ISER
INSTITUTE FOR SOCIAL & ECONOMIC RESEARCH

Impact of the Universal Infant Free School Meal policy

Dr Angus Holford and Dr Birgitta Rabe
Institute for Social and Economic Research, University of Essex

MiSoC ESRC Research Centre on Micro-Social Change

University of Essex

Nuffield Foundation

UKRI Economic and Social Research Council

www.iser.essex.ac.uk

Contents

Summary

From September 2014, all infants in state-funded schools in England (comprising Reception, Year 1 and Year 2) have been entitled to receive a free school meal under the Universal Infant Free School Meals (UIFSM) policy.

The policy aims to improve children's educational attainment, social skills and behaviour; ensure children have access to a healthy meal each day and develop long-term healthy eating habits; help families with the cost of living, and remove disincentives to work. At a running cost of around £400 per pupil/year, plus £175m of capital spending in the first three years, this policy is a sizeable investment into children, and it is important to know whether it has delivered its aims.

Free school meals have been available to children from low-income families receiving qualifying benefits since after World War II. In recent years around 16% of infants in state-funded schools were registered to receive these. Since 2011, schools have received additional 'pupil premium' funding, currently £1,320 per year, for each child registered for means-tested Free School Meals (FSM).[1] Universal Infant Free School Meals (UIFSM), making free meals available to all children in infant year-groups, were introduced in 2014, though pupil premium payments have continued to be tied to children being registered as entitled for means-tested FSM.

Universal and means-tested free school meals have been a live policy issue for several years and continue to be at the centre of public debate. In their 2019 election manifestos the Conservative party promised to maintain their commitment to the UIFSM programme, while Labour and the Liberal Democrats promised to extend it to all primary school pupils, and means-tested FSM to all secondary-school pupils whose families receive Universal Credit. The COVID-19 pandemic has highlighted the role of school meals in preventing hunger and hardship for the poorest children, prompting the Government to fund £15/week supermarket vouchers throughout the May half term and summer holidays for children registered for means-tested free meals (Crawford et al., 2020). The UIFSM programme however was halted for children who did not attend school during the partial school closures between March and July 2020.

To inform the public debate on free school meals, this project offers the first evaluation of the UIFSM policy. We use administrative data to provide evidence on the impact of UIFSM implemented in England on take-up of meals, registration for FSM, bodyweight, school attendance, educational performance and food expenditure.

Data

We use a variety of existing secondary data sources appropriate to the outcomes being studied:

- For **take-up of school meals**, we combine individual and school-level Schools Census data with local authority (LA) and survey datasets from the period before UIFSM was introduced.
- For **household expenditure** we use the UK Household Longitudinal Study (UKHLS), also known as *Understanding Society*.
- For **registration for FSM** we use individual data in the National Pupil Database.
- For **children's bodyweights** we use school-level data from the National Child Measurement Programme (NCMP) combined with some school-level information from Department for Education's 'Schools, Pupils and their Characteristics' releases.
- For **attendance or absences** (for health and other reasons) we use individual data on counts of absences by reason, from the National Pupil Database published by the Department for Education.
- For **attainment and educational development** we use individual data on performance in the National Pupil Database Early Years Foundation Stage Profile (EYFSP) and Key Stage 1 (KS1) assessments.

Methods

- Our analysis of **take-up of school meals** and **registration for FSM** is primarily graphical and descriptive, benchmarking these figures for UIFSM cohorts against those of older cohorts.
- To assess the impact of UIFSM on **household food expenditure** we use a 'difference-in-difference' model which compares how household food expenditure changes before and after UIFSM were introduced, between households who do and do not have a child of the eligible age-group.
- To assess the impact of UIFSM on **bodyweight outcomes** we exploit the fact that the NCMP measures children throughout the school year, and that if UIFSM alters children's dietary intake we should expect a dose-response relationship: UIFSM children measured right at the start of the school year (zero school meals provided) should not show different outcomes to those never exposed to UIFSM, while those visited later (after progressively more school meals) should show diverging bodyweight outcomes between cohorts that were and were not exposed to the policy. We compare the change in children's bodyweight over the school year before and

1 Schools also receive a pupil premium allocation for children currently or recently in local authority (LA) care or adopted from care, and service children.

after UIFSM introduction in a 'difference-in-difference' approach.

- To assess the impact of UIFSM on **attendance and absence** we compare infant year-group children (exposed to UIFSM) with junior year-group children (not exposed to UIFSM). These can be described as treatment and control groups respeeightctively. We use a 'difference in difference' method, assuming that in the absence of the UIFSM policy, the infant and junior absence rates would have changed in parallel to each other.
- To assess the impact of UIFSM on **children's development and attainment** we attempted to compare not-FSM-registered children (newly entitled to a free school lunch) with FSM-registered children (always entitled to a free school lunch), intending to describe these as treatment and control groups respectively, and again using a 'difference in difference' method. However, evidence from elsewhere in this report shows that FSM-registered children do, in fact, benefit significantly from the UIFSM programme, making them unsuitable as a control group. We instead provide descriptive evidence on how the gap between FSM-registered and not-FSM-registered changed.
- Our results on bodyweight outcomes, attendance and absence, development and attainment, and expenditure are all 'intention to treat' estimates, meaning the average effect of being entitled to a universal infant free school meal. This does not distinguish between effects on those actually taking up a school meal and not.
- To assess the impact of take-up of school meals on development/attainment, we compare children taking and not taking their entitled universal school meal within the same cohort at the same school, controlling for other demographic characteristics.

Main results

Take-up of school meals

- Take-up of school meals by not FSM-registered pupils rose from a consistent 30-35% in the eight years preceding the policy to approximately 85% in the UIFSM period (a 50 percentage point increase), and for FSM-registered pupils (for whom there was no change in the financial incentive to take a school lunch) from about 84% to 87%.
- Providing UIFSM to infant pupils (in Reception, Year 1 and Year 2) has reduced take-up of means-tested free school meals among FSM-registered juniors (in Years 3-6) in the same primary schools relative to FSM-registered juniors in schools with no infants.
- UIFSM has resulted in some parents entitled to register their child for (means-tested) FSM and pupil premium not doing so: registration rates for infant pupils are about 1.2 percentage points lower than should be expected.

Household food expenditure

- Having a child become entitled to UIFSM results in a saving on food expenditure among not-FSM-registered households, of approximately £20 per month in total for a household with two adults and two children. This suggests the policy has to some extent helped families with the costs of living.

Children's bodyweight

- Making high quality school meals free on a universal basis reduces children's bodyweight throughout the first year of school, reducing the proportion obese (by 0.7 percentage points from a base of just under 10%) and bringing more children into the healthy range (by 1.1 percentage points from a base of 76%).
- Benefits accrue to children in schools with a wide range of student intakes (measured as the proportion of students registered for FSM), apart from in the schools with the most and least affluent student body.

Absences from school

- UIFSM improved absence rates for FSM-registered infants. The effect size is equivalent to missing 1.2 fewer whole days at school over the academic year in total. About 60% of this effect is accounted for by reduced absences for illness or medical appointments. Changes in absence rates for infants not registered for means-tested FSM are negligible, suggesting that the policy has reduced inequalities in absences between children from lower and higher income backgrounds.

Attainment

- At age 5, the performance of the always-eligible FSM-registered group appears to have improved since UIFSM by more than their newly eligible not-FSM-registered peers, closing the gap between these groups by around 4%. The opposite is true at age 7, with the gap widening by between 5 and 10% since UIFSM was introduced, equivalent to the not-FSM-registered making two weeks' more progress. Given that we find beneficial effects on absences and take-up of school meals for the always-eligible 'control group', we do not interpret these effects on attainment as causal effects of the UIFSM policy.
- Among those entitled to UIFSM, children who actually take up the available free school lunch have stronger educational performance at both age 5 and age 7.

Implications for policy and practice

- Given current estimates of the direct healthcare and productivity costs of obesity, the policy's impacts in reducing obesity would, under assumptions detailed in this report, make it cost effective if evaluated as investment spending on the future health and productivity of the country. This suggests that UIFSM should be maintained, and possibly extended.
- Our analysis suggests that high school food standards are responsible for the beneficial impact of UIFSM on children's bodyweight. This highlights the importance of retaining the current standards. To enable continued compliance an increase in the per-meal revenue funding in line with the Full Economic Costs of providing school meals (in the region of £2.50 per meal) may be required.
- Reduced registration for FSM has contributed to schools missing out on pupil premium payments intended to support the educational attainment of disadvantaged students, to the tune of £2000 per school on average. DWP JobCentres, responsible for the administration of Universal Credit, should be enabled to share data on parents with children entitled to FSM directly with schools.
- Enabling continued high take-up of school lunches among both FSM-registered and not-FSM-registered pupils throughout primary school will be key to embedding the short-term benefits of the scheme and/or take-up, observed for obesity, absences, and attainment. Possible strategies include:
  - Efforts to maintain and create an attractive and social school dining environment. This may entail expanded use of staggered lunchtimes and improvements or enlargements of kitchen and dining spaces.
  - Emphasis of school meals as 'healthy' rather than free, and an integral part of the school day.
- UIFSM were not delivered to children who were prevented from attending school during the months of COVID lockdown. It is important that efforts to encourage take-up and adherence to school food standards are maintained as schools reopen. Switching to 'takeaway style' lunches or restricting access to school meals because of capacity constraints would undo the good work achieved in improving children's nutritional intakes, and making school lunchtimes more attractive to all children. This has to be weighed against the requirements for social distancing.
- To establish the longer-term impacts of UIFSM, consistent and comprehensive data are required. In particular:
  - Collection of the National Child Measurement Programme, which was halted by COVID-related school closures, should resume in the 2020/21 academic year if appropriate infection-control protocols can be implemented and the health and wellbeing of children protected.
  - Data on take-up of school meals should routinely be collected and published by the Department for Education separately for infant and junior school students, and within each of these age-groups separately for FSM-registered and not-FSM-registered pupils. At present, school-level take-up statistics are available on all infants, and on all FSM-eligible children. They do not differentiate take-up among infants by FSM-registration status, and do not differentiate take-up among FSM-eligible children by infant/junior status. Individual-level Census data do not include school lunch take-up for any non-infants.

Full report: The impact of the Universal Infant Free School Meal policy

1 Introduction

From September 2014 all infants in state-funded schools in England (comprising Reception, Year 1 and Year 2) have been entitled to receive a free school meal under the Universal Infant Free School Meals (UIFSM) policy. Before this, only children living in families claiming means-tested benefits were entitled to register for means-tested free school meals (FSM). The provision of UIFSM was cancelled for most children during school closures in reaction to the COVID-19 pandemic but has resumed as schools reopened. The policy aims to improve children's educational attainment, social skills and behaviour; ensure children have access to a healthy meal each day and develop long-term healthy eating habits; help families with the cost of living; and remove disincentives to work. At a running cost of around £400 per pupil/year, this policy is a sizeable investment into children, and it is important to know whether it has delivered its aims.

The most important evidence in support of the UIFSM policy came from the evaluation of a UIFSM pilot, run in three local authorities in academic years 2009/10 and 2010/11 (Brown et al., 2012). The report showed considerable effects of offering free school meals on take-up and on educational attainment at Key Stages 1 and 2, with pupils making between four and eight weeks' more progress when receiving free lunches. But there was little or no evidence that the policy had affected the type of food consumed (with the exception of crisps), attendance or children's Body Mass Index. The authors warned, however, that it was not clear that the positive outcomes of the pilot would be repeated in the roll out of UIFSM to all infant pupils across the country. This is because the pilot took place in two relatively deprived local authorities and the benefits might be lower in more affluent areas, and because the pilot included a host of supporting activities around awareness and encouragement of take-up. These are not included in the UIFSM policy, so the impact of offering universal free meals may be dampened. The authors also warn that results on Body Mass Index are based on small sample sizes.

Free school meals have been a live policy issue for some years and continue to be at the centre of public debate. In their 2019 election manifestos the Conservative party promised to maintain their commitment to the UIFSM programme, while Labour and the Liberal Democrats promised to extend it to all primary school pupils and to all secondary-school pupils whose families receive Universal Credit[2]. These pledges are mainly based on expected benefits for children's education and health. The COVID-19 pandemic has highlighted the role of school meals in preventing hunger and hardship for the poorest children, prompting the Government to fund £15/week supermarket vouchers throughout the May half term and summer holidays for FSM-registered children (Crawford et al., 2020; Sibieta and Cottell, 2020). This has sparked new discussions about meal provision during holidays beyond the current crisis, including to new groups of pupils such as migrant children with no recourse to public funds.

To inform the public debate on free school meals, this project offers the first evaluation of the UIFSM policy. We use administrative data to provide evidence on the impact of UIFSM implemented in England on take-up of meals, bodyweight, school attendance and educational development. In particular we describe how take-up of school meals has changed amongst newly eligible children and those who were already registered for means-tested free school meals. Further, we assess causal effects of UIFSM on children's bodyweight outcomes including BMI and overweight status, absences from school due to illness and medical appointments, children's development and learning at age 5 and educational performance at age 7.

2 Data and methods

Data

We use a variety of existing secondary data sources appropriate to the outcomes being studied. Data on pupils' **take-up of free meals** is somewhat patchy. Historically, take-up of school meals was only recorded for children eligible for free meals at school-level, based on take-up on a Census day in January of each year.[3] From the year of UIFSM implementation (academic year 2014/15) onwards, take-up of meals is collected individually for all children in infant schools on three Census days a year. For the pre-implementation years we can draw on several data sources to approximate the rates of children not eligible for free school meals having a school lunch. These include National Indicators used to monitor council performance which report school meal take-up for all children in primary school for financial years 2008/09 and 2009/10 by local authority (LA), as well as surveys conducted by the School Food Trust (SFT) for 2010/11 and 2011/12 which provide school meal take-up for all children in primary school at LA level, and a survey published by the Department for Education for 2013/14 which gives take-up rates by region, separately for children who are and are not eligible for free lunches. We also use data from the UK Household Longitudinal survey (UKHLS) to

2 Currently families receiving Universal Credit are only eligible for free school meals if they have net earnings below £7,400 a year. The IFS estimated that by the time Universal Credit is fully rolled out, this could cover around 40% of secondary students (Bourquin and Farqharson 2019).

3 To be *eligible* for means-tested FSM, the parent must meet the eligibility criteria and have *registered* their child for FSM. The terms 'FSM-registered' and 'FSM-eligible' are used interchangeably in this report.

investigate changes in **family's food expenditure** as a result of introducing UIFSM.

To assess the impact of UIFSM on children's **bodyweight** we draw on data from the National Child Measurement Programme (NCMP) which measures the height and weight of children in Reception class and Year 6 to assess overweight and obesity levels in children within primary schools. We focus on children in their Reception year at school (ages 4-5). Our school-level data for all 16,000 primary schools in England covers academic years 2008/09-2017/18 and includes the proportions of Reception children that are underweight, normal weight, overweight and obese in each school, as well as the average standardised Body Mass Index (BMI z-score), the date the school was visited for the height/weight measurement and basic school-level background characteristics including proportion female and proportion black ethnicity, plus quintiles of neighbourhood deprivation, of proportion of free school meal eligible children, of school meal take-up among FSM eligible children and, from academic year 2014/15, among all infant children.

To study children's **absences from school** we use records from the National Pupil Database (NPD) where counts of absences, by reason of absence, are reported at the individual pupil level. Roughly two thirds of absences in primary school are because of illness and medical appointments, and these will be used to proxy child health. We also use all absences, regardless of reason, as an outcome variable. We use data on all pupils in school Years 1-4 (aged 5-9) across a number of cohorts (between 2007/08 and 2017/18). Absence data is not available for Reception children.

To assess development and **educational attainment** of children we draw on the Early Years Foundation Stage Profile (EYFSP), collected in the National Pupil Database (NPD) for all pupils in English state schools at age 5, at the end of Reception year in primary school, and available from the Department for Education. We use the new EYFSP outcomes first introduced in the academic year 2012/13. These include assessments in 17 different areas of learning, from which we focus on a total point score, and on a threshold measure for reaching a 'good level of development'. We also draw on Key Stage 1 scores collected at age 7, differentiating between speaking and listening, reading, writing maths and science scores. The same criteria and measures were used from 2006/07 to the introduction of UIFSM, but fundamental changes in the National Curriculum and its assessments for 2015/16 mean we can only use data on one cohort exposed to the programme.

Methods

Using these data, we apply a number of methods to obtain our results. The analysis of meal take-up relies on a description of the available data. For the other outcomes we attempt causal analysis of the effects of the UIFSM. To study the impact of UIFSM on children's BMI throughout their Reception year in school, at age 4-5, we compare those exposed to the policy for different durations. We expect the impact of UIFSM to depend on the exposure to free meals, so that a greater effect should be observed for children at the end of the Reception year (after up to 190 meals) than for children just starting school for the first time. Here we can make use of the fact that the National Child Measurement Program visits primary schools throughout the school year to measure height and weight. For a school visited at the start of the school year in September there should be little difference in the BMI between cohorts of children entering reception in the years before UIFSM were introduced and those entering after (from 2014/15), while if exposure to UIFSM eligibility does affect this outcome, the difference should be progressively larger in a school visited in the spring term and in the summer term. We compare how bodyweight outcomes changed before and after UIFSM were introduced between schools visited early in the school year and those visited later in the year.

To assess the impact of UIFSM on children's absences from school we compare absences of children in Years 1 and 2 who are eligible for UIFSM with those of children in Years 3 and 4 who are not eligible (absence data for Reception children is not available). Using a 'difference-in-difference' approach we compare differences in absences before and after the policy was introduced between these treated and non-treated children.

We employ another difference-in-difference strategy to evaluate the impact of UIFSM on educational outcomes. This exploits the fact that only the situation of children who were not previously eligible for free school meals (FSMs) changed through the introduction of UIFSM, as FSM eligible children were already able to receive free lunches. This allows us to compare changes in outcomes for children who were newly eligible for FSMs under universal provision with those who were always eligible for FSMs, for whom the policy change made no difference to their eligibility for a free school meal.

Clearly, we expect the newly eligible group of pupils to be quite different from the always eligible group because of their differing socio-economic status. However, the comparison in how outcomes change over time for the two groups allows us to control for other factors that impact the outcome of interest across both groups. This method exploits data for the 'treatment' and 'control' group over a number of years before the introduction of the policy to be able to assess how changes in the outcomes differ between the two groups, to test whether both groups' outcomes follow parallel trends before the introduction of the policy, and adjust accordingly.

We also use a difference-in-difference model to evaluate the impact of UIFSM on food expenditure, with a 'household fixed effects' regression that measures the impact, within the same household, of a child moving into the eligible age group and time period for UIFSM, or equivalently but with the opposite direction of effect, moving out of this age group after receiving UIFSM for some period.

Details on the methods and on how our outcomes are measured are provided in the technical annex.

3 Results on take-up of free school meals and household food expenditure

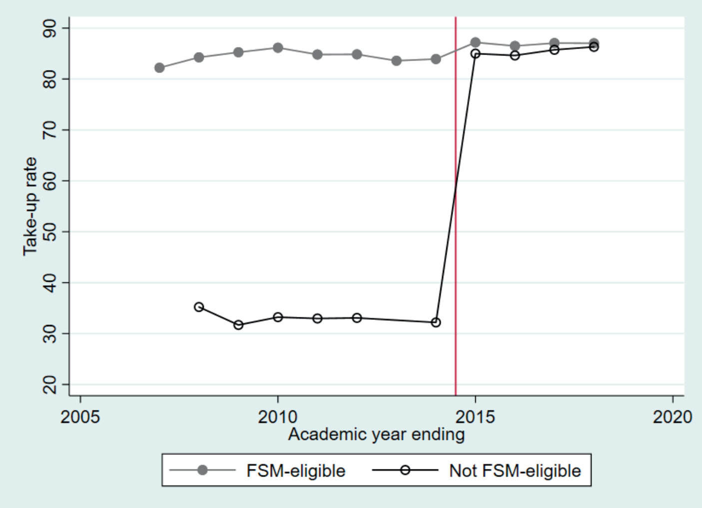
Traditionally, school food programmes use means-testing to target the children most in need of a free meal and to avoid the deadweight implied in subsidising meals for families who could afford to pay for them. This was the case in England, where children not meeting the criteria for FSM may purchase a school meal at cost (around £2.30 per meal).[4] In recent years there has been a move towards universal provision of free meals in several countries.

Making school meals universally available has been shown to address the potential stigma attached to receiving a free meal, and to send a signal that the school lunch is a desirable good, thereby raising participation amongst all students, not just those facing a change in price (Holford, 2015). We would therefore expect the take-up to rise among children who in the absence of the UIFSM scheme would not be eligible for a free meal, as well as a possible rise in take-up among eligible children for whom free meals become a more attractive option after being made universally available. In turn, we expect the UIFSM policy to reduce household food expenditure, because school meals are a substitute both for home-prepared packed lunches, and potentially for children's hot meals taken outside of school.

Take-up by FSM-eligible and not-FSM eligible children

Figure 1 compares take-up of free meals between children eligible and not eligible for means-tested FSM[5] for academic years 2006/2007 to 2017/2018. There are no consistent data on take-up for not eligible children in the pre-policy years, but there have been different surveys and LA-level data returns run over the years so that each data point is from a different source (see notes to the figure for details). In the pre-policy years take-up among not eligible children was just over 30%, documented across the different data sources. Once meals became free in academic year 2014/15 around 85% of children not previously eligible were eating them – an increase of more than 50 percentage points. This indicates that the cost of around £2.30 per meal was a sufficient disincentive to eating a school meal for a high proportion of families.

Figure 1 Take-up of school meals among free meal eligible and not eligible children



Notes Sources: FSM-eligible series 2007-2014 derived from 'Schools, pupils and their characteristics' and 2015-2018 from Spring School Census. Not FSM-eligible series: 2008-2010: 'National Indicators' from the Department for Communities and Local Government; 2011- 2012: School Food Trust take-up surveys; 2014: Department for Education take-up survey; Combining these figures for overall take-up by primary-age children at the LEA level, with the proportions FSM-eligible and the FSM-eligible take-up known from the 'Schools, pupils and their characteristics' series, enables the proportions of primary-age not-FSM eligible children taking school meals to be derived. 2015-2018 derived from Spring School Census, with take-up rate equal to the proportion of all not-FSM-eligible infant-age pupils taking a school lunch.

4 Free school meal eligibility is linked to parent's receipt of qualifying benefits and earnings thresholds.

5 Note that eligibility for free meals is still recorded post UIFSM introduction because school funding allocations depend on children's free school meal status, among other factors.

For children eligible for free meals the figure shows that take-up was about 84% in the pre-policy years and rose by around 3 percentage points to 87% in the first year UIFSM was introduced and remained stable in the next three years.[6] In summary, the UIFSM policy led a small proportion of previously eligible children to start eating school meals, whereas it increased the take-up among not eligible children considerably.

Household food expenditure

We use data from the UK Household Longitudinal Survey (waves 1-9, relating to 2009-2018) to investigate whether the change of take-up of school meals is reflected in families' lower expenditure on supermarket shopping for food and groceries and expenditure on eating out, outside the summer holidays. We assess how food expenditure has changed for families who have children in Reception, Year 1 and Year 2 in the household before and after the UIFSM policy was introduced, compared to families with children aged 0-11 who were not in these year groups. Table 1 shows the impact of UIFSM on monthly household expenditure, equivalised for household size (see the technical annex and the notes to the table for details on how these results were derived).

The table shows in column 1 that the introduction of UIFSM reduced both supermarket expenditure and expenditure for eating out across all families. Splitting the sample into families that would be eligible for FSM and those that would not, columns 2 and 3 show that the monthly savings are statistically significant for not eligible families only. This confirms the pattern we have seen in the take-up data: there was a significant shift in taking free meals among those previously not eligible to have them for free, and a small shift among those already eligible which did not lead to a saving in food shopping or eating out.

The estimated equivalised values can best be interpreted by looking at the savings in a typical family. In a household of two adults and two children that is not eligible for free meals, having one child exposed to UIFSM reduces total household supermarket shopping expenditure by £13.03 and eating out expenditure by £6.35 over four weeks.[7] This is a saving of about a pound per weekday across all families not eligible for FSM. Among the roughly 50% of children from these families who newly take up free meals as a result of the policy, the saving is about £2 per week day (compared to £2.30, the usual cost of a school meal).

Table 1 Effect of UIFSM on expenditure on supermarket food and on eating out

	Effect of UIFSM			Monthly saving of having an UIFSM eligible child in a two-parent, two-child family not eligible for FSM
	All families	Non-FSM-eligible	FSM-eligible	
	1	2	3	
Supermarket food	-5.731[A]	-6.207[A]	-3.152	£13.03
SE	(1.815)	(1.971)	(4.535)	
N	31,999	26,954	5,045	
Mean	165.60	169.63	143.92	
Eating out	-2.204[B]	-3.023[B]	2.546	£6.35
SE	(1.099)	(1.234)	(2.238)	
N	32,010	26,967	5,043	
Mean	41.40	44.11	25.24	
				£19.38 total saving

Notes [A]Statistical significance at the 1% level. [B]Statistical significance at the 5% level. 'SE' are standard errors, in parentheses. Data source: UKHLS waves 1-9. Sample of families with any children aged 0-11 interviewed outside the summer holidays. Estimated treatment effect of exposure to UIFSM September 2014 onwards, relative to pre-UIFSM period. Treatment is the number of UIFSM-eligible children in the family. Outcome is 2015 real expenditure for supermarket shopping (food and groceries) and eating out, equivalised for household size. Estimates derived from a difference-in-difference regression with year and month fixed effects, controlling for urban/rural, household tenure, age of youngest child, number of lone parents in household, nine dummies for household composition, number of household members in work. FSM status of children is derived by applying the FSM eligibility criteria to parent's survey information on receipt of benefits.

6 The data are somewhat noisy as we have take-up rates among all free meal eligible students in the school for the years before the UIFSM policy was introduced (spanning Reception year to Year 6 in most schools) and among eligible students in the first three years of schooling for the post-UIFSM years. This should give a correct picture if take-up patterns do not vary across primary school years. We checked and confirm that patterns are similar when restricting the sample to infant schools.

7 The estimated coefficient of 6.207 is multiplied by 2.1, giving a weight of one to the first adult in the household, 0.5 to the additional adult household member and 0.3 to each child.

Take-up among FSM-eligible children by school types

Next we ask whether the small increase in FSM-eligible children taking free meals after UIFSM was introduced could be related to removing the stigma sometimes attached to having means-tested free meals by making them universally available. This is often stated as a possible benefit of a universal meal scheme in the literature (Bartfield, 2020; Holford, 2015) and would be expected to be most potent in settings where only few students take free meals. We investigate this by looking at how take-up among FSM-eligible children developed depending on the proportion of children eligible for free meals within the school. To this end, we split the sample of schools into five groups of equal size ('quintiles') according to the proportion of children that were FSM-eligible in the academic year-ending 2014.

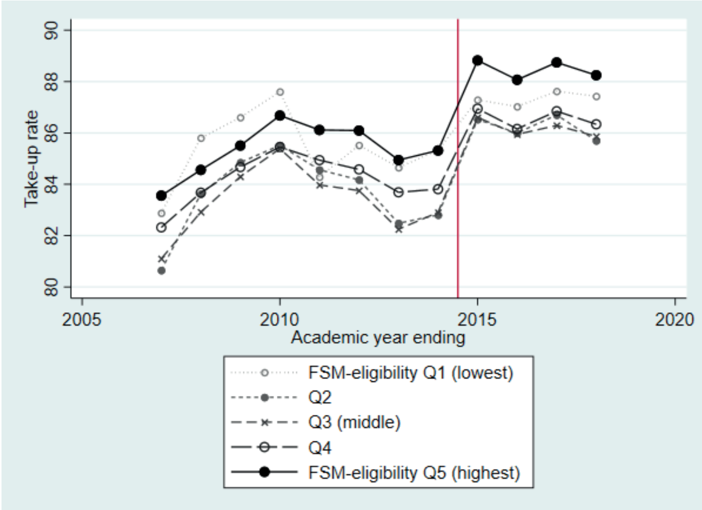
Figure 2 shows that both in the pre- and post-policy years there is no clear pattern as to whether take-up is higher in schools with higher or lower proportions of children on free meals. Moreover, the change in take-up is very similar between the different schools. The expectation that stigma effects might be higher in schools where few children take free meals is not reflected in differential take-up rates or differential changes in take-up rates.

Figure 3 instead plots take-up among free school meal eligible pupils across whole schools, separately by the age-range of each school's intake. While schools with only infant pupils, or just infant and nursery pupils, saw a significant spike in the academic year-ending 2015 when UIFSM were introduced, with take-up holding up well in subsequent years, for schools with juniors as well as infants, whole-school take-up of FSM among FSM-eligible pupils has fallen by around 4 percentage points since the year-ending 2016. In contrast, take-up among juniors in junior-only schools fell by only 2 percentage points in the same period, despite a somewhat faster downward trend previously. This graph strongly suggests that UIFSM is crowding out participation in FSM among non-infants eligible for it. This is most likely due to capacity constraints and waiting times in an environment in which many more infants are participating in school meals than previously, but in which the non-FSM-eligible peers of these junior children are no longer entitled to a free meal. This drop-off in take-up presents a threat to the benefits of UIFSM, particularly on obesity (see chapter 4) persisting even in the medium term. This makes a case for the extension of Universal FSM to all primary school children. The estimated cost of such an expansion is around £850m per year (Bourquin and Farqharson, 2019) and this would have to be accompanied by considerable investment and innovation in provision.

Registration for means-tested free school meals

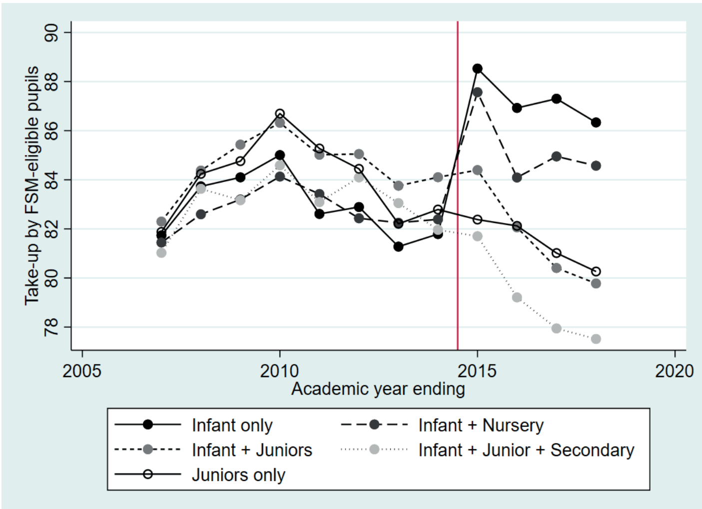
It also seems likely that UIFSM will have reduced rates of registration for means-tested or benefits-related FSM, because

Figure 2 Take-up of school meals among free meal eligible children, by school-level eligibility quintiles



Notes Sources: Academic years ending 2007-2014: School level 'Schools, pupils and their characteristics' data issued by Department for Education, with take-up rates weighted by the number of FSM-eligible primary school aged children. 2015-2018: Spring School Census, with take-up rate equal to the proportion of all FSM-eligible infant-age pupils taking a school lunch. School FSM-eligibility quintile is fixed over time, based on registration rates for the academic year-ending 2014.

Figure 3 Whole-school take-up of school meals among free meal eligible children, by school type



Note Sources: Academic years ending 2007-2018: School level 'Schools, pupils and their characteristics' data issued by Department for Education.

in the presence of UIFSM there is no direct financial incentive for parents to do so. This matters since registering as receiving the qualifying benefits is required to unlock pupil premium payments to the school, and other benefits, such as subsidised school transport.

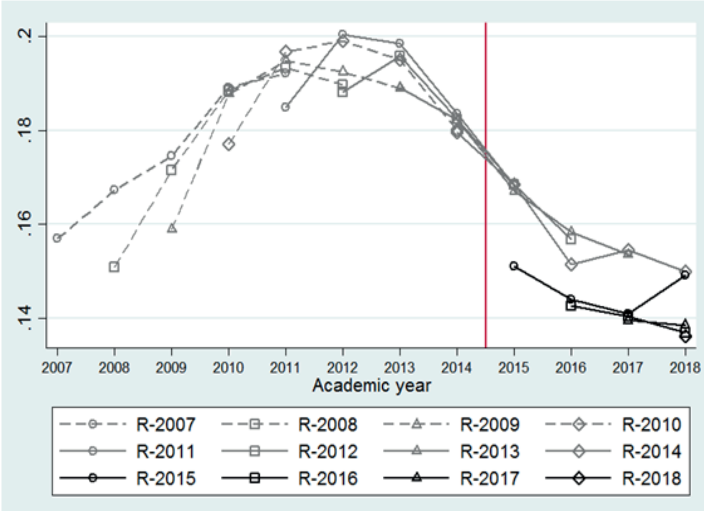
In Figure 4, we plot population FSM-eligibility rates by cohort of entry: 'R-2007' shows the cohort that was in Reception in the academic-year ending 2007, 'R-2008' that starting school in the year-ending 2008, etc; with the first dot of each series representing school Year 1, following through to school Year 4. We indeed see a decline in FSM-registration in 2015 and 2016, but this was common, and at very similar levels, for all students who had already started school in 2014 or earlier, i.e. including those already in school Years 3 and 4 in 2015, and unaffected by the policy. However, those starting school in 2015 onwards are registered for FSM at a rate of around 1.2 percentage points lower while in Years 1-2 than their older peers. The uptick for the 2015-entry cohort in 2018, once they lose eligibility for UIFSM, is supportive of the direct financial incentive to register playing some part.

The link between means-tested FSM status and pupil premium which target the educational attainment of children from disadvantaged backgrounds is a mechanism through which UIFSM could have reduced the resources available to schools. Even assuming that all parents whose children are entitled to means-tested FSM do register them once their UIFSM entitlement ends, if we benchmark the FSM-registration rates of infants in 2018 against their older peers in Year 4 (who were never entitled to UIFSM), then on average primary schools are losing just over £2000 of pupil premium funding each, or £32m in total, as a result of UIFSM. This makes a strong case for auto-enrolment of pupils for entitlement to pupil premium, for example by enabling DWP JobCentres to share data on Universal Credit access by parents directly with schools. Alternatively, this could represent a benchmark against which schools or LEAs could conduct a cost-benefit analysis, to determine whether regular checks of FSM eligibility among all their pupils could be cost-effective.[8]

4 Results on obesity

Childhood overweight and obesity is one of the most serious worldwide public health problems, known to have serious implications for children's health which carry on into adulthood and cause significant healthcare and indirect productivity costs. Addressing the determinants of childhood obesity is therefore a policy priority for many governments worldwide. Because children consume a large fraction of their

Figure 4 Rates of registration for FSMs by cohort and academic year



Note Source: National Pupil Database, Spring School Census. Population data.

8 14.99% of Year 4 pupils were FSM-registered in 2017/18, compared with 13.77% of Years 1 and 2, a gap of 1.22%. Calculation based on a mean cohort size of 42 pupils (126 infants) and pupil premium of £1320 per eligible pupil, across 15,782 schools.

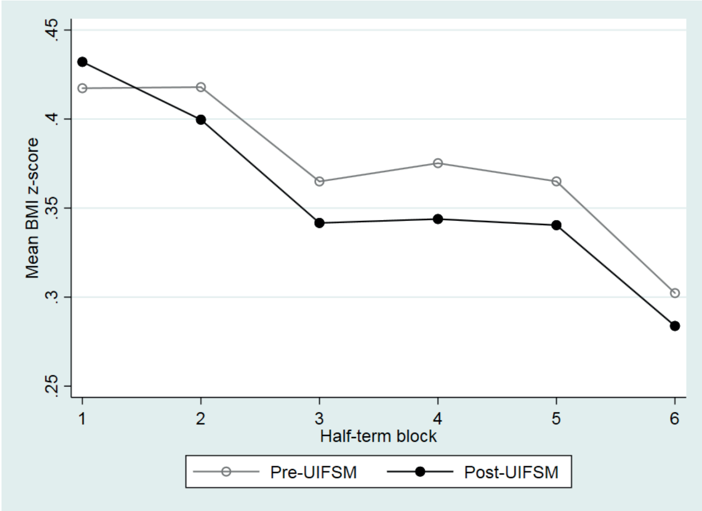
food energy at school, school meal provision is an obvious policy lever to increase rates of healthy weight among children (Davies, 2019).

Most of the existing evidence on the effect of free school lunches on bodyweight outcomes suggests that these raise the prevalence of obesity. This includes studies based on marginal recipients of the United States' National School Lunch and School Breakfast Programmes (Frisvold, 2015; Hinrichs, 2010; Dunifon and Kowaleski-Jones, 2004; Schanzenbach, 2009; Millimet et al., 2010). For the UK, von Hinke Kessler Scholder (2013) shows no effects of means-tested free school meal provision on child bodyweight outcomes in the 1980s. However, the context in which this evidence-base was collected is very different to the current UIFSM environment, both because it does not evaluate systems with universal entitlement, and because the nutritional standards for school meals like those currently imposed in England were either laxer or non-existent.

With free school meals introduced in many countries after the Second World War to combat food insecurity and malnutrition, standards that ensure children receive nutritious and healthy meals have only been introduced and improved relatively recently across several countries. In England, from September 2008, school meals were required to comply with both food-based standards, determining portion sizes and the frequency with which different types of food may be served; and with nutrient-based standards, which specify maximum and minimum levels of intake of different nutrients, averaged over a three-week period and maximum calorie intake (about 530 calories per meal, see Spence et al., 2013, 2014). In January 2015, updated food-based standards came into force, which were designed to embed the existing nutrient-based standards and make it easier for caterers to understand whether they comply (Department for Education, 2014). Compliance with these standards must be specified in each school or local education authority's (LEA's) contract with their catering, who must provide evidence that their menus meet the requirements (Department for Education, 2019a). Moreover, the Department for Education provides a range of resources to help school principals and governing bodies monitor compliance with the standards (Department for Education, 2019b).

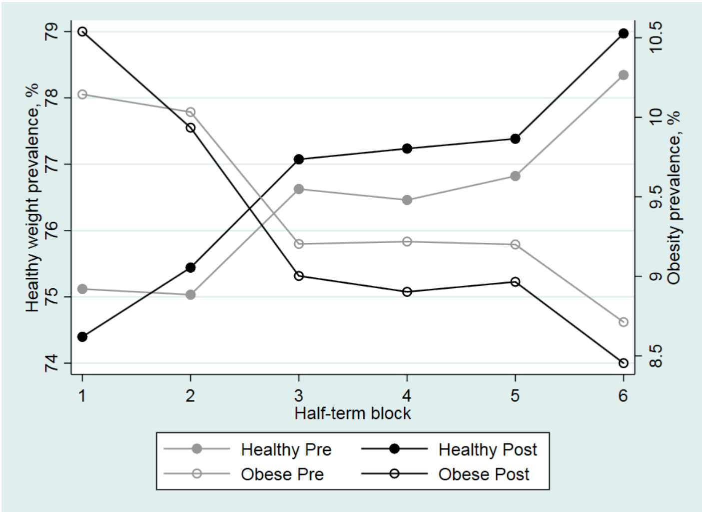
Students opting not to have a school meal may bring a packed lunch from home. These lunches are not required to comply with school food standards, though individual schools may implement their own restrictions on what children are allowed to bring. The content of packed lunches, being the counterfactual to school meal consumption for those induced to switch by the UIFSM policy, are an important determinant of the effect of UIFSM on bodyweight outcomes. While a school lunch complying with the standards should average 530

Figure 5 Trends in BMI z-score over the school year, and pre- and post-UIFSM



Note Data source: National Child Measurement Programme. Unweighted means of within-school mean BMI z-score (accounting for age and sex of children measured) for schools measured in each half-term block, by pre- (academic years ending 2009-2014) and post- (academic years ending 2015-2018) UIFSM.

Figure 6 Trends in healthy weight and obesity over the school year, and pre- and post-UIFSM



Note Data source: National Child Measurement Programme. Unweighted means of within-school proportions healthy weight and obese (accounting for age and sex of children measured) for schools measured in each half-term block, by pre- (academic years ending 2009-2014) and post- (academic years ending 2015-2018) UIFSM.

calories per day, the audit study by Evans et al. (2018) found 89% of packed lunches to exceed this level, averaging 624 calories, and only 1% of packed lunches meeting food school standards in terms of energy and nutrients.[9]

Our prior expectation is therefore that, other things equal, we would expect a reduction in children's bodyweight outcomes as a result of the UIFSM policy. In particular, we expect the impact of UIFSM to depend on the 'dose' of free meals received, so that a greater effect should be observed for children at the end of the first year in school (after up to 190 meals) than for children just starting school for the first time.

Descriptive evidence

Figures 5 and 6 plot children's weight status derived from school-level height and weight measurements taken at the NCMP visit by the time of the school visit. We divide this into six half-term blocks of the school year, where each term of the school year (autumn, spring and summer) is split in two by half-term breaks in October, February and May. We compare children's BMI z-score, obesity rates and normal weight rates between children weighed and measured in school in the years before and after UIFSM was implemented.

Figure 5 (on page 12) shows that when Reception children first start school, in the first half-term block starting in September, those measured in the pre-policy years have a BMI z-score that is slightly lower than those measured in the years after UIFSM were implemented. This reflects the trend that children are becoming heavier over time.[10] From the second half-term block onwards children weighed and measured in the post-UIFSM years begin to have a lower BMI z-score than children did before UIFSM were introduced. Figure 6 (on page 12) shows a similar relationship for obesity prevalence which is lower for children post- than pre policy from the second half-term onwards. Normal weight prevalence moves in the opposite direction, being more common for children receiving universal free meals in Reception than for those who did not.

Estimation results

This descriptive evidence indicates that providing universal free meals to Reception children may positively impact children's weight status. We proceed to test this by estimating a difference-in-difference model which compares the change in bodyweight outcomes before and after UIFSM were introduced between schools visited early in the school year and those visited later in the year, by half-term block. We enter a range of variables in the regression which control for other policies active in the same time-period, time trends, shifts in students' characteristics and school-specific factors (see the technical annex and notes to Figure 7 for details).[11]

Figure 7 (on page 14) presents the estimated treatment effects of UIFSM on our three bodyweight outcomes with 95% confidence intervals. As expected, in the first half-term of the school year when there has been little exposure to UIFSM, there is no statistically significant treatment effect of UIFSM on bodyweight outcomes. For every later half-term, UIFSM has a beneficial effect on bodyweight (positive for healthy weight, negative for obese and BMI z-score) which for all cases is statistically significant at the 1% level.

The figure reveals a pattern in the effects across half-term blocks, in which the treatment effect is smaller in the first half-term block of each term (i.e. those beginning September, January and Easter) than in the corresponding second half-term block of each term (November, March and June). The second half-term blocks of each term follow short, one-week holidays, whereas the first half-term blocks follow holidays of at least two week length. Though these differences are not statistically significant, this seems to suggest that there is some reversion in holidays, and a benefit from longer or less interrupted exposure to UIFSM. Further research would be needed into whether an expansion of food vouchers during holidays, as provided to FSM-eligible families in the summer of 2020, would help maintain the healthier bodyweights resulting from UIFSM. Our finding does support the provision of summer holiday play schemes, with food provided, as an important component of an anti-obesity strategy.

The size of the treatment effect does not get significantly larger after the second half-term block in November for the remainder of the school year. This suggests that while the differential between children's calorie intake and expenditure is initially negatively affected by UIFSM, they reach a new steady state fairly quickly. The estimated effects show that by the end of the school year (190 school days), on average a child exposed to UIFSM is 1.1 percentage points more likely to be of 'healthy weight' (relative to a pre-policy average of 76%), 0.7 percentage points less likely to be obese (relative to a pre-policy average of 9.4%), and has body mass index (BMI) that is 4.1% of a standard deviation lower than a child not exposed to the policy (relative to a pre-policy average that is 37% of a standard deviation above the 1990 average). To put this into context, a 4.1% standard deviation reduction in BMI z-score

9 Moreover, one-third of packed lunches surveyed contained a sweet snack, processed savoury snack and sweetened drink.

10 The BMI z-score was scaled at zero in 1990. The figure shows that children averaged over the years 2009-2018 start school weighing about 0.4 standard deviations more than same-age children did in 1990.

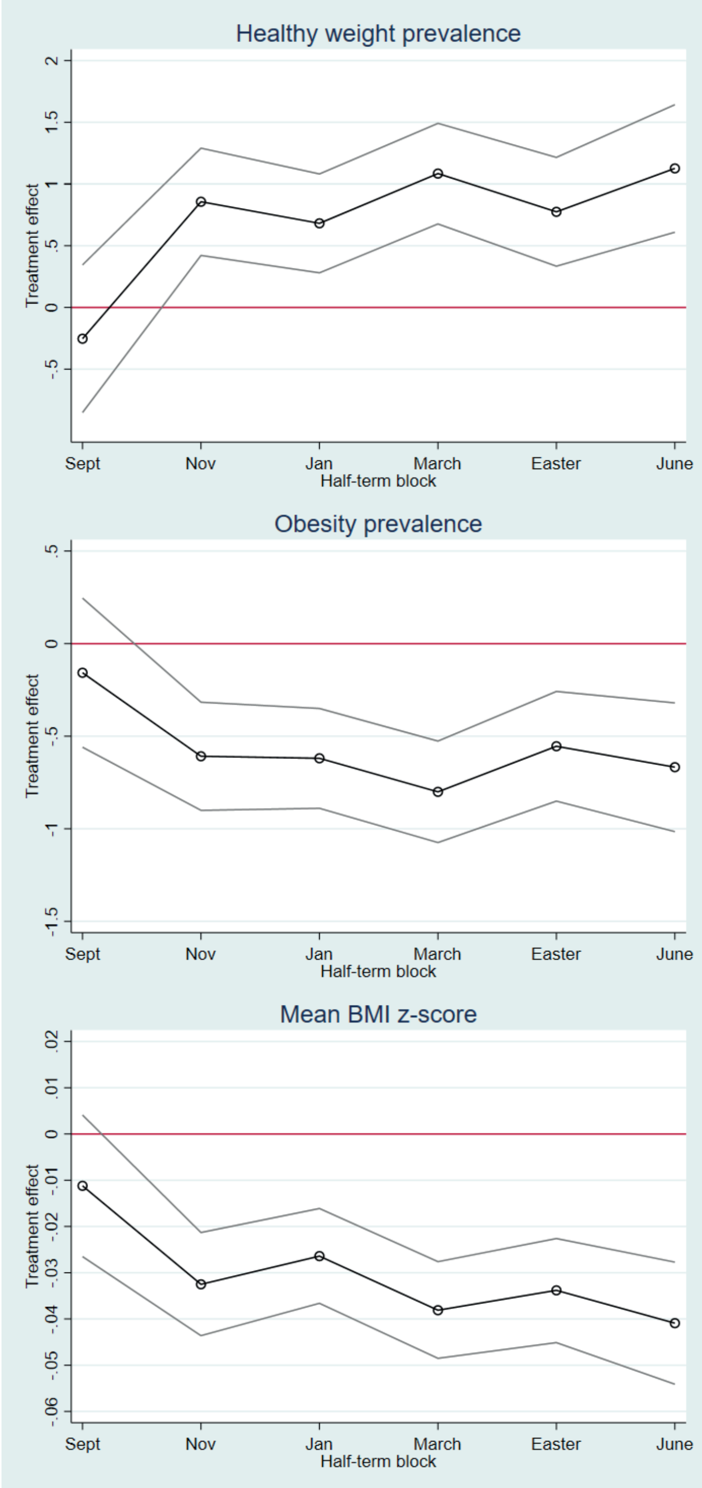
11 We implemented additional checks, including dropping post-treatment years of analysis (which suggests that treatment effects have become stronger over time), including a placebo test timed to align with both the transfer of responsibility for measurement visits from Primary Care Trusts to LEAs and the introduction of the sports premium (which did not reveal a pattern consistent with a treatment effect of the policy).

corresponds to about 63g of absolute weight change for boys and 73g for girls of this age.[12]

The estimated effect of making school meals free for all children (in Reception) is a so-called intention-to-treat effect, meaning that it is the impact across all children, regardless of whether they were moved by the policy to have a school lunch or not. We can use the changes in take-up rates shown in the previous section to roughly calculate the effect of a free lunch on those taking it up as a result of the policy. Take-up increased by roughly 40% across all children (FSM eligible and not eligible children taken together). Dividing our estimates shown in Figure 7 by 0.4 would indicate that among children taking school meals because of UIFSM the policy increased the likelihood to be of healthy weight by 3 percentage points (3.9%), reduced the likelihood to be obese by 1.8 percentage points (19%) and reduced the average BMI by 10.8% of a standard deviation by the end of the first year in school among treated children. These effects are considerable.

They also compare favourably with other bodyweight reduction interventions that have been trialled in the UK. For example, an education-based intervention involving 16 lessons on healthy eating, physical activities and reducing sedentary activities had no effect on BMI (Kipping et al., 2008).[13] Similarly, a physical activity program in Scotland comprising 3x30 minutes of high-intensity physical activity per week for 24 weeks for 4-year-olds found no overall reduction in BMI (Reilly et al., 2006). The 'Daily Mile', which entails primary school children walking or running outside for 15 minutes each day improved physical fitness and reduced body fat proportion but reduced BMI by only 0.8% of a standard deviation over the course of an academic year (not statistically significant), so it appears to generate benefits of at most 20% the size of UIFSM (Chesham et al., 2018). In summary, and considering how difficult it is to affect children's bodyweight through policy interventions, the impact of UIFSM on children's bodyweight is considerable. It is not, however, a panacea:

Figure 7 Treatment effects of UIFSM by half-term block



Notes Data source: National Child Measurement Programme. Estimated treatment effect of exposure to UIFSM (academic years ending 2015-2018, relative to pre-UIFSM period 2009-2014). Derived from school fixed effect regression controlling for exposure to UIFSM pilot schemes, pupil premium and sport premium exposure, proportion measured black (and missing indicator), proportion measured girls, year entered linearly, squared and cubed and interacted with IDACI quintile as well as proportion black and girls and half-term block dummies interacted with proportion black and girls.

12 Our measure of BMI is provided as the mean 'z-score' (i.e. standard deviations from the mean) with respect to the British 1990 Growth Reference Charts. The coefficient of variation (in percentage points) at age five-and-a-half for these charts is 7.6 for boys and 9.25 for girls, for a mean BMI of 15.5kg/m^2 (Cole et al, 1995). This implies standard deviations $\sigma_{boy} = 0.076 \times 15.5 = 1.178$kg/m^2 and $\sigma_{girl} = 0.0925 \times 15.5 = 1.43375 kg/m^2$. At heights of 113.1cm for boys and 111.8cm for girls, this means a one-standard deviation change in BMI corresponds to the following change in weight, $\Delta W_{boy} = 1.178 \times 1.131^2 = 1.507$kg and $\Delta W_{girl} = 1.43375 \times 1.118^2 = 1.792 kg$. This means that 1% of a standard deviation change in BMI, or a change in the BMI z-score of 0.01, corresponds approximately to a change in weight of 15g for boys and 18g for girls.

13 Better results were found for the Healthy Schools Network scheme in Denmark, involving schools sharing best practice over health and physical educations and a measurement program. This achieved a 0.010-0.015 s.d. reduction in BMI (albeit not statistically significant) and reduced the prevalence of obesity by 1% (Greve and Heinesen, 2015).

the recent downward trend in obesity and excess weight among Reception boys has slowed, and upward trend among Reception girls has continued, since the introduction of UIFSM (Public Health England, 2020).

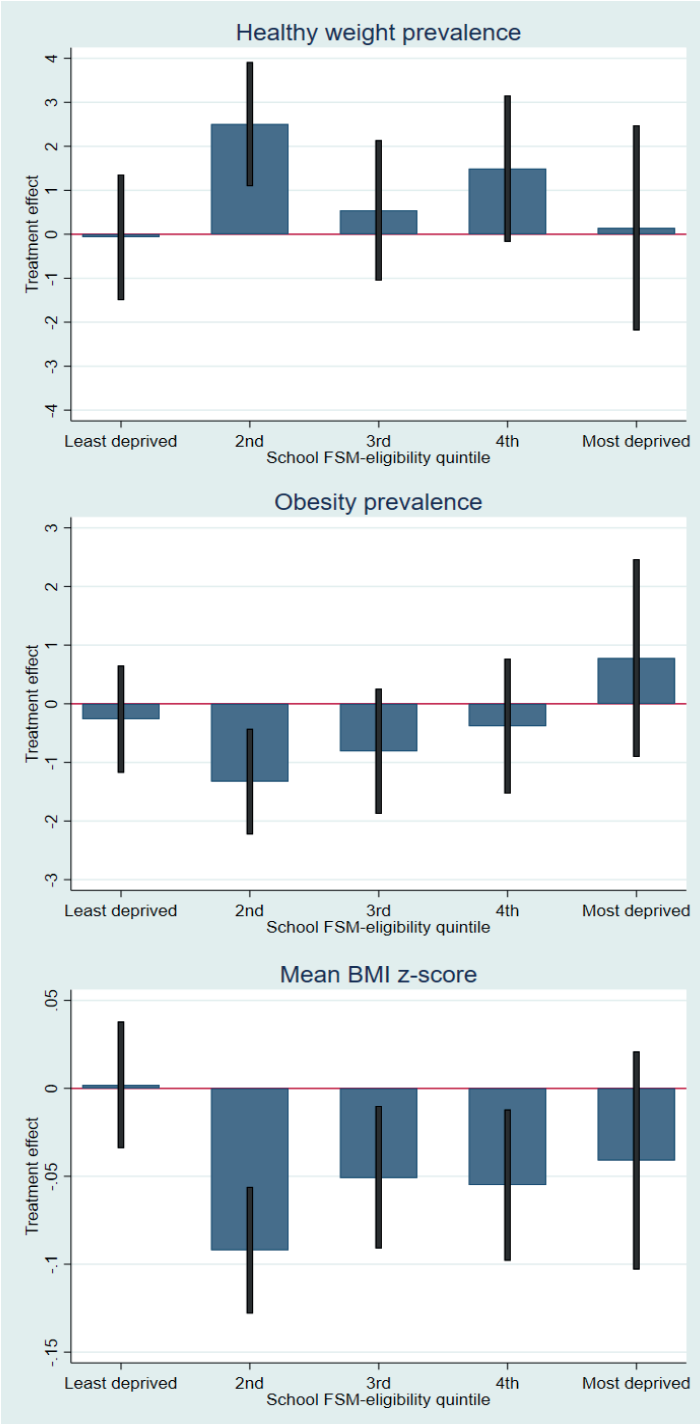
Who benefits?

We have seen that the UIFSM policy has led to a considerable (50ppt) increase in the take-up of free meals among children not previously eligible for them and a small increase of about 3ppts among always FSM-eligible children. This does not imply that the main impact of the policy was on not eligible children. It could be that all the benefits of the policy were concentrated on the few FSM eligible children who were induced by the policy to take up meals. One way to investigate this is by analysing treatment effects by the proportion of FSM-eligible children in the school. If the impact of UIFSM was concentrated in high FSM-eligibility schools that would indicate that benefits accrued mostly to FSM eligible children (although they could also accrue to low-income students in deprived schools who just miss the FSM criteria). If the impact was concentrated on low FSM-eligibility schools this could suggest newly eligible children benefitted most.

We divide schools in our data into quintile groups according to the proportion of FSM-eligible students in the school, as measured in the academic year-ending 2014. In the first quintile, between 0 and 4.4% of children were FSM-eligible. In the fifth quintile at least 27%, and an average of 38%, were FSM-eligible. This means that even in the fifth quintile, most of the rise in take-up will still be accounted for by not-eligible children. In Figure 8 we present the effects of UIFSM in the last half-term of the school by the school's FSM-eligibility quintile. The bars indicate the size of the effect for each quintile, and the black lines delimit the confidence intervals. For all three outcomes we find a zero treatment effect for both the lowest and the highest FSM-eligibility quintiles (the confidence interval includes zero, therefore we cannot rule out that the estimated effect is equal to zero). The middle three FSM-eligibility quintiles have differing effect sizes depending on outcome which generally go in the expected direction but in some instances are not significantly different from zero (e.g. health weight prevalence in the 3rd quintile).

Our consistent finding across the bodyweight outcomes that children in schools in the lowest quintile of FSM-eligibility do not benefit from UIFSM is in line with Alex-Petersen et al. (2017) who found benefits from free, nutritious school lunches in Sweden for all households except the richest. Our finding cannot be explained by the absence of a rise in take-up, so must instead reflect that the lunches brought in from home by children in these schools are very similar in energy content to the free school meals. This suggests that households in the least deprived schools (where increased take-up is likely driven by students who were not previously eligible for free

Figure 8 Treatment effects of UIFSM for June half-term block by school FSM-eligibility quintile



Notes Data source: National Child Measurement Programme. Estimated treatment effect of exposure to UIFSM (academic years ending 2015-2018, relative to pre-UIFSM period 2009-2014) for sixth half-term of the school year. Derived from school fixed effect regression controlling for exposure to UIFSM pilot schemes, pupil premium and sport premium exposure, proportion measured black (and missing indicator), proportion measured girls, year entered linearly, squared and cubed and interacted with IDACI quintile as well as proportion black and girls and half-term block dummies interacted with proportion black and girls. School FSM-eligibility quintile is fixed over time, based on registration rates for the academic year ending 2014.

meals) have sufficient income, time and/or education to be able to produce balanced lunches at home, in contrast to those in more deprived schools where income, time or information constraints are more likely to bind. The peaking of the treatment effect in the second quintile across all outcomes suggests that the diets of relatively well-off pupils can still be improved. The lack of a beneficial treatment effect on obesity in the poorest (highest FSM-eligibility) schools suggests that there is a subset of income-constrained or low-educated households in which parents respond to the UIFSM transfer by reducing the quality of the food provided to the affected children during the rest of the day.

Cost-benefit analysis

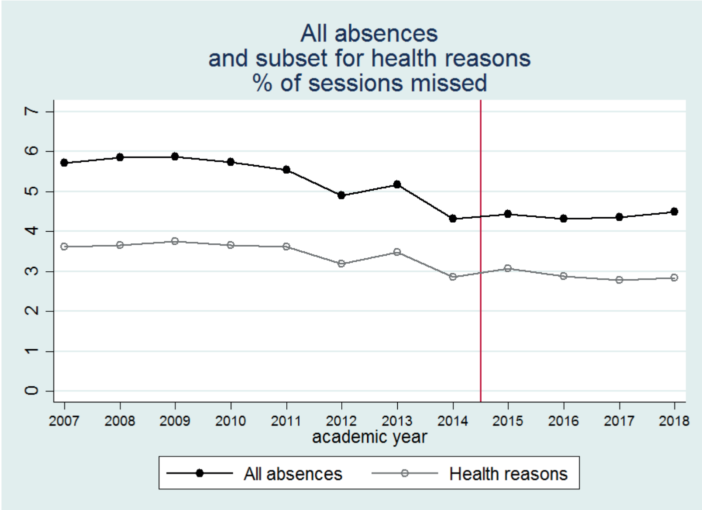
To weigh up the costs and benefits of the UIFSM policy we need to make assumptions about whether or not the benefit found for one-year exposure to UIFSM in Reception year of school will be sustained for the next two years of infant school and beyond into adulthood. If we make this optimistic assumption, a back-of-the-envelope calculation for the overall costs and benefits of UIFSM can be conducted which compares the direct costs of the policy per person not overweight and per person not obese with cost to the UK economy from direct medical expenditure on overweight and obesity-related ill-health plus productivity-related factors. Assuming the benefits would persist, and adopting estimates for the direct medical and productivity costs of obesity and overweight-related conditions (McKinsey Global Institute, 2014, cited in Davies, 2019), we calculate that the policy does represent value-for-money (see the technical annex for details on the calculations).

The cost-to-benefit ratio will be more favourable if we consider benefits on other outcomes, for example a reduction in absences from school (see next section), social benefits or welfare. It will be less favourable if the effects on bodyweight outcomes are not sustained over the life span. Our analysis has shown some reversion in children's bodyweight during short holidays, suggesting that there may be relatively quick fade-out of the benefits of UIFSM. However, our analysis only covers the first year in school, while the policy covers three years and we do not know whether and after which time-period healthy eating habits imbed in children.

5 Results on absences

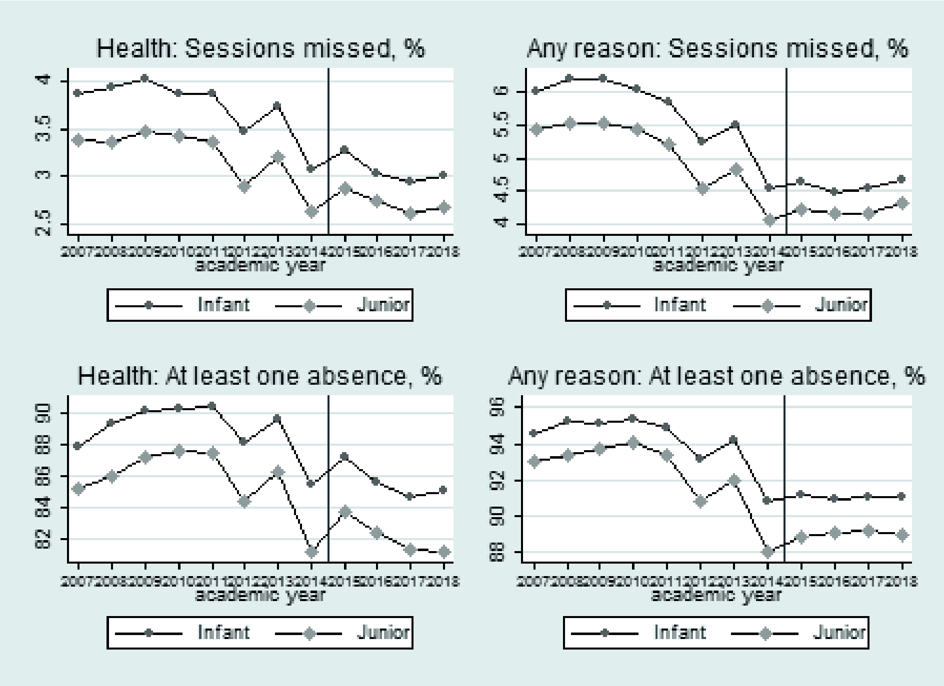
Attendance and absences from school are an important outcome from UIFSM for two reasons. First, attendance is a prerequisite for benefiting from teacher instruction and peer-group interactions that promote cognitive and socio-emotional development. Second, absences for illness or medical appointments, which accounted for 65% of all sessions in our data, represent an indicator of each child's overall health.

Figure 9 **Absence rates by reason for school Years 1-4, academic years-ending 2007-2018**



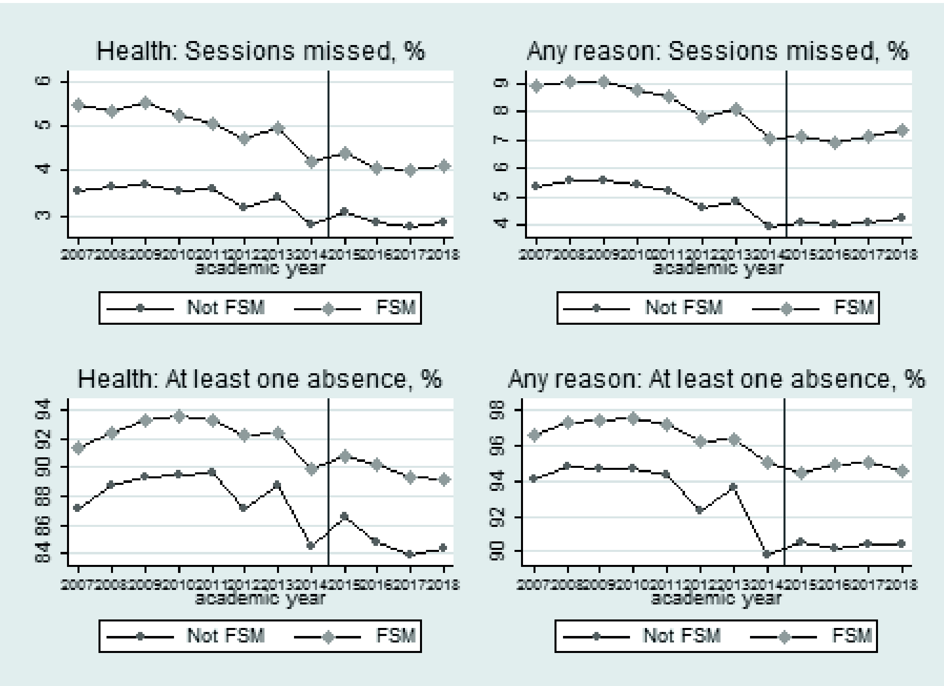
Notes Data source: National Pupil Database, absences data. 'All absences' includes all authorised and unauthorised absences. 'Health reasons' are authorised absences for illness or for medical appointments.

Figure 10 **Absence rates by reason for Infants (Years 1-2) and juniors (Years 3-4), academic years-ending 2007-2018**



Notes Data source: National Pupil Database, absences data. 'All absences' includes all authorised and unauthorised absences. 'Health reasons' are authorised absences for illness or for medical appointments.

Figure 11 **Absence rates by reason for FSM-eligible and not-FSM eligible infants (Years 1-2) for academic years-ending 2007-2018**



Notes Data source: National Pupil Database, absences data. 'All absences' includes all authorised and unauthorised absences. 'Health reasons' are authorised absences for illness or for medical appointments.

There are several reasons to expect UIFSM to affect absences, with the overall direction of the effect determined by which ones dominate.

UIFSM provides a small financial incentive for parents to send their children to school on any given day, since to do otherwise means needing to provide an alternative lunchtime meal. Moreover, since UIFSM ought to improve work incentives (by preventing entitlement to FSM being removed as a result of a parent moving into work) it may be less likely that in any given circumstance parent will be available to look after children kept off school.

In addition to potential work incentives, by saving each household £2.30 per child per day they take up their UIFSM (relative to purchasing a school lunch – and slightly less relative to those taking a packed lunch), UIFSM has a non-trivial impact on household budgets. If this enables households to afford a holiday they would not otherwise have taken, and they take this during term-time, UIFSM may have the effect of increasing absences. If it enables households to shift holidays from (cheaper) term-time into school holiday periods, it may reduce absences.

Moving on to social benefits felt by the child, by increasing the probability that a given child's friends will take a school lunch, UIFSM may make lunchtimes a more attractive prospect, especially to those who already took FSM. If school is more enjoyable, this may reduce the likelihood that they will ask to be kept off school.

Finally, as documented in our obesity chapter, school lunches meeting the school food standards are significantly more nutrient-dense than the vast majority of packed lunches. Over the short term, we would expect UIFSM to reduce health-related absences by improving the strength of children's immune systems, directly but also indirectly through mechanisms such as greater sleep quality. Only in the longer term would we expect to see a reduction in absences due to chronic conditions.

We focus on two outcomes: the proportion of sessions missed for any reason, and for 'health reasons', with the latter including illnesses and medical appointments. Figure 9 (on page 16) shows that absences for health reasons (average 3.26%) have consistently accounted for around two-thirds of all absences (average 5.02%) across school Years 1-4. The trajectory of both measures was fairly flat between 2007 and 2011, fell somewhat between 2011 and 2014, and was flat again between 2014 and 2018.

Figure 10 (on page 17) shows that absence rates are typically around half a percentage point lower for juniors (Years 3-4) than infants (Years 1-2), but both age-groups are subject to the same shocks and very similar trends.[14] This is also true if we consider just the margin of missing any time from school. Figure 11 (on page 17) shows that, among infants, absence rates for health reasons are 1-2 percentage points lower among not-FSM-eligible than FSM-eligible pupils, and for any reason 3-4 percentage points lower. Again, both groups appear similarly sensitive to the same shocks, but absences are more likely to be eliminated entirely for the not-FSM-eligible group.

Taking advantage of the clearly parallel trends and responses to transitory shocks in absences for infants and juniors in the pre-UIFSM period, we estimate a difference-in-difference model, with added control variables, for the effect of UIFSM on absences. Here the treated group comprises children in the infant year-groups (Years 1-2), and the control group comprises in the junior year-groups (Years 3-4).

We assume that effects on absences are contemporaneous, so that past exposure to UIFSM does not reduce absence rates once the same children are juniors, as some or all of our sample of juniors will be from 2016 onwards. We also require that other policy changes introduced in 2015 or afterwards would not affect infants and juniors differentially.

We do not think it is likely that dietary changes due to UIFSM would cause a change in chronic conditions observed this early, though it is possible that positive habits formed as infants will improve general health as juniors. Both of these possibilities would cause UIFSM to reduce junior absences, which means we would be underestimating the benefit of the programme. On the other hand, Figure 3 suggests that take-up of school meals among FSM-eligible juniors may be crowded out by the policy. If take-up is beneficial regardless of age-group, then this would lead to us overestimating the benefit of the programme.

Results are presented in Table 2 (on page 19). The top row shows the treatment effect of UIFSM according to our difference-in-difference method (see the technical annex and the notes to the table on how the results were derived). Effect sizes are shown in percentage points. Standard errors, a measure of statistical precision, are shown in parentheses.

Strikingly, UIFSM reduces absence rates by a much larger margin for FSM-registered than not-FSM-registered pupils. With 190 days (380 sessions) in the standard school year, a 1 percentage point reduction in absence rates is equivalent to attending just under two more whole days of school in a year. This means the results in column 3 indicate that an FSM-registered pupil will miss 1.2 fewer days of school per year in total, on average, as a result of the UIFSM policy;[15] and column 6 indicates that around half of this effect will be due to having fewer absences for illness or medical appointments (0.7 days,

14 Absence data are not available for Reception children.

15 This figure is reached as follows: Effect size is 0.643 percentage points, i.e. 0.643 fewer sessions missed per 100. There are 380 sessions in the school year, so 3.8 × 0.643 = 2.4434 sessions. There are two sessions per day, so 2.4434 ÷ 2 = 1.2217 days fewer missed.

or just over one session per pupil per year).[16] The effect size on absences for any reason for not FSM-registered pupils is negligible, and for health reasons around 6 times smaller than for FSM-registered pupils.

Our analysis therefore shows that UIFSM contributes to reducing absences overall, as well as closing the gap in attendance between disadvantaged FSM-registered and their more advantaged not-FSM-registered pupils. The Department for Education's own analysis on cohorts taking Key Stage 2 assessments in 2015 showed that after controlling for other factors, missing an additional day of school during this key stage reduced the probability of attaining the expected level by 0.4 per cent, and of performing above the expected level by 0.8 per cent (DfE, 2016). The analysis was not performed for Key Stage 1 pupils, but assuming such effects are causal and replicated for these students, we would also expect UIFSM to contribute to closing the gap in educational performance by FSM registration status.[17]

6 Results on learning development and educational attainment

Development at age 5 (Early Years Foundation Stage Profile)

The Early Years Foundation Stage Profile records children's development in 17 learning goals, across 7 domains: Communication and Language; Physical Development; Personal, Social and Emotional; Literacy; Mathematics; Understanding the World; and Expressive Art and Design. For each learning goal, the child is recorded as 'Emerging', at the 'Expected' level of development, or 'Exceeding' it. Good Level of Development, a binary variable defined by the Department for Education, is equal to one if the student is at the expected level of development or above for every learning goal in the Personal, Social and Emotional; Communication and Language; Physical Development; Literacy and Mathematics domains. A Total Point Score, out of 51, is calculated by assigning values of 1, 2 and 3 to emerging, expected or exceeding levels of development in each learning goal respectively.

Figures 12-14 (on pages 20 and 21) plot the evolution of these outcomes by FSM and not-FSM status, from the 2012/13 academic year when the system described above was introduced, to 2017/18. In every domain the not-FSM group

Table 2 Estimates for the effect of the UIFSM programme on absences from school

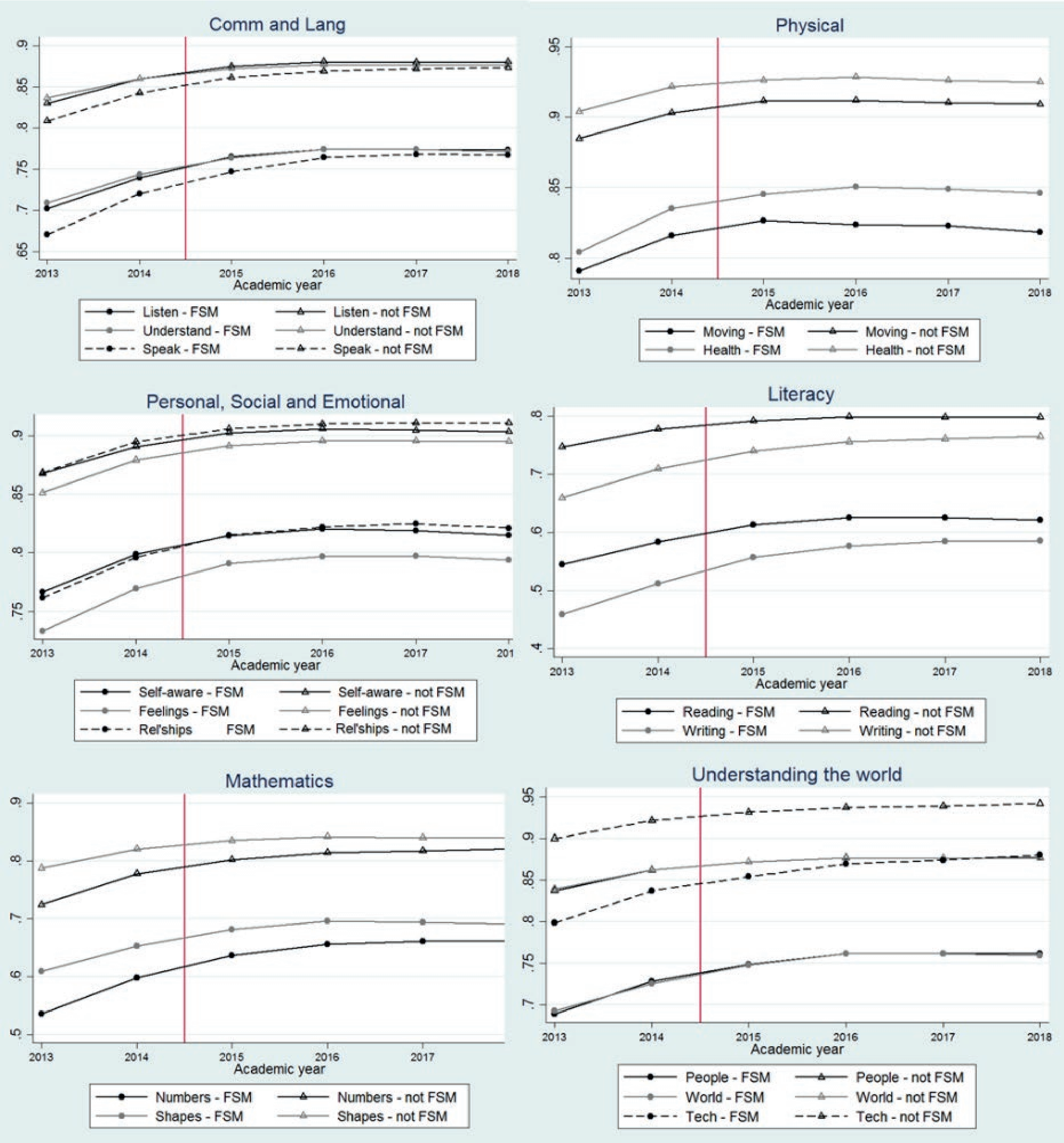
	Absences for any reason			Absences for heath reasons		
	1	2	3	4	5	6
	All	Not-FSM	FSM	All	Not-FSM	FSM
Treat-ment effect	**-0.122**[A] (0.030)	**-0.015** (0.029)	**-0.643**[A] (0.163)	**-0.114**[A] (0.016)	**-0.065**[A] (0.017)	**-0.375**[A] (0.075)
Depen-dent variable mean	5.02			3.26		
N	*1,408,548*	*1,165,737*	*242,811*	*1,408,548*	*1,165,737*	*242,811*

Notes Data Source: National Pupil Database, absences data, 5% random sample of students. [A]Statistical significance at the 1% level. Standard errors in parentheses. Additional controls (individual): Infant year-group dummy, Month of Birth (11 dummies), Special Educational Needs, English as an Alternative Language, five ethnicity dummies; (neighbourhood) four domain scores in index of multiple deprivation for lower super output area (LSOA) of residence, unemployment rate in LA of school; (school and policy) School type (6 dummies), School Religion (21 dummies), School sex (Mixed is omitted category), Pupil premium per pupil, involved in UIFSM pilot; School by year Fixed-Effects.

16 Effect size is 0.375 percentage points. 3.8 × 0.375 = 1.425 fewer sessions, ÷ 2 = 0.713 fewer days missed.

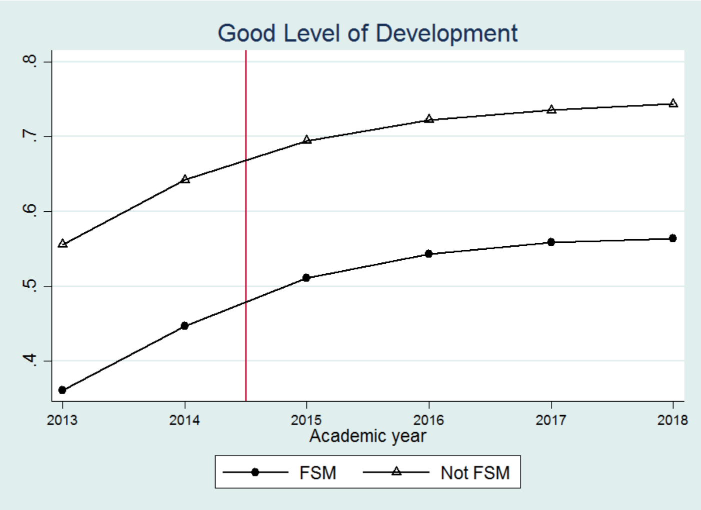
17 We did include absences as a control variable in some auxiliary models assessing the effect of UIFSM on KS1 educational performance. As expected, we always found a negative and significant coefficient, though including this 'bad control' (a variable known directly to be affected by the 'treatment') also significantly changed our estimates of the effect of the programme.

Figure 12 **Proportion achieving expected level in each learning goal of the Early Years Foundation Stage Profile, by learning goal, by academic year and FSM-registration status**



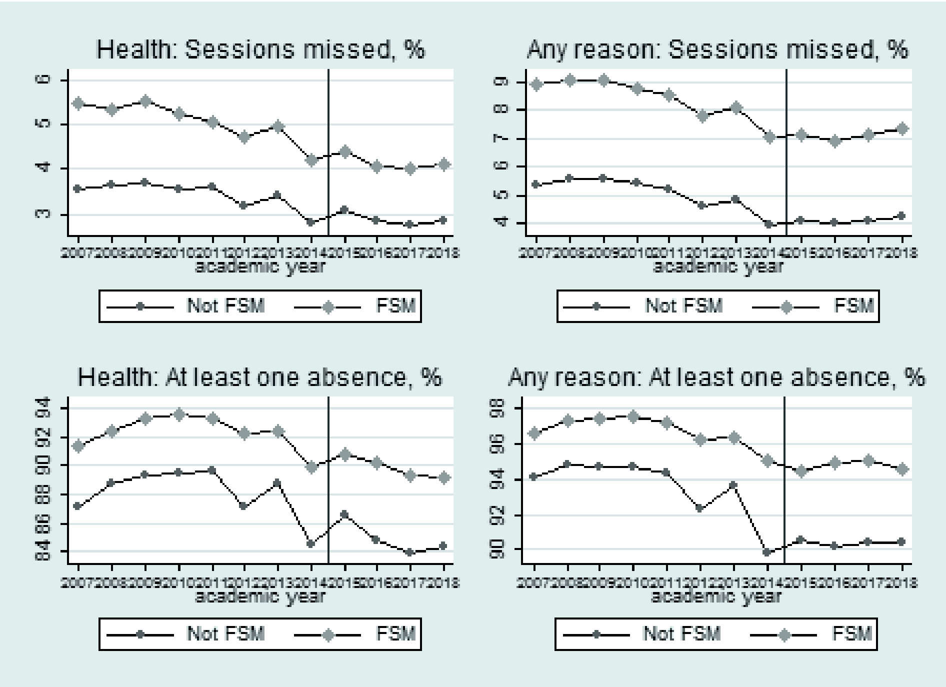
Notes Source: National Pupil Database Early Years Foundation Stage Profile. 'Communication and Language' domain: 'Listening and attention, 'Understanding' and 'Speaking' learning areas. 'Physical development' domain: 'Moving and handling' and 'Health and self-care' learning areas. 'Personal, social and Emotion' domain: 'Self-confidence and self-awareness', 'Managing feelings and behaviour' and 'Managing relationships' learning areas. 'Literacy' domain: 'Reading' and 'Writing' learning. 'Mathematics' domain: 'Numbers' and 'Shape, space and measure' learning areas. 'Understanding the world' domain: 'People and communities', 'The world' and 'Technology' learning areas. 'Expressive Arts and Design' domain. 'Media and materials' and 'Imagination' learning areas.

Figure 13 **Proportion achieving a 'Good Level of Development' by FSM-registration status and academic year**



Notes Source: Early Years Foundation Stage Profile. A 'Good Level of Development' means performing at the expected level of development or above for every learning goal in the Personal, Social and Emotional; Communication and Language; Physical Development; Literacy and Mathematics domains Shown by FSM-registration status.

Figure 14 **Mean EYFSP Total Point Score by FSM-registration status and academic year**



Note Source: Early Years Foundation Stage Profile.

outperforms those FSM-registered, with especially large gaps for literacy and mathematics (around 20 percentage points).

All outcomes and both groups saw slower growth in performance at the 'expected' level after UIFSM was introduced, which appears to be an artefact of bedding in of a new set of measures determined by teacher assessment. There is not an obvious convergence or divergence in any of these outcomes by FSM status.

However, with only two pre-treatment periods for these outcomes, it is impossible to control for differential prior trends by demographic, neighbourhood and school characteristics or other policies, to determine the treatment effect of UIFSM on these measures of development in a regression framework.

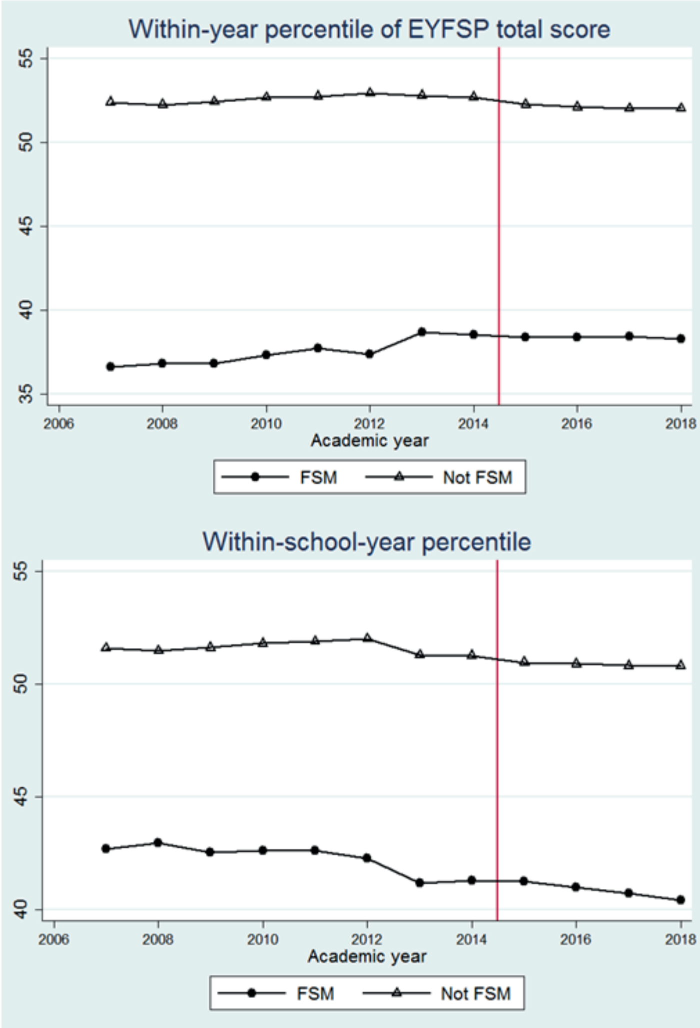
We therefore combine the 2012/13-2017/18 EYFSP with data from the version used from 2006/07/-2011/12, when the EYFSP was recorded over 13 sub-domains, each on a 9-point scale. For the most robust comparison, we do not attempt to align domains of development in the new and old versions, but take the total point score (out of 51 and 117 respectively) and transform it to a percentile within a cohort, either nationally or within a school, on a 0-100 scale (0 being the least and 100 the most developed child). An explanation of this process and the treatment of ties is shown in the technical annex.

Figure 15 plots the mean percentiles of within-national and within-school cohorts, by FSM-registration status. Note that the proportion of Reception children eligible for FSM changed over the years as a result of changes in eligibility criteria (from as low as 15% to as high as 19% in the pre-treatment period). This suggests there will be changes in the pupil composition over time making the FSM/not FSM comparison less compelling. With this caveat in mind, neither group reveals a decisive relative shift in the performance of the treated (not-FSM-registered) relative to the control (FSM-registered) at the introduction of UIFSM, and a longer duration since UIFSM was introduced does not appear to correspond to a greater 'dose' for pupils, since those considered here are all in their first year of school.

Table 3 shows the treatment effect of UIFSM according to our difference-in-difference method using the always-eligible FSM registered group as our control group (see the technical annex and the notes to the table on how the results were derived). Effect sizes are shown in percentile points. Standard errors are shown in parentheses.

The estimated negative treatment effect, of 0.6 percentile points in both these outcome variables is equivalent to around 4% of the raw Not-FSM – FSM gap from Figure 15. As we have already established that take-up of school meals did rise, and absences fall, significantly, among the 'control group' of FSM-registered pupils, we might expect the control group to benefit in terms of attainment too. This means our results do not indicate that the policy was harmful to not-FSM-registered

Figure 15 EYFSP Total Point Score Percentiles by FSM-registration status and academic year



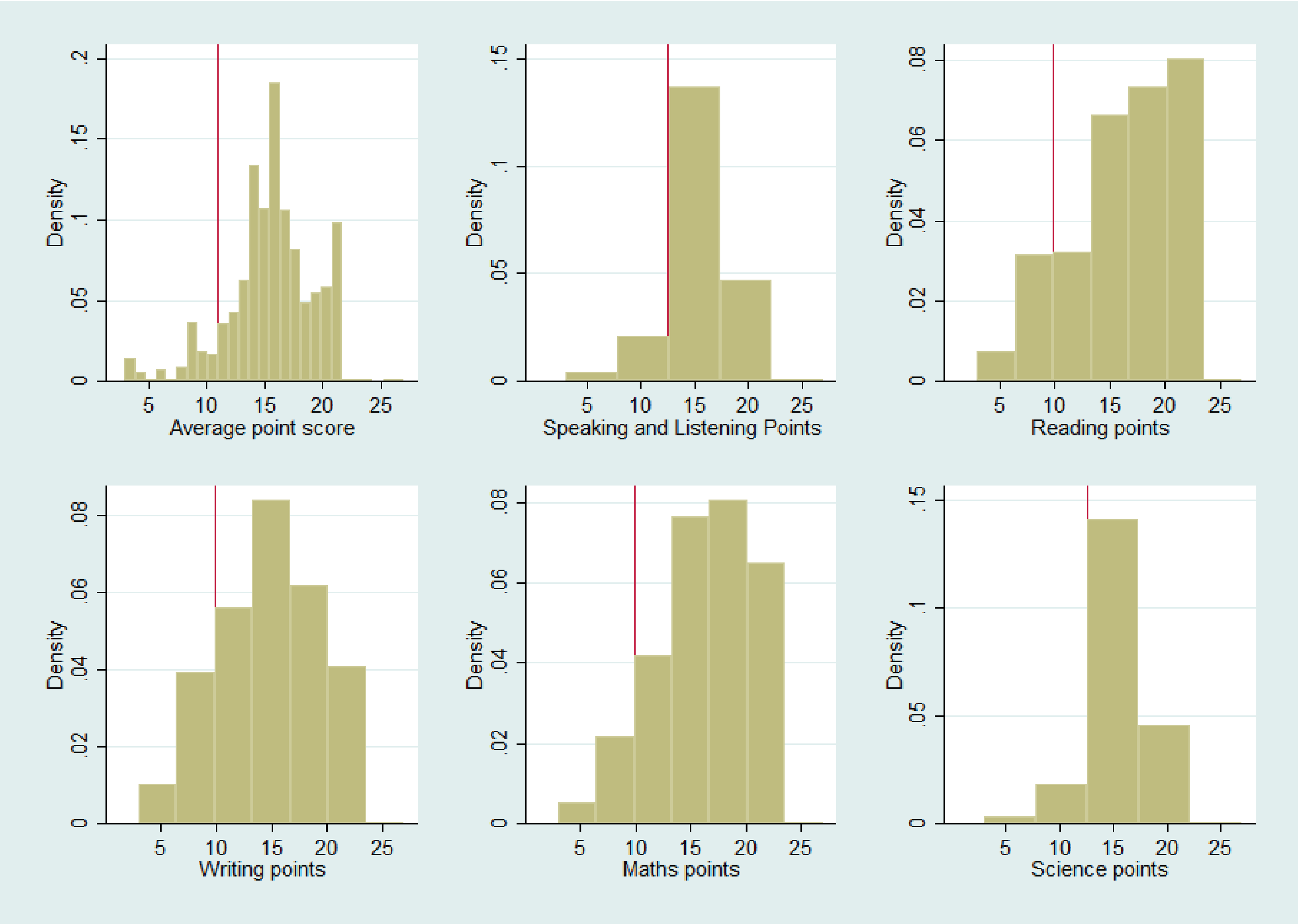
Notes Early Years Foundation Stage Profile. See technical appendix for description of derivation of within-year and within-school percentiles.

Table 3 Estimates for the effect of the UIFSM programme development in the Early Years Foundation Stage Profile

	Within-year percentile	Within-school and year percentile
	1	2
Treatment effect	**-0.611**A (0.196)	**-0.647**A (0.214)
N	*3,836,804*	*3,836,492*

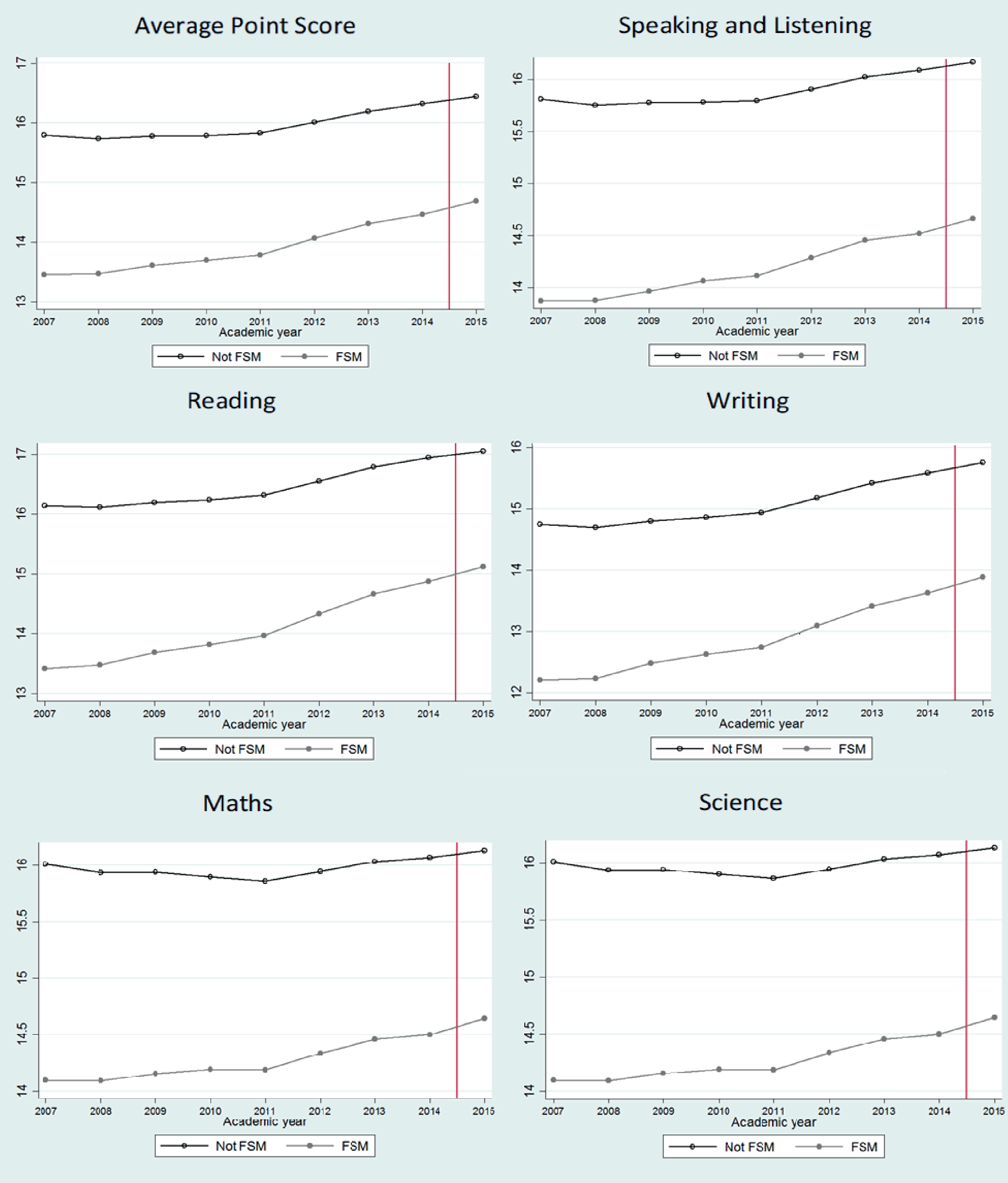
Notes Additional controls (individual): School year, Month of Birth (11 dummies), Special Educational Needs, English as an Alternative Language, five ethnicity dummies; (neighbourhood) four domain scores in index of multiple deprivation for lower super output area (LSOA) of residence, unemployment rate in LA of school; (school and policy) School type (6 dummies), School Religion (21 dummies), School sex (Mixed is omitted category), Pupil premium per pupil, involved in UIFSM pilot. Trends implemented as calendar-year-ending minus 2015, this squared and cubed, and interacted with each of above variables.

Figure 16 **Distributions of KS1 performances, academic years-ending 2007-2015**



Notes Source: National Pupil Database KS1 results. Share reaching expected level of performance (to right of red vertical line): APS: 89.5%, Speaking and Listening: 88.0%, Reading: 86.6%, Writing: 83.0%, Maths: 90.6%, Science, 89.5%

Figure 17 Mean KS1 Average Point Score, and mean point scores in each domain, by academic year and FSM status



Note Source: National Pupil Database KS1 results.

Table 4 Estimates for the effect of the UIFSM programme on KS1 educational attainment

	Average Point Score	Speaking and Listening	Reading	Writing	Maths	Science
	1	2	3	4	5	6
Treatment effect	**0.144**^{A} (0.027)	**0.109**^{A} (0.031)	**0.177**^{A} (0.034)	**0.200**^{A} (0.031)	**0.102**^{A} (0.030)	**0.099**^{A} (0.031)
N	*5,109,816*	*5,109,113*	*5,109,144*	*5,109,166*	*5,109,042*	*5,107,842*

Notes ^{A}Statistical significance at the 0.1% level. Standard errors in parentheses. Additional controls (individual): Not FSM dummy, Month of Birth (11 dummies), Special Educational Needs, English as an Alternative Language, five ethnicity dummies; (neighbourhood) four domain scores in index of multiple deprivation for lower super output area (LSOA) of residence, unemployment rate in LA of school; (school and policy) School type (6 dummies), School Religion (21 dummies), School sex (Mixed is omitted category), Pupil premium per pupil, involved in UIFSM pilot. Trends implemented as calendar-year-ending minus 2015, this squared and cubed, and interacted with each of above variables. School and year fixed effects.

Table 5 Estimates for the effect of participating in the UIFSM programme on EYFSP development and KS1 educational attainment

	EYFSP (Age 5)		KS1 (Age 7)					
	Total Point Score	Good Level of Development	Average Point Score	Speaking and Listening	Reading	Writing	Maths	Science
	1	2	3	4	5	6	7	8
School Lunch Taken	**0.775**^{A} (0.034)	**0.038**^{A} (0.002)	**0.209**^{A} (0.029)	**0.193**^{A} (0.031)	**0.234**^{A} (0.031)	**0.223**^{A} (0.033)	**0.184**^{A} (0.032)	**0.188**^{A} (0.031)
School Lunch x Not FSM	**0.246**^{A} (0.035)	**0.011**^{A} (0.002)	**-0.039** (0.031)	**0.061**^{B} (0.033)	**-0.024** (0.033)	**-0.034** (0.035)	**-0.053** (0.034)	**0.007** (0.033)
N	*2,586,702*	*2,586,702*	*634,170*	*634,063*	*634,113*	*634,114*	*634,135*	*634,035*

Notes ^{A}Statistical significance at the 0.1% level. ^{B}Statistical significance at the 10% level. Standard errors in parentheses. Additional controls (individual): Not FSM dummy, Month of Birth (11 dummies), Special Educational Needs, English as an Alternative Language, five ethnicity dummies; (neighbourhood) four domain scores in index of multiple deprivation for lower super output area (LSOA) of residence, unemployment rate in LA of school; (school and policy) School type (6 dummies), School Religion (21 dummies), School sex (Mixed is omitted category), Pupil premium per pupil, involved in UIFSM pilot. Trends implemented as calendar-year-ending minus 2015, this squared and cubed, and interacted with each of above variables. School and year fixed effects.

pupils. Instead, they show that the not-FSM-registered group, only entitled to a free school meal because of the UIFSM policy, are in fact caught up with slightly by the FSM-registered group for whom there is no change in entitlement.[18]

Educational attainment at age 7 (KS1)

The format of Key Stage 1 assessments changed for the 2015/16 academic year. This means that we have an extended period of pre-treatment data, starting in 2006/07, but only one cohort exposed to UIFSM, for only one year, with comparable attainment data to those preceding them.

Our main outcome of interest for KS1 data is the students' 'Average point score'. This is derived from points assigned to levels of attainment across Reading, Writing, Maths and Science. Students also receive a level for Speaking and Listening, and for these five domains we use the raw point score as an additional outcome variable.[19] These levels are marked from 1-4, with the higher the number the better, and level 2 tired into 2C, 2B and 2A providing differentiation in points. The 'expected level' of attainment is level 2, and the distribution of points in our overall population, together with a red line demarking this threshold for the expected level, is shown in Figure 16 (on page 23). The 'expected rate of progress' is one whole level over school Years 1 and 2, equivalent to 3 points per year, or 0.077 points per week over a 39-week school year.

Evolution over time in these outcomes for FSM-registered and not-FSM registered pupils is shown in Figure 17 (on page 24) with the same caution regarding compositional changes across the groups as above. All the graphs show a convergence (catch-up) in the performance of FSM-registered pupils with their not-FSM-registered peers. In all cases, this absolute improvement, and in most cases convergence, continued after UIFSM was introduced (marked by the red vertical line).

Because there is no evidence that those already in school when UIFSM was introduced were less likely to remain registered for FSM if entitled, our treated group is the not-FSM-registered who newly become entitled to a free school meal.

Our difference-in-difference regression analysis in Table 4 (on page 25) shows that the not-FSM-registered pupils in the UIFSM year perform better than we would have expected them to if UIFSM wasn't introduced, according to our difference-in-difference method using the always-eligible FSM registered group as our control group (see the technical annex and the notes to the table on how the results were derived). Effect sizes are shown in Key Stage 1 Points (see Appendix A3 in the technical annex for detail on how these are allocated). Standard errors are shown in parentheses.

The magnitude of this treatment effect is between 0.1 and 0.2 points. This is between 5% and 10% of the raw gap between FSM and not-FSM registered pupils, similar in magnitude to the overall performance gap between females and males, and equivalent to approximately two weeks' expected progress.

There is not a significant difference in the magnitude of the treatment effect between the Average Point Score and any of the individual domains here, though the effect size is larger for reading and writing, and smaller for speaking and listening, maths and science.

In summary, for both development at age 5 and attainment at age 7, we control for changes in performance levels over a long pre-treatment period and evaluate the effect of UIFSM on children exposed to it for only a single year. Results on these different age groups point in opposite directions, with the policy appearing to contribute to FSM-registered pupils at age 5 catching up with their non-FSM-registered peers, while among age 7 pupils, the not-FSM-registered group pull further ahead.

UIFSM take-up and attainment and development

As individual data on school meal take-up linked to information on learning development or academic performance is not available in the Schools Census and National Pupil Database for the years prior to the introduction of UIFSM, we cannot evaluate the causal effect of *taking up* a school meal as a result of UIFSM on development or educational performance, using the difference-in-difference framework adopted for the effect of the policy overall.

However, using individual data on school meal take-up for infants in the period since UIFSM was introduced, we can document the association between taking up a Universal Infant Free School Meal, conditional on it being available, and development or attainment.

As above, we compare students within the same school and cohort, and account for the rich set of control variables available in the NPD, but there may be unobservable characteristics of children correlated with both their universal school meal take-up and their development or attainment, that mean this does not represent a causal effect.

In Table 5 (on page 25), the highlighted main effect 'School Lunch Taken' is that for an FSM-registered pupil. 'School Lunch x Not FSM' shows how much bigger or smaller this effect is for a not-FSM-registered pupil.

For development in the EYFSP, we use data on academic years-ending 2015-2018. The first row of columns 1 and 2 shows that on average, FSM-registered students taking a School Lunch perform 0.8 points better, and are 4 percentage

18 As UIFSM appears to have reduced registration for means-tested FSM, we also produced results in which we removed from the treated group, and place in the control group, those students we predict would have been
FSM-registered, had the policy not been introduced. The resulting treatment effect is also negative and our interpretation is unchanged.

19 The mapping from levels to point scores is shown in the technical annex.

points more likely to reach a Good Level of Development than FSM-registered students not taking a School Lunch. The second row shows that the interaction with Not FSM is positive, meaning that the effect of taking up a free meal is larger for not-FSM registered pupils than FSM-registered.

For educational attainment at KS1 (age 7), we use data from 2015 only to retain comparability with the attainment results above. Columns 3-8 show that school lunch participation for FSM-registered pupils is strongly positively correlated with KS1 performance by all measures, with those taking a school lunch performing around 0.2 points better on average, other things equal, meaning that at most they make three weeks' more progress over the academic year. The School Lunch x Not FSM interaction is significant in only one case, indicating that the not-FSM group benefit slightly more than the FSM-registered group for Speaking and Listening, with no significant differences for any other outcomes. This shows that children from both disadvantaged and better-off groups benefit similarly from participating in UIFSM.

Both these sets of results indicate that encouraging take-up of school meals, now they are free, would be beneficial for both child development at age 5 and educational attainment at age 7.

7 Implications and recommendations for policy and practice

Our key messages

Our key messages on **bodyweight** are:

- Making high-quality school meals free on a universal basis reduces children's bodyweight throughout the first year of school. This reduces the proportion obese and brings more children into the healthy range.
- Benefits accrue to children from a wide range of backgrounds, but are smaller in schools with the most and least affluent intakes.
- The fact that relatively well-off students can benefit from free school meals suggests that **policies addressing unhealthy eating habits should target a wide range of households**, not just the poorest.
- Our results suggest that children may revert to higher bodyweight during holidays, though more research is needed. This indicates there may be a **benefit from longer or less interrupted exposure to UIFSM**, such as could be realised through provision of **summer holiday play schemes, with food provided**, as an important component of an anti-obesity strategy.
- The policy is **cost effective** under the assumption that the benefits obtained after the first year of treatment do not increase or fade out after the treatment ends after three years, and weighing costs against current estimates of the direct healthcare and productivity costs of obesity. The cost-to-benefit ratio would become more favourable if we included the impact on absences and any impacts on social benefits/welfare in the analysis and less favourable if the benefits are not sustained.
- Given the short- and long-run health impacts of childhood obesity and the difficulty to affect bodyweight outcomes through other trialled policies, **the UIFSM policy should be maintained** (if not expanded to all primary school children) to secure the beneficial effects on children.
- To be able to assess the persistence of the beneficial impact of UIFSM into Year 6 of primary school it is important that appropriate resources are provided to enable **collection and publication of the NCMP for both Reception and Year 6 pupils safely to resume from the 2020/21 academic year**.

Our key messages on **registration** for FSM are:

- UIFSM has resulted in some eligible parents not registering their child for (means-tested) FSM – registration rates for infant pupils are about 1.2 percentage points lower than should be expected.
- This has contributed to schools missing out on pupil premium payments intended to support the educational attainment of disadvantaged students, to the tune of £32m per year, or £2000 per school on average. For LEAs and schools without access to an eligibility checking service, these figures provide a guide to the cost-effectiveness of signing up for one.
- This problem can be addressed directly by **enabling DWP JobCentres, responsible for the administration of Universal Credit, to share data on eligible parents directly with schools**.

Our key messages on **absences** are:

- UIFSM improved absence rates for FSM-registered infants: they missed 4-6% fewer sessions for health reasons and 8-10% fewer sessions overall. This amounts to attending a whole additional day at school over the academic year.
- Given that take-up did not increase much among FSM-registered students this is likely to be driven by **making the school environment at lunchtime more attractive to children**.
- Changes in absence rates for newly eligible (not-FSM-registered) infants were negligible. This pattern of results suggests that take-up of UIFSM does not reduce susceptibility to common illnesses in the short term.

Our key messages on **attainment** are:

- Benefits observed for FSM-registered pupils (a reduction in absences and obesity) potentially related to attainment mean there is not a suitable control group to make causal claims about the effect of UIFSM on the attainment of newly-eligible 'treated' children.
- Indeed, at age 5, the performance of the existing FSM-registered group appears to have improved by more than their newly eligible peers. The opposite is true at age 7.
- Now that UIFSM has been implemented, taking up the entitlement is strongly positively associated with both learning development at age 5 and educational attainment at age 7.

Our key messages on **take-up** are:

- Take-up of school meals by not FSM-eligible pupils rose from a consistent 30-35% in the eight years preceding the policy to approximately 85% in the UIFSM period (a 50 percentage point increase), and for FSM-eligible pupils (for whom there was no change in the financial incentive to take a school lunch) from 84% to 87%.
- Given the positive effects of UIFSM on bodyweight and absences, **take-up should be encouraged among students currently choosing not to have it**.
- Possible steps to realise this in practice include making **sufficient time available for lunch**, providing **capital funding** for necessary investments in school kitchens and the dining environment and, and **updating the per-meal revenue** funding provided by the Department for Education, in line with the Full Economic Costs of producing school meals.
- **Extending universal entitlement to all primary school children** would also help safeguard the take-up by the most disadvantaged children, and the benefits to bodyweight outcomes described above.
- Providing universal free school meals to infant pupils has reduced take-up of means-tested free school meals among FSM-eligible juniors in the same schools. (Data do not exist to evaluate the effect on not-FSM-eligible juniors).
- **Increased use of staggered lunchtimes, expanded dining areas or increased kitchen staffing** may be necessary to prevent this crowding-out of take-up by older FSM-eligible children, once their peers are no longer entitled to a universal free meal.
- To establish the longer-term impacts of UIFSM on school lunch habits of former recipients, and keep track of effects on non-recipients, **data on take-up of school meals by both FSM-eligible and not-FSM-eligible pupils *throughout primary school* should routinely be collected** and published by the Department for Education.

Our key messages on **household food expenditure** are:

- Having a child entitled to a free meal under UIFSM reduces spending on both supermarket shopping and eating out among families not eligible for means-tested FSM. A household with two adults and two children of whom one is in the age-range to receive UIFSM saves approximately £20 per month during term-time.
- This shows that UIFSM has to some extent helped families with the cost of living. This is particularly important for those not entitled to means-tested FSM but who do face financial constraints, for example, those just above the income threshold for eligibility.

Next steps

The most important next step for the research agenda on UIFSM is to establish the extent to which effects on bodyweight outcomes, absences and take-up of school meals persist; whether any effects on attainment emerge over the longer term; and what the remaining barriers are for students to take up universal free meals.

While short-term beneficial effects on obesity, absences and take-up are desirable, evidence on persistence could support UIFSM to be considered an investment in the future health and productivity of the country, rather than simply a running cost of a public service. Evidence on persistence of the beneficial impact of UIFSM could inform decisions on the extension of universal FSM to older children. Evidence of the determinants of school meal take-up could help tackle existing barriers.

The closing of schools to most pupils in reaction to the COVID-19 pandemic has highlighted the role of means-tested school meals in preventing hunger and hardship for the poorest children. The debate has focused on gaps in provision of food during school holidays, prompting the Government to fund £15/week supermarket vouchers throughout the May half term and summer holidays for eligible children, including to migrant children with no recourse to public funds who were previously not eligible. Future research is needed to assess the impact of child nutrition during holidays – the extent to which there is hunger and/or malnutrition, and for whom, and the role this plays for children's bodyweight outcomes and learning. This could inform the debate on universalism vs. means-testing, identify the groups most in need and be linked to research on summer learning loss.

Acknowledgements and disclaimers

The Nuffield Foundation is an independent charitable trust with a mission to advance social well-being. It funds research that informs social policy, primarily in Education, Welfare, and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics and the Ada Lovelace Institute. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit www.nuffieldfoundation.org.

This work benefited from the helpful comments and feedback of seminar, workshop and conference participants at the University of Essex, Royal Holloway, Royal Economic Society, Norwegian University of Science and Technology, European Association of Labour Economists, and from members of our Advisory Group; and from research assistance by Yuliya Kazakova.

This work uses data from the National Child Measurement Programme, supplied by NHS Digital, also known as the Health and Social Care Information Centre, part of the Government Statistical Service.

This work also uses data from the Department for Education's National Pupil Database, provided through the ONS Secure Research Service. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

References

Bartfield, J.S., (2020). 'The Community Eligibility Provision: Continuing the Century-Long Debate over Universal Free School Meals', *American Journal of Public Health* 110:9, 1272-1273. DOI: 10.2105/AJPH.2020.305853

Bourquin, P. and C. Farqharson (2019). 'Universal free school meals are back on the table', IFS Observation. https://www.ifs.org.uk/election/2019/article/universal-free-school-meals-are-back-on-the-table

Brown, V., Crawford, C., Dearden, L., Greaves, E., Kitchen, S., Payne, C., Purdon, S. and Tanner, E. (2012). *Evaluation of the Free School Meals Pilot: Impact Report*, Department for Education Research Report RR227

Chesham et al, (2018). 'The Daily Mile makes primary school children more active, less sedentary and improves their fitness and body composition: a quasi-experimental pilot study' *BMC Medicine* 16:64. DOI: https://doi.org/10.1186/s12916-018-1049-z

Crawford, C., Greaves, E, and Rabe, B. (2020). 'What difference will the COVID Summer Food Fund make to children's lives?' Economics Observatory. https://www.coronavirusandtheeconomy.com/question/what-difference-will-covid-summer-food-fund-make-childrens-lives

Davies, S., (2019). *Time to Solve Childhood Obesity: An Independent Report by the Chief Medical Officer*

Department for Education (2014). *Revised standards for food in schools: Government response to the consultation on revised school food standards* (accessed 14th October 2019)

Department for Education (2016). *The link between absence and attainment at KS2 and KS4: 2013/14 academic year*. Research report. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/509679/The-link-between-absence-and-attainment-at-KS2-and-KS4-2013-to-2014-academic-year.pdf

Department for Education (2019a). *School food in England: Advice for governing boards*. https://www.gov.uk/government/publications/standards-for-school-food-in-england (accessed 17 Sept 2020)

Department for Education (2019a). 'School food standards: resources for schools'. https://www.gov.uk/government/publications/school-food-standards-resources-for-schools (accessed 17 Sept 2020)

Dunifon, R.E. and Kowaleski-Jones, L. (2004). *Exploring the influence of the National School Lunch Program on children*. Institute for Research on Poverty Discussion Paper 1277-04.

Evans, C.E., Greenwood, D.C., Thomas, J.D. and Cade, JE., (2010). 'A cross-sectional survey of children's packed lunches in the UK: food- and nutrient-based results'. *Journal of Epidemiology and Community Health* 64 (11). 977-983.

Frisvold, D.E., (2015). 'Nutrition and cognitive achievement: An evaluation of the School Breakfast Program', *Journal of Public Economics* 124: 91-104. DOI: https://doi.org/10.1016/j.jpubeco.2014.12.003

Greve, J. and Heinesen, E. (2015). 'Evaluating the impact of a school-based health intervention using a randomized field experiment'. *Economics and Human Biology* 18C 41-56. DOI: https://doi.org/10.1016/j.ehb.2015.03.005

Hinrichs, P., (2010). 'The effects of the National School Lunch Program on education and health'. *J. Policy Analysis and Management* 29 (3), 479–505. DOI: https://doi.org/10.1002/pam.20506

Holford, A. (2015). 'Take-up of Free School Meals: Price Effects and Peer Effects', *Economica* 82:328, 976-993. DOI: https://doi.org/10.1111/ecca.12147

Kipping, R.R., Payne, C. and Lawlor D.A. (2008). 'Randomised control trial adapting US school obesity prevention to England'. *Archives of Disease in Childhood* 93:6, 469-473. DOI: http://dx.doi.org/10.1136/adc.2007.116970

McKinsey Global Institute (2014). *Overcoming obesity: An initial economic analysis*. Discussion paper.

Millimet, D.L., Tchernis, R. and Husain, M. (2010). 'School Nutrition Programs and the Incidence of Childhood Obesity'. *Journal of Human Resources* 45: 640-654. DOI: http://doi.org/10.3368/jhr.45.3.640

Public Health England (2017). 'Health matters: obesity and the food environment', Guidance, 31 March 2017. https://www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2 (accessed 15 November 2018)

Public Health England (2020). 'National Child Measurement Programme (NCMP): trends in child BMI'. https://www.gov.uk/government/publications/national-child-measurement-programme-ncmp-trends-in-child-bmi-between-2006-to-2007-and-2018-to-2019/national-child-measurement-programme-ncmp-trends-in-child-bmi (accessed 29 September 2020)

Reilly et al, 2006, 'Physical activity to prevent obesity in young children: cluster randomized control trial'. *British Medical Journal* 333:7577. DOI: https://doi.org/10.1136/bmj.38979.623773.55

Schanzenbach, D.W. (2009), 'Do School Lunches Contribute to Childhood Obesity?' *Journal of Human Resources* 44: 684-709. DOI: https://doi.org/10.3368/jhr.44.3.684

Sibieta, L. and Cottell, J. (2020). *Education policy responses across the UK to the pandemic*. Education Policy Institute report. https://epi.org.uk/publications-and-research/education-responses-uk-pandemic/ (accessed 19th October 2020)

Spence, S., Delve, J. et al (2013). 'The Impact of Food and Nutrient-Based Standards on Primary School Children's Lunch and total Dietary Intake: A Natural Experimental Evaluation of Government Policy in England'. *PLOSone* 8:10 e78298. DOI: https://doi.org/10.1371/journal.pone.0078298

Spence, S., Matthews, J. et al (2014). 'A repeat cross-sectional study examining the equitable impact of nutritional standrads for school lunches in England in 2008 on the diets of 4-7y olds across the socio-economic spectrum'. *International Journal of Behavioural Nutrition and Physical Activity* 11:128

von Hinke Kessler Scholder, S. (2013). 'School meal crowd out in the 1980s'. *Journal of Health Economics* 32: 538-545. DOI: https://doi.org/10.1016/j.jhealeco.2013.02.003

Technical annex

A1 Estimation methods

Food expenditure

We evaluate the impact of UIFSM on expenditure for supermarket shopping for food and groceries and for eating out using a difference-in-difference model. This compares the change in expenditure between families with children in the household who would be exposed to UIFSM, i.e. who are in Reception, Year 1 or Year 2 of primary school, with families who do not have children in this age-range, before and after UIFSM were introduced. A change in expenditure can be interpreted as an impact of UIFSM under the assumption that outcomes would have evolved over time in the same way for both groups in absence of UIFSM.

We estimate the following pooled OLS regression:

$$EXPENDITURE_{it} = \alpha_1 + \alpha_2 TREAT_{it} + \alpha_3\, UIFSM_t + \beta(TREAT_{it} \times UIFSM_t) + \boldsymbol{\gamma X_{it}} + \varepsilon_{it}$$

Here $EXPENDITURE_{it}$ is expenditure of household i at time t on supermarket shopping for food and groceries and on eating out, both in the last four weeks, and equivalised for household composition (using the OECD equivalence scale and measured in 2015 pounds). $TREAT_{it}$ is the number of children in the household who are eligible for UIFSM and $UIFSM_t$ an indicator equal to one for the periods when UIFSM is available. The treatment effect is given by β, the coefficient on their interaction. $\boldsymbol{X_{it}}$ is a vector of time-invariant and time-varying individual and household characteristics and ε_{it} is an idiosyncratic error term.

We use waves 1-9 (2009-2018) of *Understanding Society*, the UK Household Longitudinal Study, to estimate this model. Our sample is households with at least one child aged 0-11, resident in England. The set of controls included in $\boldsymbol{X_{it}}$ are listed in the footnotes to Table 1.

Obesity

The UIFSM programme was introduced simultaneously across the whole of England in September 2014, and therefore there is no experimental variation in exposure to UIFSM across schools, or a 'control group' of similar schools recorded in our data which were not exposed to UIFSM. Our access to information on the date schools were visited for height and weight measurement both before and after UIFSM was introduced allows us to compare children who were exposed to the policy for different durations at the time they were weighed and measured with children who were not exposed to the policy but weighed and measured at the same time of the year. We expect the impact of UIFSM to depend on the 'dose' of free meals received, so that a greater effect should be observed for children at the end of the first year in school (after up to 190 meals) than for children just starting school for the first time. That is, for a school visited at the start of the school year in September, once accounting for other underlying trends there should be little difference in the BMI between a cohort of children entering reception in 2013-14 (pre-implementation) and 2014-15 (post-implementation), while if exposure to UIFSM does affect this outcome, the difference should be progressively larger in a school visited, say, in the spring and summer.

Using this set-up and the six half-term blocks described in the main report to measure duration of exposure we formulate a difference-in-difference model as follows:

$$\bar{Y}_{st} = \textstyle\sum_{h=1}^{6} \beta_h HTERM_{st} + \tau_u UIFSM_t + \sum_{h=1}^{6} (HTERM_{st} \times UIFSM_t) + \boldsymbol{\gamma X_{st}} + \mu_s + \varepsilon_{st} \quad (1)$$

where $\bar{Y}_{st}$ is the mean of the outcome recorded in school s in year t, $HTERM_{st}$ is the half-term of NCMP visit in school s in school year t and can take a value from 1 to 6, $UIFSM_t$ is a dummy variable that switches on for the UIFSM policy years, $\boldsymbol{X_{st}}$ is a vector of controls that varies across school and time, μ_s is a school fixed-effect, and ε_{st} a normally distributed error term. The intention-to-treat effect for each half-term block in this equation is given by $\tau_u + \tau_h$. We estimate equation (1) using linear models on our school-level data.

Identifying assumptions

In order for our difference-in-difference regression to yield causal estimates of the impact of the UIFSM policy on bodyweight outcomes we need to make two identifying assumptions. These are (1) that conditional on the controls included in our model, bodyweight outcomes would have evolved in the same way over the school year in the post-UIFSM as pre-UIFSM years, had the policy not been introduced (parallel trend assumption), and (2) that the timing of NCMP visits to schools did not change between the pre-and post-UIFSM period in a way that was related to any unobserved factors affecting bodyweight outcomes. We discuss the steps we take to defend these assumptions in turn.

Parallel trends

The parallel trend assumption could be violated if there were other policies introduced during the period of our analysis, which had an effect on bodyweight outcomes that are not otherwise accounted for. There were Department for Education pilot schemes for universal or extended means-tested entitlement to Free School Meals, and a number of other pilots run at the initiative of local authorities over the years preceding UIFSM. We capture and control for these using six dummy variable categories, also interacted with half-term block, in all our regression specifications. Another potential policy is the pupil premium, extra funding made available to schools for each student eligible for free lunches plus a small number of other pupil groups (e.g. children adopted from care) which could potentially affect children's bodyweight. The funding per student increased uniformly across the country, but non-linearly year-by-year from £430 in the academic year 2012/13 to £1320 in 2017/18. We approximate the premium available to schools as the average across all the pupils in the school in each year, calculated using the mean proportion of free lunch eligible children in each of the quintile bands and the size of the pupil premium amount, allowing this to have differential effects pre- and post-UIFSM.

Moreover, we control for the percentage of children measured at each visit who were girls and who were of black ethnicity, since these groups are expected to exhibit lower and higher prevalence of overweight or obesity than boys and non-black pupils respectively, and school level outcomes will therefore be sensitive to changes in proportions of these variables. (This is despite sex directly being accounted for in defining the threshold measures. Ethnicity is not.) We also include a cubic-time-trend interacted with both these variables to discount any differential growth in the prevalence of obesity or overweight between years by sex or by ethnic group, that may arise from these groups' different metabolic response to the same prevailing environmental changes. Likewise, we include a cubic time-trend specific to the neighbourhood 'Income Deprivation Affecting Children Index' (IDACI) quintile, to accommodate the widening of the gap in outcomes between schools in the most and least deprived neighbourhoods. (The IDACI is time invariant within schools, so cannot be included as an independent regressor). We also include the means-tested FSM eligibility rate of the school (in quintiles), and a school fixed effect in our model to control for time-invariant school factors affecting outcomes.

Because all schools received the UIFSM treatment from academic year-ending 2015 onwards, we cannot perform a conventional test of the assumption of parallel trends between a treated and control group in the pre-treatment period. Instead, the relevant test is for parallel trends over time between 'low-dose' schools, visited in the first half-term of the school year, and 'high-dose' schools, visited later in the school year. For the pre-treatment period we run a school fixed-effect regression of bodyweight outcomes on an exhaustive set of half-term by year interactions:

$$\overline{Y}_{st} = \sum_{h=1}^{6} \sum_{t=2009}^{2014} \theta\_st\,(HTERM_s \times YEAR_t) + \boldsymbol{\gamma X_{st}} + \mu_s + \varepsilon_{st} \quad (2)$$

For each year t and half-terms s the difference in coefficients $(\theta_{st} - \theta_{1t})$ provides a measure of the conditional improvement in observed bodyweight outcomes since the start of the school year. We would be concerned for our identification strategy if we were also to see a systematic relative improvement in bodyweight outcomes for 'high-dose' schools over 'low-dose' schools beginning in the pre-treatment period. For only one outcome in one academic year do we ever observe a statistically significant (and only at 10%) deviation from a constant school environment effect over this period.

Timing of measurement

Our second identifying assumption relates to the timing of measurement. Bodyweight outcomes will be representative of the children in England for each half term only if the timing of visits by NCMP is random across schools. In particular, we may expect a bias from our estimation if any pattern in the timing of visits changed between pre- and post-UIFSM introduction. For example, if NCMP had the habit of visiting schools with the smallest concern over obesity first in each academic year but changed this to late visits in recent UIFSM years, our results would overstate the beneficial effect of the policy.

To investigate whether there were any shifts in timing of school visits accompanied with changes in school student composition we conduct a check where we run similar regressions to equation (1) above, but using school-level child characteristics as outcomes. The coefficients on the half-term x UIFSM interactions will tell us whether schools with the characteristic in question were more likely to be visited in a particular half-term block post than pre UIFSM. We find statistically significant half-term x UIFSM interactions for black students and FSM quintiles of the school in some half-term blocks but the effects are very small. We therefore control comprehensively for student characteristics and their interaction with time trends. Inclusion of these controls do not change our estimated treatment effects significantly as a result of this exercise and the pattern of treatment effects over the school year remains the same.

We also investigate the impact of school starting policies on our results. In the early years of our analysis window some schools staggered entry into Reception year (such that those born later in the school year start school in January or after Easter rather than in September), and this practice became less common over time. Schools with staggered entry may require school visits to be scheduled later in the year, in order to ensure that most children are measured. Any switch from staggered to no-staggered-entry may threaten identification if switching schools are different from those that don't switch in unobservable ways that also relate to obesity, and switch to earlier measurement. This is only a problem if the switches are similarly timed to the introduction of UIFSM. We analyse school switching patterns and find that a small minority (under 2%) of schools switched every year, apart from 2012 and 2013 when this was 8.45% and 2.99%. Given the small proportion of switchers and the peaking in 2012 we do not expect this to affect our results. Restricting estimation to data from 2012 onwards, after which the vast majority of schools had switched, indeed does not significantly affect the results.

Absences and attainment

We evaluate the impact of UIFSM on absences, attainment and development, using 'difference-in-difference' models. This means that we compare the change in outcomes between a pre-UIFSM and during-UIFSM period, for groups of children newly treated by the UIFSM policy ('the treatment group'), versus children whose status did not change ('the control group').

An improvement in the outcomes of the treatment group relative to the control group can be considered evidence for a beneficial 'treatment effect' of the UIFSM policy, under the assumption that outcomes would have evolved over time in the same way for both groups, were UIFSM never to have been introduced.

The basic regression model is:

$$OUTCOME_{it} = \alpha_1 + \alpha_2 TRTGRP_{it} + \alpha_3\, UIFSM_t + \beta(TRTGRPit \times UIFSM_t) + \boldsymbol{\gamma X_{it}} + \mu_i + \varepsilon_{it}$$

Here $OUTCOME_{it}$ will be:

- Individual *i*'s absence rate (percent of sessions missed) in period t for all reasons or for health reasons.
- Individual *i*'s performance according to learning goals in the Early Years Foundation Stage Profile or Key Stage 1.

$TRTGRP_{it}$ is an indicator equal to one if the individual is in the group that would be 'treated' by the UIFSM policy, and $UIFSM_t$ an indicator equal to one for the periods when UIFSM is available. The *treatment effect* of UIFSM, under parallel trends assumptions the relative improvement for the former group in the latter period, is given by β, the coefficient on their interaction. $\boldsymbol{X_{it}}$ a vector of time-invariant and time-varying individual and school characteristics, μ is an individual-specific random or fixed effect, and ε_i is an idiosyncratic error term.

Our preferred specification, presented in this report, is a school-by-year fixed regression, which means we effectively compare children within the same cohort at the same school, while also including in $\boldsymbol{X_{it}}$ a set of individual and neighbourhood characteristics (listed in the footnotes to each table). We allow the treated and control children, and those with different individual and neighbourhood characteristics, to be differentially affected by prevailing time trends that we are able to model where we have constructed a long pre-treatment series.

Note that both students who are always eligible to receive a Free School Meal, and those who are never eligible to receive a Free School Meal, potentially represent suitable control groups, because neither of their incentives to participate in school lunches are affected.

For our analysis of **absences**, our treatment group is infants (Years 1 and 2, newly eligible to UIFSM) and our control group is juniors (Years 3 and 4, never eligible for UIFSM).

Although juniors have consistently lower absences than infants, they are clearly similarly affected by the same shocks at the same time. Although we have reason (Figure 3) to suspect that take-up of school meals among FSM-eligible juniors may be crowded out by the policy, whether infants benefit from raising take-up, juniors are harmed by reducing take-up, or both, our results favour the extension of universal FSM to all primary school children.

Comparing cohorts of different ages at the same point in time is not a strategy available to us for attainment, conceptually because educational attainment is a cumulative process with important dynamic complementarities, and practically because attainment is measured against different criteria. Therefore, for our analysis of **attainment**, our treatment group is **not-FSM-registered** (newly eligible to an FSM) and our control group is **FSM-registered** (always eligible for an FSM).

The evidence of this report is that the composition of the FSM-registered group changed (got smaller) as a result of the introduction of UIFSM. For KS1 results we assume that this did not affect the treated cohort (who were already in school for two years before UIFSM was introduced). For the EYFSP results we also produced results using an imputed FSM status, 'topping up' FSM registration levels to the predicted level based on population characteristics. This did not qualitatively affect the results.

However, the evidence of this report also suggests that the FSM-registered group benefited from the UIFSM programme, and in the case of absences more strongly than the not-FSM-registered group. Taking difference-in-difference results at face-value implies a 'negative treatment effect' of the policy, which is an interpretation we cannot endorse. Instead, we interpret these results as an indication of how the gap between FSM-registered and not-FSM-registered pupils changed as a result of the policy.

A2 Calculation of cost-effectiveness of UIFSM for reducing obesity

Our claim in our 'Implications for policy and practice' section that UIFSM would be a cost-effective policy for reducing obesity is grounded in the following assumptions:

- Exposure to UIFSM lasts three years, costing £1,350 per person. (Here we assume constant revenue funding of £2.30 per meal (£437 per pupil per year), and capital funding for improved or expanded kitchen facilities of £175m allowed to depreciate over 10 years).
- Assume that effects persist with 0.7 percentage point reduction in obesity and 1.1 percentage point increase in healthy weight prevalence meaning an equivalent reduction in overweight prevalence, the programme costs £191,000 per person who was not obese later in life and would have otherwise been, or £121,000 per person not overweight.
- It is estimated that the NHS annually spends £6.1bn on overweight and obesity-related ill-health (Public Health England, 2017). This is £377 per obese person (approximately 24% of the population, including children) or £165 per overweight-or-obese person (approximately 56% of the population including children).

- If such expenditure is required for every one of an expected lifespan of 80 years, the total benefit in reduced NHS costs of no longer being obese or at-least-overweight can be calculated at £30,160 or £13,200 respectively. Even without discounting future benefits, this is less than the cost of the policy now.
- However, the overall cost to the UK economy from direct medical expenditure plus the productivity-related factors has been estimated at £60bn per year (McKinsey Global Institute, 2014, cited in Davies, 2019), or £3708 per obese person, or £297,000 over an 80-year lifespan.
- This estimated future benefit outweighs the current cost, when future benefits are discounted at a rate of 1.2% per year or less.

A3 Derived outcome measures

BMI z-score, obesity prevalence and normal weight prevalence

The NCMP took *individual* measurements of height and weight, and calculated a Body Mass Index (BMI) for each child. Each child was assigned to a category: underweight, healthy weight, overweight, obese, with reference to age-and-sex-specific thresholds. These are derived from the UK 1990 growth charts, with those in the bottom 2% of the BMI distribution in 1990 being underweight, from the 2nd to 85th percentiles a healthy weight, 85th to 95th overweight, and top 5% obese. Each child was also assigned a BMI z-score, corresponding to the number of standard deviations above or below the mean they would have been in the 1990 distribution. The population has got considerably heavier, with around 10% of 5 year-olds in our data obese, another 13% obese, and a mean BMI z-score around 0.4 (versus figures of 5%, 10% and zero that would have prevailed if the population distribution had remained the same).

Our data on bodyweight outcomes was provided by NHS Digital at the school level, comprising the proportion of measured pupils in each weight category, and the mean BMI z-score among measured pupils.

Key Stage 1 point scores

The following table shows the point scores allocated to different levels of each subject for the purpose of calculation of average point scores. The 'expected level' is level 2B. The expected rate of progress is half a level, or 3 points, per academic year between the EYFSP and Key Stage 1.

Working towards L1	Level 1	Level 2C	Level 2B/ Undifferentiated L2	Level 2A	Level 3	Level 4
3	9	13	15	17	21	27

Standardised measure of development in the Early Years Foundation Stage Profile

Because the measures of development in the Early Years Foundation Stage Profile had only been in place for two academic years before UIFSM was introduced, we could not adequately control for differential prior trends in development. We therefore produced a standardised measure of performance in the EYFS that would be comparable across academic years over a longer pre-treatment period.

The version in place between 2007 and 2012 rated children in 13 sub-domains, on a 9-point scale (1-3 was 'working towards', 4-5 'within', 6-8 'securely within' and 9 'working beyond' expected skill levels), with a recorded 'total point score' out of 117. The version in place between 2013 and 2018 rated children on 17 sub-domains, on a simpler 3-point scale (pertaining to 'emerging', 'expected' and 'exceeding' skill levels) with a recorded 'total point score' out of 51. Both had thresholds for a 'good level of development' based on performing securely within or at the expected level in a range of key skills, and in the pre-2013 case also reaching a threshold for their overall total score. Although attempting to capture the same concept, using 'good level of development' with its distinct thresholds pre-and-post 2013 is not likely to be statistically robust, and there are scaling issues that make imposing a z-score (assuming a normal distribution and standardising by the mean and standard deviation within each system) problematic.

We therefore make our outcome measure the **within-cohort-percentile** of the total point score, with the cohort defined either nationally or at the school level. This is notionally on a 0-100 scale, with 0 being assigned to the lowest performing student, and 100 to the highest. However, in both versions there are many ties, to which we assign the median rank of the pupils with the same score, and those (jointly) attaining the maximum (observed) score are given a percentile of 100 and the minimum a percentile of zero. This still means that the measure is sensitive to finer-grained nature of the pre-2013 measure making it harder to obtain the maximum or minimum score. An FSM and not-FSM registered pupil swapping places would make a bigger difference to the mean FSM percentile in most cases (except in schools with more FSM than not-FSM pupils), while a weakly order-preserving shift in both kinds of pupil can move the mean of this non-parametric measure in the same direction for both groups. Nevertheless, overall, in this setup, a beneficial treatment effect would be indicated by an improvement in the mean percentile of not-FSM-registered pupils' performances relative to FSM-registered, after UIFSM was introduced in the academic year-ending 2015.

© ISER November 2020