the lack of a control group and small sample size. Parents of children attending the preschool were given the option of participating in the program at no cost, however not all parents gave consent, introducing the possibility of volunteer bias.
3.3 Family-based programs

3.3.1 Family-based education to increase cereal consumption

The only community-based study identified involved a family-based education initiative aimed at increasing the consumption of ready-to-eat cereal to two serves per day, in conjunction with an increase in walking by 2000 steps per day, in order to prevent excessive weight gain in children and adults. Participants were all members of families with at least one child aged 8-12 years who was at risk for overweight or obesity. The intervention resulted in a significant increase in number of serves of cereal consumed without increasing overall energy or macronutrient intake, and a significant increase in the number of steps per day (at a level approaching 2000 steps per day).

Appraisal

*The intervention was relatively short, only 14 weeks, but resulted in a reduction in BMI-for-age in overweight girls aged 8-12 over the study period. Unfortunately the study was not able to separate the effects of the dietary and physical activity intervention components however it is suggested that the effect on reduced BMI might be due to the increased activity not dietary changes, as daily energy intake remained the same.*
4 Evidence appraisal

None of the six studies identified which involved school or preschool breakfast programs were aimed at changing body weight or preventing unhealthy weight gain (BMI-for-age). The programs were aimed at improving the social and educational aspects of children at school and/or improving the healthiness of breakfast or the overall diet in some way. Subsequently, while a number of the studies reported improvements in dietary quality, no intervention successfully reduced overall energy intake.

Similarly, the one community-based intervention identified demonstrated some impact on dietary quality, but there was no evidence to show that the breakfast component of the intervention was responsible for the observed reductions in BMI.

On the limited available research, breakfast programs do not appear to be a promising approach for reducing energy intake or influencing weight status. While they may contribute to improved nutrition, there is no evidence that they are more promising than other nutrition interventions at promoting healthy weight.
5 Implications for Policy and Practice

While eating a healthy breakfast has clear health and nutritional benefits, programs that promote breakfasts do not themselves provide a promising component for comprehensive school or family-based obesity prevention initiatives. The evidence provides stronger support for other nutrition and physical activity strategies as part of comprehensive obesity prevention programs.
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6 References


## 7. Appendix. Tables summarising the available intervention evidence for promoting eating breakfast

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<tr>
<th>Ref</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention description</th>
<th>Outcome variables</th>
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</table>
| Ask et al 2006 | Setting: School; Design: Controlled pilot study; Duration: 4 months | 10th grade students (N=52); 15 yr olds | Schools in Norway do not provide breakfast or lunch – cafeterias supply bread, sweet buns, waffles, milk, soft drinks, fruit  
Intervention aim: to improve school attention and performance; reduce antisocial behaviour  
2 classes in one school – 1 intervention class, 1 control class  
Both intervention and control classes: education on the importance of healthy eating; parents informed of the importance of breakfast and packed lunch; practical info on nutritious packed lunches provided  
Intervention class also offered free breakfast (low fat milk, orange juice, whole grain bread, different spreads – fish, meat, cheese, and a fruit) | Baseline one week before study; follow-up one week after study  
Self-reported school performance and school contentment  
Self-reported FFQ  
Body weight and height | Almost all students in intervention group had breakfast every day at school during intervention – but frequency of having breakfast returned to same as pre-intervention one week post-intervention  
Control group: BMI increased significantly (P<0.01 for weight, P<0.05 for BMI); significant increase in weight of males in intervention group (P<0.05) but not females. BMI did not change significantly in intervention group overall.  
Lunch every day:  
intervention group: 52% pre-intervention, 58% one week post-intervention (n.s.)  
Control group: 81% versus 86% (P<0.01)  
Healthy eating index increased in male students in intervention class (P<0.01); Males in intervention group reported increased satisfaction with school (P<0.05)  
Teachers reported improvement in school attention and social behaviour but not statistically significant because too few teachers involved |
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| Belderson et al 2003         | Setting: School Design: Observational Duration: | 3 schools (2 secondary, 1 junior) N = 111 n=59 attendees, n= 52 control 9 – 15 year olds | Aimed to provide breakfast to children who might otherwise not have eaten  
To establish a positive relationship at the start of the school day  
To offer children a choice of healthy food – which may encourage healthier eating habits  
All 3 schools had received funding for breakfast club provision – open to all children irrespective of eligibility for free school lunches  
Children who used the breakfast club at last 3days/wk for most weeks chosen as attendees  
Attendees and controls matched for eligibility to receive free school lunches to reduce confounding by socio-economic status | 3 day weighed food diary – nutrient intake BMI Availability of breakfast foods and drinks | Foods served varied considerably between the 3 schools – and unhealthy foods offered at 2 schools  
Attendees of breakfast clubs had significantly higher intakes of fat (% energy; 41.0% versus 36.8%); saturated fat (% energy; 14.3% versus 12.9%); and Na (2381.3 mg versus 1940.8 mg), lower intake of carbohydrate (47.2% versus 52.2%)  
Attendees – greater absolute intakes of fat Consistent with Gordon et al (1995) – participation in the US school breakfast program resulted in higher breakfast intakes of fat and saturated fat energy and lower intakes of carbohydrate energy  
Children attending clubs may have habitual diets that are unhealthier than non-attendees or the breakfast itself is contributing to poorer nutrient intake |
| Crepinsek et al 2006         | Setting: School Design: Controlled trial Duration: 3 consecutive school years 2000-2003 | Elementary school students (Grades 2-6) from 153 matched elementary schools in 6 school districts 79 treatment schools; 74 control schools N=4,358 (approx 30 students from each school) | Treatment schools – universal (regardless of income) free school breakfast  
Control schools – traditional, means-tested School Breakfast Program | Breakfast consumption  
Food and nutrient intake BMI (not available at baseline) | Significant increase in school breakfast participation among sample students in treatment schools (from 16% to 40%, P<0.01), the rate of breakfast skipping did not differ between groups (4% overall)  
Treatment school students more likely to consume a nutritionally substantive breakfast (P<0.01) at home and at school, but dietary intakes over 24 hours were essentially the same  
Students in schools where universal-free school breakfast was available had significantly lower mean usual energy intakes than their controls (Table 3); however, differences at the median and other percentiles of the usual intake distribution did not reach statistical significance. In both groups, students’ usual daily energy intakes exceeded their requirements  
No differences in BMI at follow-up (17% overweight treatment; 18% control) |
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<tr>
<td>Cunningham-Sabo et al 2003</td>
<td>Setting: School Design: RCT Duration: 3 years</td>
<td>American-Indian school students 3rd-5th grade N = 1,700 students in 41 schools randomised to intervention and control conditions within four field sites</td>
<td>PATHWAYS: Intensive 3-year intervention with school food service staff – to reduce fat content of school meals (breakfast and lunch) to 30% or fewer calories from fat, without compromising dietary quality 1. partnership between researchers and school food service staff 2. set of behavioural guidelines worded in the language of food service staff and operationalised in multiple modes 3. hands-on skill-building exercises and taste-testing 4. frequent visits to school kitchens to provide friendly support and encouragement Other intervention components – classroom curriculum, new skills and activities for PE classes, activities and events with families Nutritional aspects of the curriculum and family component emphasised healthy eating and low-fat alternatives</td>
<td>School breakfast menu and recipe information at four time intervals</td>
<td>No significant differences for mean energy intake baseline to end of study Fat-related measures reduced: Intvn. 16.0 g to 13.6 g Control 16.6 g to 16.7 g Difference -3.2 g (P&lt;0.03) % calories from total fat, saturated fat (g) and % calories from satd fat Higher frequencies and %s of nonfat and low fat milk served at intvn schools Also provided more servings of fruit, fewer pastries and donuts, less peanut butter, fewer fats and gravies Total energy from breakfast – changes non sig. 483.1 calories at baseline; to a range of 503.0 to 509.0 for subsequent measures; in control schools 480.2 to 469.3 to 476.4 in intervention schools Approx 6% of Pathways students reported eating a breakfast at home before eating another at school</td>
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| Rodearmel et al 2006 | Setting: Community Design: RCT Duration: 14 weeks | N =105 families (82 intervention; 23 control) with at least one 8-12 year old child who was at risk for overweight or obesity | Aim: to increase steps and cereal consumption (for breakfast and snacks), to reduce weight gain, in children and adults  
  - Asked to increase walking by 2000 steps/day  
  - Asked to consume 2 servings/day of ready-to-eat cereal (one for breakfast and one for a snack)  
 Control – asked to maintain their usual eating and step patterns throughout the study  
  - 1 week baseline; 13 weeks intervention | Baseline:  
  - 7 day daily steps  
  - 3 day food records  
  - Usual no. cereal serves  
  - BMI (adults) and BMI-for-age (children)  
  - % body fat  
 Follow-up:  
  - Self-recorded steps and cereal consumption recorded daily during intervention  
  - 3 day food records in middle and at the end of study | Target children (≥85th percentile BMI-for-age; 8-12 years)/ other children (8-17)/ parents  
 Nb. Other children data – interpret with caution (older, larger age range, leaner)  
 Did not separate effects of dietary and step interventions  
 Intervention resulted in significantly more steps per day in EXP target girls, target boys, mums and dads, versus control during intervention weeks. Increased over baseline levels approaching target 2000 steps/day  
 Also consumed significantly more cereal per day (1 serve versus 0.5 serve/day) without increasing overall energy or macronutrient intake  
 Behaviour effects similar by age/sex however, overweight target girls decreased BMI-for-age (gained less weight than attributable to normal growth) – but no reported change in energy intake since baseline (just attributable to the steps increase?) |
| Shemilt et al 2004 | Setting: School Design: Cluster RCT Duration: 1 year | Deprived areas across England 6076 students (from 30 schools)  
 Follow-up at 3 months and 12 months (1999-2000) | Funding to establish a school-based breakfast club versus control (no funding)  
 Nb. Contrary to info provided prior to intervention, some control schools did have a breakfast club, also many of those in the intervention group implemented the club too quickly to get baseline data  
 Therefore at second follow-up: 72.2% of students in the intervention arm and 77.0% in the control arm had breakfast clubs operating | Intention to treat and observational analysis  
 Range of nutritional, health, psychological, behavioural, social, educational and economic outcomes | Very mixed results – reduced truancy and increased fruit consumption in primary school children who had attended a club versus non-attendees was observed; however, apparent ill-benefit – poorer conduct/total difficulties score in attendees  
 Variable rate of implementation and lack of continuous provision of breakfast club  
 Some teaching staff believed children became less well-behaved and more energetic after attending breakfast club  
 Parents believed their children more receptive to greater diversity of foods since attending  
 Boisterousness in clubs, lack of discipline |
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<tr>
<td>Worobey &amp; Worobey 1999</td>
<td>Setting: Preschool Design: Non-controlled pre-test, post-test Duration: Two semesters (over two consecutive years)</td>
<td>3 – 4 year olds attending a University laboratory demonstration preschool Optional participation in program 1st year = 13 (out of 20) 4 yr olds participated 2nd year = 10 (of 16) 3 yr olds and 9 (of 19) 4 yr olds</td>
<td>Aim to see if middle-class preschool aged children would eat a more nutrient-dense and well-balanced breakfast at school (SBP) than they would at home School breakfast program – healthy foods offered; multivitamins provided Carried out one semester in two consecutive years (spring semester both years – breakfast club suspended in winter break)</td>
<td>Baseline (prior to SBP) – one week food diary of breakfast food eaten at home After 6 weeks – records of breakfast foods eaten for 6 days for 4 year olds and 4 days for 3 year olds</td>
<td>SBP1 = mean intake of calories same from home and preschool settings During SBP1 – calories from starch-rich foods and fibre increased slightly and calories from simple sugars decreased significantly SBP2 – protein and carbohydrate calories, which had decreased slightly with the return to home breakfasts, again increased slightly with the resumption of the SBP; sugar intake increased during return to home breakfast and decreased again with SBP Refined sugar 15% and 16% at home 7% and 8% at school Calories from starch and fibre 47% and 49% at home 54% and 53% at school</td>
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