School food policy in secondary schools in England and its impact on adolescents' diets and dental health: the FUEL multiple-methods study

Miranda Pallan,[1*] Marie Murphy,[1] Breanna Morrison,[1] Irina Pokhilenko,[1] Alice Sitch,[1,2] Emma Frew,[1] Clare Rawdin,[1] Rachel Adams,[3] Ashley Adamson,[4] Suzanne Bartington,[1] Alexandra Dobell,[1] Rhona Duff,[1] Tania Griffin,[5] Kiya Hurley,[1] Emma Lancashire,[1] Louise McLeman,[1] Sandra Passmore,[6] Vahid Ravaghi,[7] Suzanne Spence[4] and Peymane Adab[1]

[1]Institute of Applied Health Research, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK
[2]NIHR Birmingham Biomedical Research Centre, University Hospitals Birmingham NHS Foundation Trust and University of Birmingham, Institute of Translational Medicine, Birmingham, UK
[3]Health Services Management Centre, College of Social Sciences, University of Birmingham, Birmingham, UK
[4]Population Health Sciences Institute, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, UK
[5]Department for Health, University of Bath, Bath, UK
[6]Services for Education, Birmingham, UK
[7]The School of Dentistry, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK

[*]Corresponding author m.j.pallan@bham.ac.uk

Published November 2024
DOI: 10.3310/TTPL8570

Scientific summary

School food policy in secondary schools in England and its impact on adolescents' diets and dental health: the FUEL multiple-methods study

Public Health Research 2024; Vol. 12: No. 12
DOI: 10.3310/TTPL8570

NIHR Journals Library www.journalslibrary.nihr.ac.uk

Scientific summary

Background

National school food standards (SFS) legislation has been in place since 2006. In 2013, the School Food Plan (SFP) was introduced, which contained recommendations for schools to support healthy eating. Following this, in 2015, the government introduced updated SFS legislation. Evaluation of the impact of the 2006 SFS on nutritional intake has focused on primary school-aged children, and evidence relating to secondary school pupils is more limited. To the best of our knowledge, implementation of the updated SFS and the SFP, and their impact on pupil nutritional intake, has not been evaluated in secondary schools.

The national SFS legislation applies to state-funded schools in England, except for academies and free schools established between 2010 and 2014. The exemption of these schools provided an opportunity to compare implementation of the SFS and SFP, pupil nutritional intake, and dental health between schools that are mandated and schools that are not mandated to comply with the SFS. However, exempt schools have been encouraged to voluntarily comply with the standards, and in the last 18 months of this study there has been a government expectation that all schools, regardless of their exemption status, should comply with the SFS. Despite their legislative status, there are no formal national arrangements for monitoring or reporting schools' compliance with the SFS.

Objectives

The three research objectives were:

1. in secondary schools either mandated (SFS-mandated) or not mandated (SFS-non-mandated) to comply with the national SFS legislation, to compare –

    a. school food provision and compliance with the SFS
    b. the school food environment/culture and the food curriculum, and implementation of the SFP actions
    c. the nutritional intake and dental health of school pupils, focusing on free sugar intake as the primary outcome
    d. the costs of food provision, food curriculum delivery and other measures to influence the school food culture and environment.

2. to explore the variation in compliance with the SFS and implementation of SFP actions in secondary schools and use this to develop a typology of schools
3. to use the developed school typology to explore associations between the school types and pupil dietary and dental outcomes.

Methods

We conducted an observational, multiple-methods study comprising two phases: (1) collecting a variety of data to assess school SFS/SFP implementation, pupil dietary intake and dental outcomes in SFS-mandated and SFS-non-mandated schools and (2) a qualitative case study with four school sites to understand the experiences of schools in implementing and embedding the SFS and SFP. In addition, we undertook an economic evaluation to assess how the costs and outcomes compared across SFS-mandated and SFS-non-mandated schools.

State-funded secondary school academies/free schools were sampled from the Midlands, England, using a stratified sampling approach. Pupils were sampled from one class in each of years 7 (age 11–12 years), 9 (age 13–14 years) and 10 (age 14–15 years) in participating schools. School staff and governors with a role in food provision or education were also recruited.

Schools were recruited by invitation, and for participating in the study they received a £300 payment and a report detailing the school's implementation of the SFS/SFP. Case study schools received an additional £150. Written, informed consent was provided by all participants. Parents of invited pupils provided passive consent for their child's participation. Pupils were given a £5 voucher as a thank-you for their participation.

Data collection was guided by a logic model and was undertaken at the school and pupil level. It incorporated assessment of food provision (to assess compliance with the SFS); the school food culture, curriculum and environment (to assess implementation of the SFP actions); costs related to food provision and the food culture/curriculum/environment; school contextual data; and pupil nutritional and dental outcomes.

School food standards and School Food Plan implementation

Assessment of SFS implementation was guided by published checklists and comprised a 1-day researcher observation of all school mealtimes and food outlets and a review of school menus. Assessment of implementation of SFP actions was guided by published resources for schools and comprised researcher observation, document analysis, and surveys to schools, staff and pupils. Compliance with each SFS was judged as a binary yes/no, and level of implementation of each SFP action was categorised into high, medium or low. The embedding of the SFS and SFP policies overall was assessed through school/catering staff and governor surveys. Contextual data were provided by schools via surveys and/or documents.

School-level data were also used to develop a school typology using a two-stage process. In stage 1 we used SFS compliance data to generate school types based on high/medium/low compliance with two sets of standards relating to two key dietary patterns: (1) food/drinks that are energy-dense and/or high in fat or sugar; and (2) variety/balance of food groups. In stage 2, we identified subtypes based on the implementation of selected SFP actions.

Pupil outcomes

The primary outcome was pupil free sugar intake (defined as all sugars added to foods by the manufacturer, cook or consumer, and natural sugars found in honey, syrups and unsweetened fruit juices). Secondary nutritional outcomes were percentage of total energy intake (TEI) from free sugars; TEI (kcal); total fat intake (g); fibre intake (g); number of portions of fruit and vegetables (F&V) consumed; number of sugar-sweetened beverages (SSB) consumed; number of confectionery items consumed; and number of foods high in fat, sugar and salt (HFSS) consumed. These nutritional outcomes were calculated for three time periods: the school day lunch; while present at school; and during the full 24-hour period of the same school day. Additional secondary nutritional outcomes were free sugar intake providing > 5% of 24-hour TEI; consumption of five or more portions of F&V during a 24-hour period; and number of eating/drinking occasions (excluding plain water) during a 24-hour period. Dental outcomes were the presence of dental caries symptoms in the previous 3 months; the number of dental caries symptoms in the previous 3 months; and past dental caries treatment.

Data on nutritional outcomes were collected by pupil self-report using an online 24-hour dietary recall (Intake24), with one or two recalls per participant on non-consecutive school days. Dental outcome data and sociodemographic data were collected by pupil self-report using online surveys. Postcodes were mapped to Index of Multiple Deprivation (IMD) 2019 scores and used to obtain water fluoridation levels at participants' homes.

Linear or Poisson multilevel models were used to explore differences in pupil outcomes across the SFS-mandated and SFS-non-mandated school groups. The models were adjusted for relevant school-level and pupil-level variables. We explored two-way interaction effects between school SFS-mandated/non-mandated status and lunch source (school-provided vs. obtained from elsewhere), year group and IMD group. We conducted exploratory analyses to compare pupil outcomes across identified school types. Statistical analyses were conducted in Stata version 17 (StataCorp LP, College Station, TX, USA).

Economic evaluation

The economic evaluation took the form of a micro-costing and a cost–consequences analysis. Costs to schools associated with school food were collected via a school survey. In addition, public data on catering expenditure were used to supplement the analysis. Pupil expenditure on school food was collected through the online surveys. Outcomes were pupil dietary intake and dental health (detailed above); pupil health-related quality of life (HRQoL), measured via the online surveys using the Child Health Utility 9-Dimensions tool; and school-level educational outcomes relating to absenteeism and attainment (publicly available).

Case study

We explored the way in which the SFS, SFP and local school policy or initiatives were introduced, embedded and sustained in the schools, and their perceived influence on the dietary intake of pupils. We selected four schools from the phase 1 sample based on their SFS-mandated/non-mandated status, the percentage of pupils eligible for free school meals (FSM), and their catering model. We conducted four to six interviews per school with relevant staff/governors and three focus groups with pupils from years 7, 9 and 10. All interviews/focus groups were thematically analysed using the Framework approach.

Public involvement

At multiple time points, we consulted with public representatives (young people, parents and school staff/governors), who advised on participant information, recruitment, data collection tools, interpretation of the findings and dissemination.

Results

Thirty-six schools participated (SFS-mandated, *n* = 13; SFS-non-mandated, *n* = 23) and 2453 pupil participants provided nutritional and/or dental outcome data (SFS-mandated, *n* = 836; SFS-non-mandated, *n* = 1617).

On average, schools were compliant with 64% of SFS, with standards applying to lunchtime provision (average of 81% of standards met) more likely to be implemented than those applied to food provided across the whole school day or outside lunch (average of 43% and 64% standards met, respectively). The standards with low compliance mostly related to the restriction of HFSS foods and drinks. On average, schools implemented 41% of SFP actions to a high level. SFS compliance and SFP implementation were similar across SFS-mandated and SFS-non-mandated schools.

School Food Plan assessment revealed a lack of implementation of actions relating to leadership and oversight on school food, engagement (with pupils, parents and the community) and catering practices (catering staff encouraging healthy behaviours and nutritional balance) in the majority of schools. Implementation of actions relating to the lunchtime experience was variable; for example, most schools (77%) had strategies in place to reduce queuing, but many schools (58%) did not ask for feedback on the lunchtime experience from their pupils. Curricular education relating to food and healthy eating was well implemented in most schools, but education around growing and extracurricular food education was not. Specifically relating to leadership and oversight on school food, governor leadership and engagement with school food, independent checking of compliance of the school with the SFS and governor review of school food uptake data were actions that were poorly implemented across schools

(implemented to a low level in 64%, 79% and 74% schools, respectively). None of the governors responding to the staff/governor survey reported that they were involved in managing or overseeing the implementation of the SFS, and only 31% of senior leader respondents stated that they were involved.

Compared with pupils in SFS-non-mandated schools and adjusting for other variables, pupils in SFS-mandated schools had lower free sugar intake (−2.78 g, 95% CI −4.66 to −0.90 g) and lower TEI (54.97 kcal; 95% CI −88.87 to −21.07 kcal) at lunch, but there was no significant difference in the percentage of energy intake from free sugars. When TEI was adjusted for, compared with pupils in SFS-non-mandated schools, pupils in SFS-mandated schools had a significantly lower intake of F&V at lunch (−0.20 portions; 95% CI −0.32 to −0.08 portions), during the school day and over 24 hours. There was also significantly higher consumption of confectionery during the school day and SSB over 24 hours in the SFS-mandated schools group than in the SFS-non-mandated school group, when TEI was adjusted for. Participants who had a 100% school-provided lunch had lower lunchtime free sugar, TEI, fat, fibre and F&V intake. There were no significant differences in dental outcomes between the SFS-mandated and SFS-non-mandated school groups, and no clear interaction effects between school SFS-mandated/non-mandated status and lunch source, IMD group or year group.

We identified four school types based on SFS compliance and two further subtypes based on SFP implementation in stages 1 and 2 of our school typology development. We noted some differences in pupil nutritional outcomes across the four school types. Compared with type 1 schools (low implementation of obesity/dental health-related SFS and high implementation of dietary variety-related SFS), pupils in the type 2 school (medium implementation of both sets of SFS) had a lower percentage of TEI from free sugar at lunch (−8.12%, 95% CI −14.48% to −1.76%) but higher consumption of confectionery items during the school day [incidence rate ratio (IRR) 2.70, 95% CI 1.30 to 5.59]. Pupils in the type 4 school (high implementation of obesity/dental health-related SFS and dietary variety-related SFS) had a higher consumption of confectionery items at lunch than those in type 1 schools (IRR 2.15, 95% CI 1.16 to 3.98).

Twenty-two schools contributed data on costs related to food (SFS-mandated, $n = 6$; SFS-non-mandated, $n = 16$). Annual ongoing costs of food provision from a societal perspective included costs to schools, costs to catering providers and volunteer time, and ranged from £8500 to £974,563, with a mean of £207,094. The annual ongoing costs per pupil (from a societal perspective) ranged from £9 to £982, with a mean of £195 (based on the total number of pupils). Staff costs constituted the largest cost category. The average annual ongoing costs of implementing and delivering the SFS and SFP and of food provision was lower in SFS-mandated schools than in SFS-non-mandated schools (£167 vs. £206 per pupil). SFS-mandated schools also reported spending slightly less on catering, on average, than SFS-non-mandated schools (£128 vs. £133 per pupil, based on the total number of pupils). Pupils in SFS-mandated schools reported slightly higher HRQoL than pupils in SFS-non-mandated schools (0.8302 vs. 0.8274); however, potential confounding factors were not adjusted for, and there was variation in the number of missing HRQoL data across SFS-mandated/non-mandated groups.

Twenty-one staff/governors and 137 pupils from 4 schools participated in the qualitative case study phase, with variation across the schools in relation to FSM eligibility (9–53%), SFS-mandated/non-mandated status (50% SFS-mandated) and catering model (50% external). Schools described patchy implementation of the SFS, acknowledging that some standards were difficult to adhere to, especially at breakfast/breaktime. Staff described balancing SFS compliance with conflicting priorities around maintaining viable levels of school food uptake, cost/profit and pupil preferences. Drivers of pupils' food choices included convenience, speed, perceived value for money and taste. Some pupils felt that these were not met by school food and described negative lunchtime experiences, which discouraged a sit-down meal and influenced their eating behaviours. Some school staff felt that their influence on pupils' food choices was limited, acknowledging difficult social and environmental contexts. School staff/governors had a low awareness of the SFP and generally were not taking steps to implement it. The time dedicated to healthy eating in relevant lessons was perceived to be low, despite staff acknowledging its

importance, while pupils felt that healthy-eating education was sporadic. In general, governors reported minimal oversight of school food and SFS compliance.

Conclusions

Our findings suggest that the current SFS are difficult to comply with in a secondary school context, partly due to the style of food provision (e.g. extensive provision at breakfast/breaktime) and the need to provide foods and drinks to meet the pupils' demands to ensure school food uptake and financial viability. There is currently a lack of oversight and monitoring of SFS compliance within schools.

Our findings also indicate that the SFP has not achieved the desired outcomes in the secondary school setting, which suggests that a different approach may be needed to better support secondary schools in cultivating a healthy-eating culture. Finally, our findings suggest that even when the SFS are relatively well implemented, this may have no beneficial effect on the nutritional intake of pupils or may even lead to marginally worse nutritional intake. Schools need to be considered as only one part of the food system that influences adolescents' dietary intake, and it is important to address other aspects of this system to substantially influence nutritional intake in this age group.

A key focus for future research is to develop alternative models of healthy food provision that better meet the needs of secondary school pupils and to better understand how to situate the food and healthy-eating agenda in secondary schools.

Trial registration

This trial is registered as ISRCTN68757496.

Funding

This award was funded by the National Institute for Health and Care Research (NIHR) Public Health Research programme (NIHR award ref: 17/92/39) and is published in full in *Public Health Research*; Vol. 12, No. 12. See the NIHR Funding and Awards website for further award information.

Public Health Research

ISSN 2050-439X (Online)

A list of Journals Library editors can be found on the NIHR Journals Library website

Public Health Research (PHR) was launched in 2013 and is indexed by Europe PMC, NCBI Bookshelf, DOAJ, INAHTA, Ulrichsweb™ (ProQuest LLC, Ann Arbor, MI, USA) and MEDLINE.

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: journals.library@nihr.ac.uk

The full PHR archive is freely available to view online at www.journalslibrary.nihr.ac.uk/phr.

Criteria for inclusion in the *Public Health Research* journal

Manuscripts are published in *Public Health Research* (PHR) if (1) they have resulted from work for the PHR programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

Reviews in *Public Health Research* are termed 'systematic' when the account of the search appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

PHR programme

The Public Health Research (PHR) programme, part of the National Institute for Health and Care Research (NIHR), is the leading UK funder of public health research, evaluating public health interventions, providing new knowledge on the benefits, costs, acceptability and wider impacts of non-NHS interventions intended to improve the health of the public and reduce inequalities in health. The scope of the programme is multi-disciplinary and broad, covering a range of interventions that improve public health.

For more information about the PHR programme please visit the website: https://www.nihr.ac.uk/explore-nihr/funding-programmes/public-health-research.htm

This article

The research reported in this issue of the journal was funded by the PHR programme as award number 17/92/39. The contractual start date was in March 2019. The draft manuscript began editorial review in November 2022 and was accepted for publication in October 2023. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The PHR editors and production house have tried to ensure the accuracy of the authors' manuscript and would like to thank the reviewers for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this article.

This article presents independent research funded by the National Institute for Health and Care Research (NIHR). The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, the PHR programme or the Department of Health and Social Care. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, the PHR programme or the Department of Health and Social Care.

This article was published based on current knowledge at the time and date of publication. NIHR is committed to being inclusive and will continually monitor best practice and guidance in relation to terminology and language to ensure that we remain relevant to our stakeholders.

Published by the NIHR Journals Library (www.journalslibrary.nihr.ac.uk), produced by Newgen Digitalworks Pvt Ltd, Chennai, India (www.newgen.co).