




# The economic cost-effectiveness of the Magic Breakfast model of school breakfast provision

Jon Franklin, Toby Kenward | Pro Bono Economics  
Katie Freeman, Alysa Remtulla | Magic Breakfast  
Jonathan Coller, Nathaniel Greenwold | Heinz

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Pro Bono Economics uses economics to empower the social sector and to increase wellbeing across the UK. We combine project work for individual charities and social enterprises with policy research that can drive systemic change. Working with 400 volunteer economists, we have supported over 500 charities since our inception in 2009.


Magic Breakfast is a registered charity delivering healthy breakfasts to children in the UK who arrive at school too hungry to learn, and providing expert support to their schools. The charity partners with over 960 schools in disadvantaged areas of England and Scotland and works with them to offer nutritious breakfasts to more than 167,000 children at risk of hunger at the start of the school day.

Heinz and Magic Breakfast have a long-term partnership that began in September 2019. As part of this partnership, Heinz have donated No Added Sugar Beanz to Magic Breakfast schools, significantly uplifting their donation during the COVID-19 pandemic. Heinz are also supporting Magic Breakfast to raise awareness of the scale of classroom hunger and build support for school breakfast provision as an effective solution.



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## Executive summary

This Pro Bono Economics Report (PBE) report, undertaken in partnership with Magic Breakfast and Heinz, provides an analysis of the cost-effectiveness of the Magic Breakfast model of free, universal, school breakfast provision. School breakfast provision, targeted at schools with a high proportion of disadvantaged children, is intended to tackle classroom hunger and drive-up academic performance by improving children's energy, concentration, behaviour and overall readiness to learn.

A previous study by the Institute for Fiscal Studies has evaluated the impact of the Magic Breakfast model of school breakfast provision on Key Stage 1 academic results (for children aged 6 or 7). Our study looks at longer-term economic benefits, drawing on established literature to examine what these academic impacts mean for reduced costs incurred for special educational needs, truancy and exclusions as well as improvements in earnings from employment up to the age of 60.

We find that:

- Providing the Magic Breakfast model of school breakfast provision for one year to pupils completing Key Stage 1 could generate long-term benefits to the economy of around £9,200 per child. Approximately £4,000 of these benefits will go to Government through increased tax revenue and reduced public services costs.
- There are an estimated 298,000 pupils completing Key Stage 1 at schools with high levels of disadvantage<sup>1</sup> in England. If all of these pupils received the Magic Breakfast model of school breakfast provision it would generate total long-term economic benefits of around £2.7 billion.
- In Scotland there are 22,100 children in the equivalent year group at schools with high levels of disadvantage<sup>2</sup>. If all of these pupils received the Magic Breakfast model of school breakfast provision it could generate further long-term economic benefits of around £200 million.
- More than 90% of these benefits are likely to be in the form of improved life-time earnings for the beneficiaries, with the remainder due to reduced costs for special educational needs, truancy and exclusions.
- The cost of Magic Breakfast's school breakfast provision is around £180 per pupil per year. As such breakfast provision for one year for

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<sup>1</sup> 'Schools with high levels of disadvantage' in England are defined as schools with at least 50% of pupils in Income Deprivation Affecting Children Index (IDACI) Bands A-F.

<sup>2</sup> 'Schools with high levels of disadvantage' in Scotland are defined as schools with at least 55% of pupils in Scottish Index of Multiple Deprivation (SIMD) quantiles 1-2.

those pupils completing Key Stage 1 has potential to generate net long-term benefits in excess of £9,000 per child.

- This means that every £1 spent on the programme could generate more than £50 in benefits, making it a highly cost-effective intervention.
- These conclusions have been tested under a range of alternative assumptions, including the potential impacts of incurring these costs over multiple years throughout a child's primary school career. However, whilst the exact estimate of benefits may change, the conclusion that the intervention offers excellent value for money remains remarkably robust.

Our study adds to the growing evidence that the provision of food at school is a cost-effective way of improving academic attainment by demonstrating that the potential long-run benefits are likely to significantly out-weigh the short-term costs. As such, this strengthens the evidence that interventions such as those provided by Magic Breakfast represent excellent return on investment for children.

This is a timely finding as the Government is currently considering its future policy on school breakfast provision. The Department for Education's National School Breakfast Programme will end in July 2021 and the Government has indicated it is considering how to develop future approaches to school breakfast provision. Our report also indicates that an investment in school breakfasts could contribute to achieving wider Government policy objectives related to supporting young people to secure highly paid work. The Government's Industrial Strategy, for example, aims to 'generate greater earning power for all' and draws the connection between the quality of a child's education and their earnings later in life.<sup>3</sup>

Whilst we have demonstrated that our broad conclusions remain robust under a wide range of alternative assumptions, our analysis remains subject to a number of important evidence gaps that we would encourage Magic Breakfast and others to try and fill over time. In particular, developing further evidence on the extent to which improvements in academic outcomes are sustained over time and the potential scale of additional benefits from exposure to Magic Breakfast's support over a number of years is key to building a greater level of certainty around economic impacts going forwards.

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<sup>3</sup> Department for Business Energy & Industrial Strategy (2017): *Industrial Strategy; building a Britain fit for the future*

Providing the Magic Breakfast model of school breakfast provision for one year to pupils completing KS1 could generate long-term net benefits to the economy of

**£9,000**

per child

Every £1 spent on the programme could generate benefits in excess of

**£50**

If all 298,000 pupils who are completing KS1 at schools with high disadvantage in England received this model for school breakfast provision it could generate long-term benefits of

**£2.7 billion**

and £200 million for the 22,100 children in Scotland with the same conditions

## Introduction

This report, undertaken in partnership with Magic Breakfast and Heinz, provides an analysis of the cost-effectiveness of Magic Breakfast's free, universal, school breakfast provision. The provision, targeted at schools with a high proportion of disadvantaged children, is intended to ensure that no child starts the day too hungry to learn. School breakfast provision aims to improve children's energy, concentration, behaviour and overall readiness to learn, leading to improved academic performance.

Magic Breakfast is a registered charity delivering healthy breakfasts to children in the UK who arrive at school too hungry to learn, and providing expert support to their schools. The charity partners with over 960 schools in disadvantaged areas of England and Scotland and works with them to offer nutritious breakfasts to more than 167,000 children at risk of hunger at the start of the school day. Heinz and Magic Breakfast have a long-term partnership that began in September 2019. As part of this partnership, Heinz have donated No Added Sugar Banz to Magic Breakfast schools, significantly uplifting their donation during the COVID-19 pandemic. Heinz are also supporting Magic Breakfast to raise awareness of the scale of classroom hunger and build support for school breakfast provision as an effective solution.

Pro Bono Economics helps charities and social enterprises understand and improve the impact and value of their work, matching professional economists who want to use their skills to volunteer with charities.

In 2019 the Institute for Fiscal Studies, with the support of the Education Endowment Foundation, published an evaluation of Magic Breakfast's impact on academic attainment (referred to throughout as the IFS Report).<sup>4</sup> IFS concluded that there is evidence that children completing Key Stage 1 in schools with a Magic Breakfast provision performed better at Key Stage 1 compared to children completing Key Stage 1 in the business-as-usual control group<sup>5</sup>. Furthermore, there was evidence that attendance at school breakfast provision, not just eating breakfast, supported these improvements. Teachers also perceived an improvement in pupils' behaviour, resulting in an improved classroom environment for all children, even those who did not attend breakfast provision.

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<sup>4</sup> Carwford C et al. (2019): *Magic Breakfast Evaluation report and executive summary*, Institute for Fiscal Studies

<sup>5</sup> As discussed later in the note, there was no significant difference found for academic attainment amongst Year 6 pupils.

## Scope of this study

Our study builds on the evidence from the IFS Report to estimate the potential long-term economic benefits from the improvements in academic outcomes. We link the improvements in Key Stage 1 attainment to evidence on the long-term monetary impacts of an improvement in Key Stage 1 attainment.

The aim of this analysis is to allow us to compare the scale of the potential long-term economic benefits of the intervention to the scale of the costs of the programme in order to assess the likely value for money of the Magic Breakfast intervention.

It should be noted that this assessment is based on an evaluation of the impact of the programme over a single year, specifically for those children completing Key Stage 1 of primary school. As such, our analysis may not provide an accurate assessment of the cost-effectiveness of the programme over multiple years or for children in different age groups. Although formally assessing this is considered outside the scope of our report, we do explore the potential impacts it could have as part of our sensitivity analysis.



## Background

### Magic Breakfast

Magic Breakfast is a registered charity delivering healthy breakfasts to children in the UK who arrive at school too hungry to learn. The charity partners with over 960 schools in disadvantaged areas of England and Scotland and works with them to offer nutritious breakfasts to more than 167,000 children at risk of hunger at the start of the school day. As well as delivering healthy breakfast food to a school, Magic Breakfast works with staff to reach the target children in their school. This draws on years of collective best practice and strategies ensuring there is no stigma associated with receiving a breakfast and there are no barriers to accessing a breakfast. To reach all schoolchildren at risk of hunger, Magic Breakfast is also campaigning for long-term sustainable, Government investment in school breakfast provision.

In 2019, the Institute for Fiscal Studies, with the support of the Education Endowment Foundation, published an evaluation of Magic Breakfast's impact based on a study of 106 schools between September 2014 and July 2015. Schools were provided with healthy breakfast food deliveries, support from a Magic Breakfast School Partner, and a small grant towards up-front costs (i.e. freezers, toasters). The breakfast provision itself was delivered by school staff and volunteers.

The evaluation compared outcomes for 53 schools receiving Magic Breakfast support to a control group of 53 schools placed on a one-year waiting list for support. The allocation of schools to the treatment and control groups was not random, with London and other urban areas disproportionately allocated to the treatment group. Analytical techniques were used to control for this allocation, however some risk remains that part of the differences in outcomes observed could be down to factors other than the Magic Breakfast intervention<sup>6</sup>. The primary outcomes examined in the analysis were the impact of the Magic Breakfast intervention on the academic outcomes of the 2,473 pupils completing Key Stage 1 and 2,050 pupils completing Key Stage 2.

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<sup>6</sup> For more information on how schools were allocated and what factors were controlled for see 2019 revised IFS study: <https://www.ifs.org.uk/MBevaluation/Statement>

The analysis finds that:

- Key Stage 1 scores (for children in Year 2, aged 6-7) for maths and writing were 0.14-0.16 standard deviations<sup>7</sup> higher in schools receiving the treatment compared to those that didn't, the equivalent of around two month's academic progress.
- Key Stage 1 scores for reading improved by a slightly smaller amount but still significant at 0.12 standard deviations.
- Key Stage 2 scores (for children in Year 6, aged 10-11) were not significantly different, although it appeared that there was already greater pre-existing breakfast provision for this age group in the control group schools.

Other impacts identified in the report included a small reduction in school absence and an improvement in teacher-assessed behaviour and concentration. Furthermore, there was evidence of only a small increase in overall breakfast consumption which suggests that the primary impacts could be driven by a change in the content and context of breakfast, rather than the consumption of food in isolation.

### Other evidence on the impact of school meal provision

The findings of the IFS Report are broadly consistent with the picture provided by other evidence looking at the impact of nutrition on school performance.

An evaluation of the provision of free school meals to children of parents eligible for unemployment and low income in-work benefits compared outcomes for children in 3 pilot local authorities to 15 comparator local authorities who received no additional support.<sup>8</sup> The evaluation concluded that Key Stage 1 scores for children in areas that received the additional support tended to be around 0.07 - 0.12 standard deviations higher and results at Key Stage 2 appeared to be 0.12 standard deviations higher.

Studies more specifically focused on breakfast consumption also appear to demonstrate a link to academic outcomes.<sup>9</sup> For example, a cross-sectional study from the University of Leeds using a sample of 311 students aged 16-18 found that "rarely eating breakfast on school days" was correlated with GCSE point scores that were 0.14 standard deviations lower, even after

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<sup>7</sup> A standard deviation is a measure of the initial spread of observations for any outcome measure – it is often used in evaluations as a way of comparing changes between outcomes measured using different scales.

<sup>8</sup> Brown V et al. (2012): *Evaluation of the Free School Meals Pilot – Impact Report*, Department for Education Research Report DFE-RR227

<sup>9</sup> Adolphus K, Lawton C, Dye L (2013): *The effects of breakfast on behaviour and academic performance in children and adolescents*, *Frontiers in Human Neuroscience*

controlling for a number of other characteristics.<sup>10 11</sup> A cluster-randomised control trial of the Welsh Government's Primary School Free Breakfast Initiative using a sample of more than 3,000 children in Wales also found significant impacts from the provision of a free healthy breakfast on academic performance at Key Stage 2.<sup>12</sup>

However, we are not aware of any studies that have highlighted the potential long-term economic benefits from providing free school breakfasts. These long-term benefits are an important consideration for governments and potential funders when thinking about the cost-effectiveness of an intervention and are the focus of our study.

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<sup>10</sup> Adolphus K, Lawton C, Dye L (2019): *Associations between habitual school-day breakfast consumption frequency and academic performance in British adolescents*, *Frontiers of Public Health*

<sup>11</sup> As this study is cross-sectional it is likely that regular consumption of breakfast is correlated with other unobservable factors such as degree of parental support provided to a child and therefore may not accurately reflect the sole impact of regular breakfast consumption.

<sup>12</sup> Littlecott H, Moore G, Moore L, Lyons R, Murphy S (2015): *Association between breakfast consumption and educational outcomes in 9–11-year-old children*, *Public Health Nutrition*, 8(9)

## Our approach

### Analytical framework

The overall aim of our analysis is to provide an estimate of the average long-term economic benefits per pupil from Magic Breakfast's intervention and compare them to the costs per pupil to provide an overall assessment of cost-effectiveness. We break the remainder of this section into a discussion of how we assess the benefits of the intervention, the information available on costs and the approach we are taking to assessing cost-effectiveness.

### The economic benefits from Magic Breakfast

We take a three-step approach to assessing the potential benefits, summarised in Figure 2:

- Step 1 - Use the IFS Report to estimate the impact of Magic Breakfast on Key Stage 1 total point scores across 'main' subjects:**  
The IFS Report provides evidence of the impact of Magic Breakfast on scores for individual subjects within Key Stage 1 but we require an impact on total point score to link to evidence on the long-term economic impacts used in Step 2.<sup>13</sup> We estimate that, on average, Magic Breakfast added 0.25 points to pupils' Key Stage 1 scores - full details of our approach are available in Annex A.
- Step 2 - Use evidence from Paull & Xu (2017) to estimate long-term economic impacts from a 1-point improvement in KS1 point score:**  
Paull & Xu (2017) use an analysis of the National Pupil Database to estimate the long-term benefits of an improvement in Key Stage 1 scores by examining impacts on the likelihood of requiring special educational needs status, truancy, exclusions and GCSE results. These impacts are then, in turn, converted into impacts on monetary costs for education services and impacts on earnings for individuals up to the age of 60 using evidence from other sources.<sup>14</sup> Paull & Xu report their findings for a 3 point improvement in Key Stage 1 outcomes, discounted to the equivalent value for a pupil at age 3<sup>15</sup>. We need to adjust these figures so that they are representative for a pupil at age 6 and so that they reflect the general rise in costs and prices since the report was originally published. Full details of

<sup>13</sup> Reading, writing and mathematics are considered the 'main' KS1 subjects

<sup>14</sup> Paull G, Xu, X (2017): *Study of Early Education and Development (SEED) – the potential value for money of early education*, Department for Education

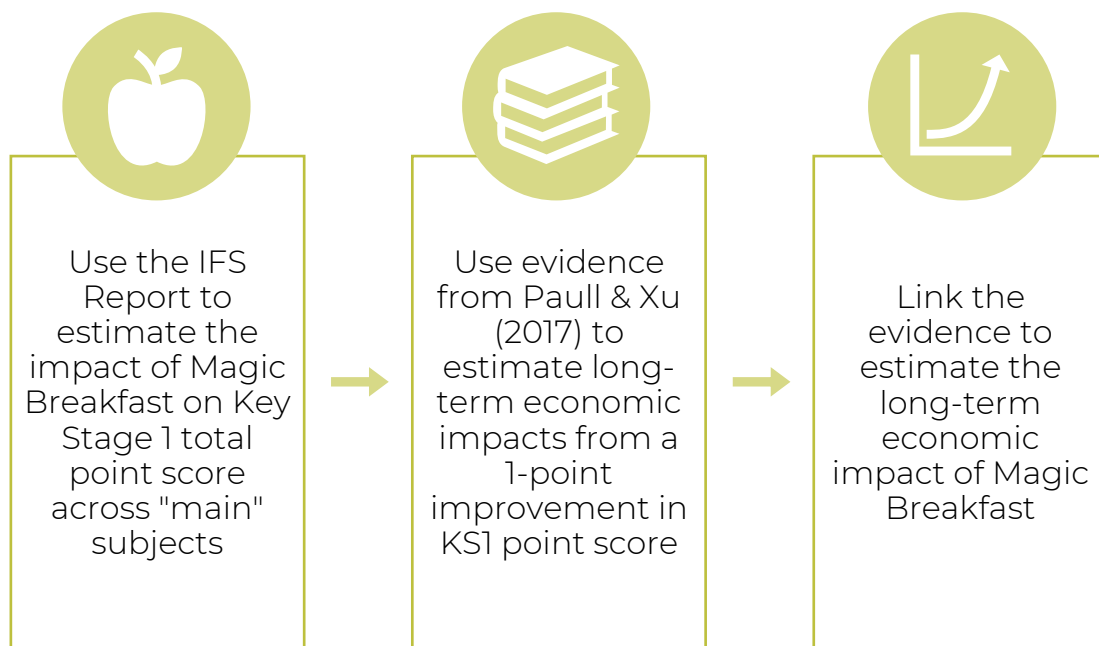
<sup>15</sup> Discounting involves the downward adjustment to flows of benefits in the future in order to reflect the preference of individuals and society to receive benefits sooner rather than later – it is standard practice for economic appraisals.

adjustments are provided in Annex A and a summary of the benefits per Key Stage 1 point improvement are provided in Table 1.

- **Step 3 – Link the evidence to estimate the long-term economic impact of Magic Breakfast:** we multiply the impact of Magic Breakfast on Key Stage 1 scores (from Step 1) with the long-run benefits of a 1 point improvement in Key Stage 1 scores (from Step 2) to provide an assessment of the long-run average benefit of Magic Breakfast for one year at the age of 6. The results of this analysis are provided in Table 1.

Throughout the report costs and benefits are expressed in 2019/20 prices and are discounted to age 6. Figures in tables are rounded to the nearest £1 for the purposes of transparency.<sup>16</sup>

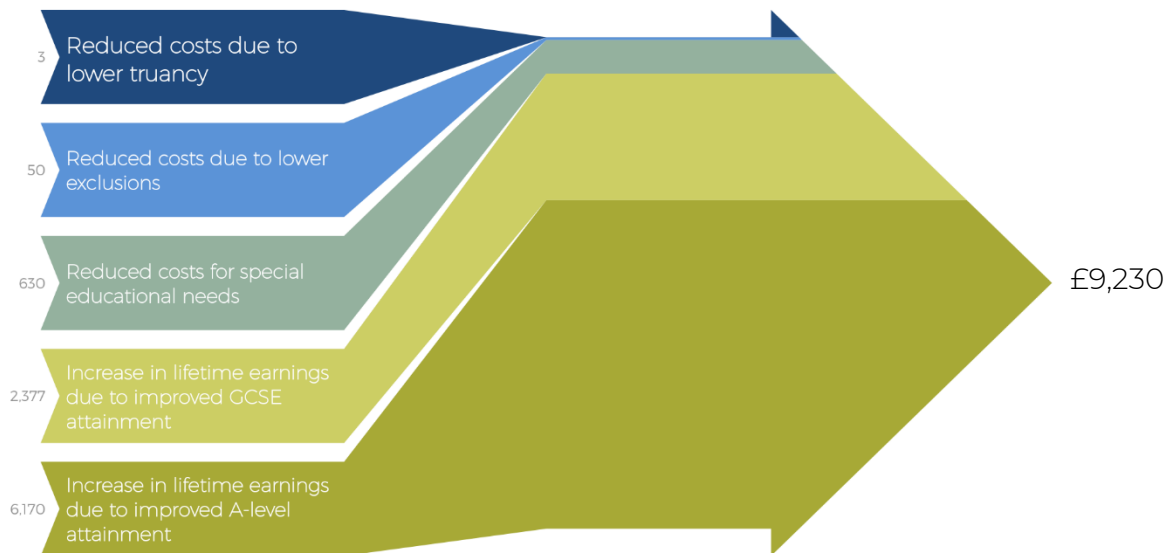
Figure 2. Summary of approach to estimating benefits



<sup>16</sup> We would emphasise that the inherent challenges in projecting outcomes for children over a long period of time mean that this level of precision does not reflect the true level of certainty in our results.

Figure 3. Summary of benefits

Type of benefit	Saving per point improvement in Key Stage 1 score based on Paull & Xu (2017)	Average saving per pupil from Magic Breakfast
Reduced costs for special educational needs	£2,543	£630
Reduced costs due to lower truancy	£12	£3
Reduced costs due to lower exclusions	£203	£50
Increase in lifetime earnings due to improved GCSE attainment	£9,595	£2,377
Increase in lifetime earnings due to improved A-level attainment	£24,908	£6,170
<b>Total benefits</b>	<b>£37,260</b>	<b>£9,230</b>



Note: Savings have been discounted to age 6.

Our analysis suggests that a 1-point improvement in Key Stage 1 performance across main subjects is expected to lead to over £37,000 of long-term economic benefits and that the estimated 0.25 point improvement in Key Stage 1 outcomes resulting from Magic Breakfast's intervention is likely to provide around £9,200 of benefits. Around 93% of this benefit is estimated to arise from increased lifetime incomes as a result of improved GCSE and A-Level results, with just under 7% arising from reduced costs for special educational needs and a very small proportion due to reduced costs of truancy and exclusions.

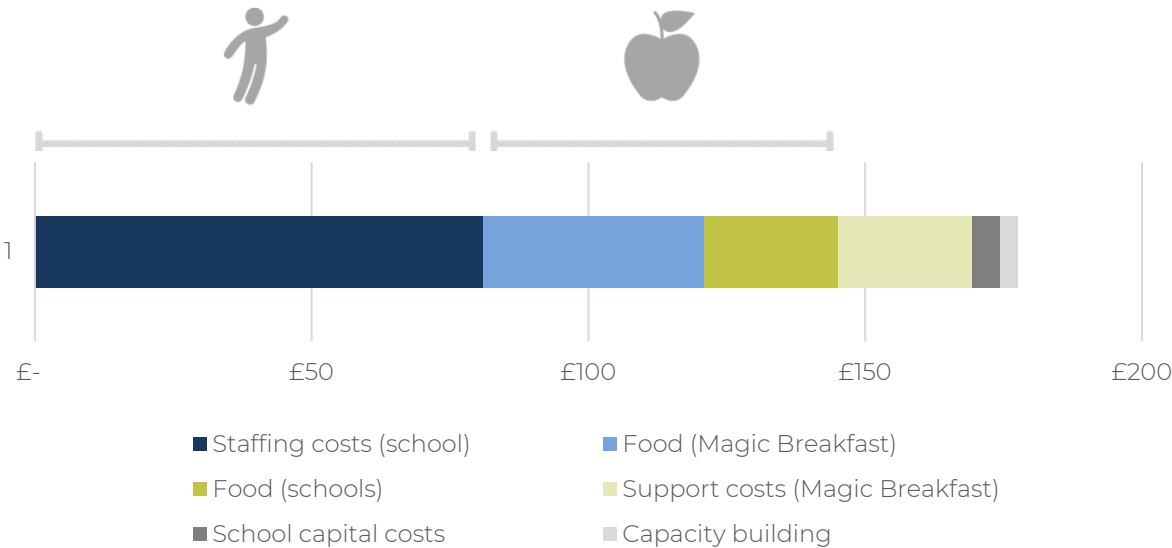
The costs of Magic Breakfast's intervention

Cost information was provided by Magic Breakfast. It incorporates:

- The total costs incurred by Magic Breakfast in 2018/19, including both direct costs relating to school breakfast provision and support costs associated with running the charity (based on 2018/19 Annual Accounts).
- Estimated costs incurred by the schools in the form of additional food provision, staff time and capital costs.

These total costs are divided by the total number of pupils supported (or the average number of pupils per school in case of school-level estimates) to provide an average cost per pupil of £178 per year. A breakdown of the costs is provided in Figure 4 and full details of the source for cost information is provided in Annex B.

Figure 4. Breakdown of cost estimates for Magic Breakfast



School staff costs account for the largest proportion of costs (around 46%) followed by food costs (36%) and Magic Breakfast support costs (14%). The remainder includes capacity building with schools and school capital costs.

We note that these estimated costs are significantly higher than those identified in Tables 16 and 17 of the IFS Report. The IFS Report calculates the cost solely from the perspective of a school (i.e. excluding Magic Breakfast costs) and excludes labour costs in line with Education Endowment Foundation guidance – these components account for 82% of the costs outlined above. However, for the purposes of this study it is important to include all costs identified in order to assess the full cost-effectiveness to society, in line with HM Treasury guidance.<sup>17</sup>

### Approach to assessing cost-effectiveness

We use two key metrics for assessing the cost-effectiveness of the programme:

- **The net benefit per pupil:** this is equal to the benefit per pupil minus the cost per pupil and provides an indication of how much extra benefit is generated per pupil supported.<sup>18</sup>
- **The Benefit Cost Ratio:** this is equal to the benefits divided by the costs and provides an indication of the benefits generated for each £1 spent on the programme.

### Key assumptions of the study

Our analysis is based on a number of assumptions, the most important of which are:

- Our analysis assumes the difference in academic outcomes identified in the IFS Report are caused by Magic Breakfast's support. As highlighted above, the allocation of schools to the treatment and control groups was not random, and, although the study controls for a wide range of factors, some risk remains that part of the differences in outcomes observed could be down to factors other than a Magic Breakfast.<sup>19</sup>
- We assume that the improvement in academic outcomes seen at Key Stage 1 for those receiving Magic Breakfast's breakfast provision

<sup>17</sup> HM Treasury (2020): *The Green Book; appraisal and evaluation in central government*, HM Treasury.

<sup>18</sup> Both costs and benefits should be discounted to present value, as outlined above.

<sup>19</sup> The original study was designed as a Randomised Control Trial. However, a coding error in the randomisation resulted in London and other urban areas being disproportionately assigned to the intervention group. In these areas' pupil achievement can be higher due to the number of interventions available. As a result, the revised study was changed to a control group study which accounts for whether schools were inside or outside of London/urban areas and for measures of previous school-level attainment to counter this error. Details of this method can be found in Appendix Z of the revised report. Both versions account for other pupil and school level-factors, for a full list of these please see the IFS 2016 report, section: Impact Evaluation.



will have the same impact on future GCSE and A-Level attainment as estimated in Paull & Xu (2017). We note that the IFS Report did not find a significant impact from Magic Breakfast at age 11, although this could have been a result of breakfast provision being commonplace for that age group in the control group.

- This analysis does not attempt to assess the impact of Magic Breakfast when provided over multiple years (i.e. throughout pupils' schooling years). It is unclear whether the academic benefits would increase over time or whether it would simply help to maintain the improvement in outcomes seen over a single year in the IFS Report. In the latter situation, the benefits would not increase as additional support is provided over multiple years but the costs would be seven times greater when accumulated over a whole primary school career.
- The long-term impacts of an improvement in Key Stage 1 results are based on evidence from the Paull & Xu (2017) paper drawing on an analysis of the National Pupil Database for pupils finishing compulsory schooling between 2013 and 2015 and other studies that look at the earnings of individuals that completed their education over a range of years. We are assuming that the scale of benefits observed in that study are appropriate for pupils today and that they are representative of the disadvantaged students targeted by Magic Breakfast.

We explore the implications of these assumptions in a series of Sensitivity Tests in the following section. However, given the importance of these assumptions, we believe that our estimates of cost-effectiveness should be treated as indicative of the broad scale of potential benefits rather than as precise measures of long-term impacts.

## Results of our analysis

### Key findings

Overall, our core scenario suggests that provision of Magic Breakfast's breakfast provision to schoolchildren completing Key Stage 1 for one year provides potential long-term benefits of around £9,200 per child, at a cost of just £178 per child. As summarised in Table 3, this means that:

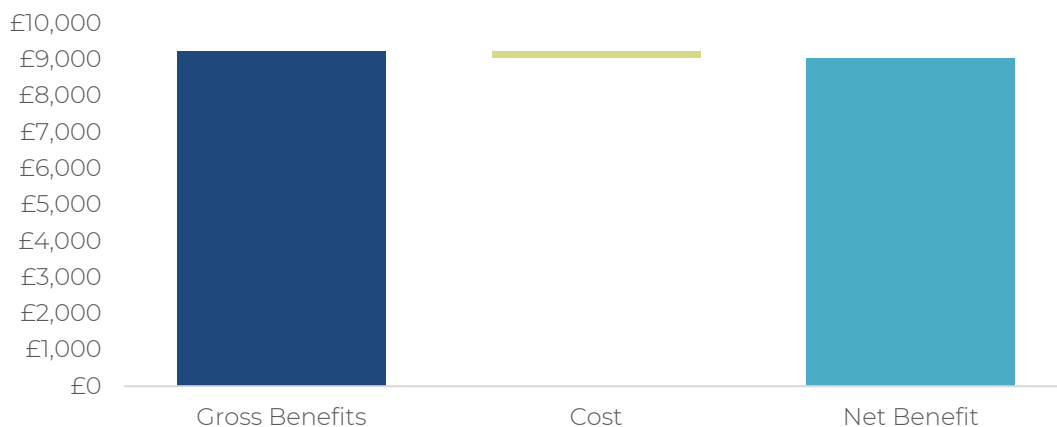
- The long-term net economic benefit per pupil is likely to be in excess of £9,000 and;
- The Cost-Benefit Ratio could be more than £50, meaning that for every £1 spent, Magic Breakfast potentially generates more than £50 in benefits.

Under this core scenario, a single year of Magic Breakfast's support for pupils completing Key Stage 1 appears to be highly cost-effective, delivering significant benefits relative to the cost.<sup>20</sup>

Figure 5. Summary of key findings

A: Benefit per pupil	£9,230
B: Cost per pupil	£178
Net Benefit per pupil (A-B)	£9,052
Benefit Cost Ratio (A/B)	£52

Figure 6. Summary of costs and benefits per pupil



<sup>20</sup> The Department for Transport considers any Benefit Cost Ratio greater than or equal to 4 as "Very High" value for money. See Box 5.1 of Department for Transport (2015): *Value for Money Framework*, Department for Transport

Around £4,000 of the £9,230 benefits generated for each child are likely to be in the form of reduced costs for government through lower demands on public services (through reduced SEN costs, truancy and exclusions) and increased taxation from the additional income earned by individuals over their lifetime.<sup>21</sup>

Magic Breakfast estimates that there were around 298,000 pupils completing Key Stage 1 at schools with high levels of disadvantage in England in 2019<sup>22</sup>. If all of these pupils had been able to access the Magic Breakfast model for school breakfast provision, then it would have generated around £2.7 billion in long-term economic benefits. In addition, there were 22,100 pupils in the equivalent year group in Scottish schools with high levels of disadvantage in 2019. If all of these pupils had been able to access the Magic Breakfast model of school provision, then we could expect it to generate a further £204m in long-term economic benefits.<sup>23</sup>

### Sensitivity analysis

In this section we explore the impact that these key assumptions may have on our results. We explore three alternative scenarios:

- **Sensitivity Test 1 – Reduced impact of Magic Breakfast on academic outcomes at Key Stage 1:** In this analysis we explore the impact of using the lowest end of the 95% confidence interval estimated around the impacts on KSI identified in the IFS Report.<sup>24</sup>
- **Sensitivity Test 2 – Assume that costs are incurred for the full seven years of a pupil’s primary school career:** In this analysis we explore the impact of assuming costs are incurred across the full seven years of a pupil’s career with no corresponding increase in the observed improvement in academic outcomes.
- **Sensitivity Test 3 – Identifying the “switching-point” for long-term cost savings:** In this analysis we explore how much smaller the estimated impacts of Key Stage 1 results on later outcomes would

<sup>21</sup> Paull & Xu (2017) estimate that 39% of lifetime income improvements accrue to government in the form of increased income tax and National Insurance payments, with the remainder representing an increase in private earnings for the individuals. This equates to £3,333 of the additional lifetime earnings being accrued to government in the form of increased taxation. This is added to the £630 in reduced SEN costs, £3 in reduced truancy costs, £50 in reduced exclusion costs per pupil – reaching £4,016 in total.

<sup>22</sup> More than 50% of pupils in Income Deprivation Affecting Children Index Bands A-F

<sup>23</sup> Magic Breakfast work with schools in Scotland that have at least 55% of children attending who come from the most deprived SIMD quantiles 1-2. We have used Scottish Government (2020): *School level summary statistics*, to identify the number of pupils in qualifying schools in year P3. Although Scotland does not operate formal KSI exams we assume that there would be an equivalent impact on academic attainment and long-term outcomes as seen in the England.

<sup>24</sup> A 95% confidence interval is a way of representing the uncertainty around a central estimate – it shows a range within which we can be 95% sure that the true value lies.

have to be before the programme would be considered not cost-effective.

We summarise the results from each of these sensitivity tests below before drawing some broader conclusions.

### Sensitivity Test 1 – Reduced impact of Magic Breakfast on academic outcomes at Key Stage 1

This sensitivity test is intended to explore the potential impacts if the findings in the original IFS Report were biased and did not identify a true causal relationship between the Magic Breakfast intervention or if the effects observed at Key Stage 1 were to fade-out over time. We have no way of knowing the scale of either of these impacts so are instead using the statistical uncertainty around the original estimates as an indication of the potential reduction in the relationship we might see.

If we adopt the lower end of the 95% confidence interval for estimated effect sizes in Table 4 of the IFS Report, then it would suggest that the average impact of Magic Breakfast on Key Stage 1 point score reduces from around 0.25 to around 0.05.

This alternative assumption leads to the scale of benefits per child being reduced from £9,230 in our core scenario to £1,904. This leaves us with a net benefit per child of around £1,700 and a Benefit Cost Ratio of around £11, meaning that £11 of benefits would be generated for every £1 spent.

### Sensitivity Test 2 – Assume that costs are incurred for the full seven years of a pupil's primary school career

This sensitivity test is intended to explore the potential impact if the Magic Breakfast intervention were applied for more than the single academic year used in the IFS Report. We deliberately look at a pessimistic scenario where the intervention is available for the full seven years of a child's primary school career; incurring additional costs but with no additional benefits. This is a deliberately extreme assumption as it's plausible that benefits could increase over time as learning in later years builds on the learning in earlier years. However, it is useful as a test of how sensitive our cost-effectiveness conclusions might be.

In this situation the benefits per child remain at £9,230 but the costs are assumed to increase from £178 to £1,163.<sup>25</sup> This means that the Net Benefit is reduced to around £7,300 and the Benefit Cost Ratio is reduced to £7, meaning that £7 of benefits would be generated for every £1 spent.

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<sup>25</sup> We discount the future costs incurred.

### Sensitivity Test 3 - Identifying the “switching-point” for long-term cost savings

This sensitivity test explores the impact if the long-term relationships between Key Stage 1 attainment and future benefits from Paull and Xu (2017) over-estimate the relationship for the cohort of children currently supported by Magic Breakfast. The original models estimating the link between Key Stage 1 outcomes and later outcomes using the National Pupil database were very well defined, with very small confidence intervals around the core estimate – using the 95% confidence interval would have provided very little variation in our results.<sup>26</sup> For this reason, rather than use statistical uncertainty we identify the “switching-point” – the reduction in estimated benefits required before the Magic Breakfast intervention no longer provides more benefits than it costs (a Benefit Cost Ratio of 1).

We would need to reduce the benefits by an enormous 98% in order to reduce the benefits to £178 – the same as the cost of the intervention. This would reduce the Net Benefit to £0, meaning that £1 of benefits are generated for every £1 spent.

#### Conclusions of sensitivity analysis

The results of our sensitivity analysis are summarised in Figure 7 below. We find that our alternative assumptions do have a dramatic impact on the level of Net Benefits and the Benefit Cost Ratio. However, the first two scenarios demonstrate that under plausible alternative assumptions Magic Breakfast’s intervention continues to demonstrate very good value for money. Our final scenario demonstrates that that our assumptions about future benefits would need to be drastically different before we would change our broad conclusion that the Magic Breakfast model of school breakfast provision provides excellent value for money.

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<sup>26</sup> The narrow confidence intervals were driven by a number of factors, including a large sample size. However, these intervals will not account for the possibility that the sample pupils in the Paull & Xu study were not representative of the group of pupils of interest to us, so is not an appropriate basis for this sensitivity test

Figure 7. Summary of sensitivity analysis

	Net Benefit per child	Benefit Cost Ratio
Core Scenario	£9,052	£52
Sensitivity Test 1 – Reduced impact of Magic Breakfast on academic outcomes at Key Stage 1	£1,731	£11
Sensitivity Test 2 – Assume that costs are incurred for the full seven years of a pupil's primary school career	£7,252	£7
Sensitivity Test 3 – Identifying the switching point for long-term cost savings	Long-term benefits need to be reduced by 98% before the Benefit Cost Ratio falls to £1 of benefits for every £1 spent	

## Conclusion and implications

Our study has assessed the potential value for money from Magic Breakfast's model of school breakfast provision in schools with a high proportion of disadvantaged students. It has drawn on an analysis by the Institute for Fiscal Studies that assesses the impact of Magic Breakfast's intervention on Key Stage 1 attainment and links this to established literature assessing the long-term economic impacts of improving Key Stage 1 outcomes.

Our key findings are as follows:

- Providing the Magic Breakfast model of school breakfast provision for one year to pupils completing Key Stage 1 could generate long-term benefits to the economy of around £9,200 per child. £4,000 of these benefits will go to Government through increased tax revenue and reduced public services costs.
- There are an estimated 298,000 pupils completing Key Stage 1 at schools with high levels of disadvantage in England. If all of these pupils received the Magic Breakfast model for school breakfast provision it would generate total long-term economic benefits of around £2.7 billion.
- In Scotland there are 22,100 children in the equivalent year group at schools with high levels of disadvantage. If all of these pupils received the Magic Breakfast model of school breakfast provision it could generate further long-term economic benefits of around £200 million.
- More than 90% of these benefits are likely to be in the form of improved life-time earnings for the beneficiaries, with the remainder due to reduced costs for special educational needs, truancy and exclusions.
- The cost of Magic Breakfast's school breakfast provision is around £180 per pupil per year. As such, breakfast provision for one year for those pupils completing Key Stage 1 has potential to generate net long-term benefits in excess of £9,000 per child.
- This means that every £1 spent on the programme could generate more than £50 in benefits, making it an highly cost-effective intervention.
- These conclusions have been tested under a range of alternative assumptions, including the potential impacts of incurring these costs over multiple years throughout a child's primary school career. However, whilst the exact estimate of benefits may change, the conclusion that the intervention offers excellent value for money remains remarkably robust.

## Implications

Our study adds to the growing evidence that the provision of food at school is an effective way of improving academic attainment by demonstrating that the potential long-run benefits are likely to significantly out-weigh the short-term costs. As such this strengthens the evidence that interventions such as those provided by Magic Breakfast represent excellent return on investment for children.

This is a timely finding as the Government is currently considering its future policy on school breakfast provision. The Department for Education's National School Breakfast Programme is currently due to end in July 2021 and the Government has indicated it is considering developing a future tender related to school breakfast provision.

Our report also indicates that an investment in school breakfasts could contribute to achieving wider Government policy objectives related to supporting young people to secure highly paid work. The Government's Industrial Strategy, for example, aims to 'generate greater earning power for all' and draws the connection between the quality of child's education and their earnings later in life. Investment in school breakfasts could help the Government make progress in line with this strategy. Generating greater earnings for all will also increase government revenue raised through taxation and decrease government spending on public services.

Whilst we have demonstrated that our broad conclusions remain robust to a wide range of alternative assumptions, our analysis remains subject to a number of important evidence gaps that we would encourage Magic Breakfast and others to try and fill over time. In particular, developing further evidence on the extent to which improvements in academic outcomes are sustained over time and the potential scale of additional benefits from exposure to Magic Breakfast's support over a number of years is key to building a greater level of certainty around economic impacts going forwards.



## Annex A – Details of benefit calculations

In this section we provide further details for our approaches to assessing the benefits from the Magic Breakfast intervention, specifically:

- **Step 1 - Using the IFS Report to estimate the impact of Magic Breakfast on Key Stage 1 total point score across “main” subjects:** providing further information on how the effect size findings from the IFS Report were converted into impacts on total point scores.
- **Step 2 - Using evidence from Paull & Xu (2017) to estimate long-term economic impacts from a 1 point improvement in KS1 point score:** further details on how our benefit estimates were derived from the Paull & Xu findings.

### Step 1 - Use the IFS Report to estimate the impact of Magic Breakfast on Key Stage 1 total point score across “main” subjects

Table 4 of the IFS Report provides a breakdown of the effect sizes observed for Key Stage 1 maths, reading and writing separately. However, we need an impact on total point score in order to link it to the evidence from Paull and Xu (2017) in Step 2.

To approximate the impact on total point scores we:

- Take the average effect size across the three individual subject areas (0.14)
- Convert the standard deviation of total points score across all subjects (3.0)<sup>27</sup> provided in Paull & Xu to an estimate of the standard deviation of total points scores in these three main subjects, by multiplying 3.0 by the proportion of the average total score made up by maths, reading and writing (59%)<sup>28</sup>, giving us an estimate of 1.8.<sup>29</sup>
- We then multiply the average effect size (0.14) by the estimated standard deviation (1.8) to get an estimated impact on total point score across main subjects of 0.25.<sup>30</sup>

This is summarised in the formula below:

$$\Delta P = \frac{\sum_{i=0}^3 d_i}{3} \times \sigma_{TOTAL} \times \rho$$

<sup>27</sup> From Table 38 of Paull & Xu (2017)

<sup>28</sup> From Table 8 of Paull & Xu (2017)

<sup>29</sup> Unfortunately, the standard deviation for the total of these three subject was not readily available. Our estimate effectively assumes that Key Stage 1 point score is scale invariant.

<sup>30</sup> This estimate is likely to be cautious as it effectively assumes that there was no impact from Magic Breakfast on other Key Stage 1 subject areas.

Where:

$\Delta P$  = change in Key Stage 1 total point score

$d_i$  = effect size for subject area  $i$

$\sigma_{\text{TOTAL}}$  = standard deviation of total point score

$\rho$  = the proportion of Key Stage 1 total average point score made up by maths, reading and writing subject areas

### Step 2 - Using evidence from Paull & Xu (2017) to estimate long-term economic impacts from a 1-point improvement in KS1 point score

We combine several key pieces of information from Paull & Xu (2017) to estimate the long-term economic benefits from a 1 point improvement in Key Stage 1 scores:

- We take the unit benefits for the different outcomes from Table 12 of Paull & Xu (2017) and discount them to Age 6 using a 3.5% real discount rate:
  - For special educational needs and truancy benefits we assume the raw costs from Table 12 are not discounted at all and instead assume that the costs are incurred uniformly between the ages of 8 and 16.
  - The exclusions and lifetime earnings benefits quoted in Table 12 are already discounted to Age 3 so we must do the opposite of discounting and “appreciate” their value forwards to age 6.
- We then inflate the costs from 2018/19 prices (used in the original source) to 2019/20 prices using ONS’s GDP deflator.
- We then multiply these discounted unit benefits by the change in each outcome linked to 1 point improvement in Key Stage 1 results across main subjects from Tables 24-27 in Paull & Xu (2017).

This approach is summarised in the formula below, with the results of key steps summarised in Table 5.

$$B_j = b_j \times \pi \times \beta_j$$

Where:

$B_j$  = benefit per child from a one unit increase in Key Stage 1 point score, for outcome  $j$ , discounted to age 6

$b_j$  = unit benefit per child for an improvement in outcome  $j$ , discounted to age 6

$\pi$  = factor for price differences between 2015 and 2018/19 based on ONS

GDP deflator, equal to 1.10

$\beta_j$  = coefficient of regression linking a Key Stage 1 outcome to outcome j

Benefit type	Reported unit benefit in Paull & Xu Table 12	Unit benefit discounted to age 6 (b <sub>j</sub> )	Unit benefit in 2019/20 prices (b <sub>j</sub> ×π)	Impact of a one-point improvement in Key Stage 1 total score on unit outcome (β <sub>j</sub> )	Benefit from a one-point improvement in Key Stage 1 total score (B <sub>j</sub> )
Special educational needs <sup>31</sup>	£4,190	£3,441	£3,773	-0.67	£630
Truancy <sup>32</sup>	£875	£719	£788	-0.02	£3
Exclusions <sup>33</sup>	£27,828	£30,853	£33,832	-0.01	£50
Lifetime earnings from GCSE attainment <sup>34</sup>	£105,225	£116,665	£127,929	0.08	£2,377
Lifetime earnings from GCSE attainment <sup>35</sup>	£184,570	£204,636	£224,393	0.11	£6,170

<sup>31</sup> The original unit used was the average cost of supporting formal SEN status for one year

<sup>32</sup> The original unit used was the average cost of tackling persistent truancy for one year

<sup>33</sup> The original unit used was the typical cost of a single exclusion

<sup>34</sup> The original unit used was discounted gross earnings uplift up to the age of 60 from obtaining 5 GCSEs at grade C or above

<sup>35</sup> The original unit used was discounted gross earnings uplift up to the age of 60 from obtaining at least one A-level

## Annex B – Details of cost information

Table 5 summarises the sources and basis for the cost estimates used in the study and Table 6 provides a more detailed breakdown of the costs used, adjusted from 2018/19 prices to 2019/20 prices using ONS GDP Deflator.

Table 5. Summary of sources for Magic Breakfast cost information

Type of cost	Description of sources
Magic Breakfast provision of food	Magic Breakfast annual report 2018/19, page 50, table 6, “activities undertaken directly 2019, food aid”
Magic Breakfast capacity building *	Magic Breakfast annual report 2018/19, page 50, table 6, “activities undertaken directly 2019, building capacity”
Magic Breakfast support costs	Magic Breakfast annual report 2018/19, table 6, “total support costs” + “activities directly undertaken 2019 making the case for change” + page 42 Statement of financial activities incorporating income and expenditure account for the year ended 31 August 2019, “expenditure on raising funds”
School provision of food (estimated)	Based on retail rate for purchasing milk for cereal and butter to spread on bagels.
School staff costs (estimated)	Based on an assumption of 3 teaching assistants staffing the breakfast provision for 1 hour a day. This works out to 15 hours of teaching assistant time a week. In total this is equivalent to around 40% of annual salary of a teaching assistant, with the full-time cost of a teaching assistant estimated to be around £20,000, including overhead costs such as National Insurance and pensions.
School capital costs (Magic Breakfast grant)	This is the standard start up grant of £500 provided to schools. This cost is not in the Magic Breakfast 2018/2019 accounts as the vast majority of schools weren't onboarded that year. The start-up grant is often used to buy equipment like a toaster or a freezer.

Table 6. Summary of cost estimates of providing school breakfasts

Type of cost	Total cost	Cost per school	Cost per child
Magic Breakfast provision of food	£1,926,688	£4,031	£40
Magic Breakfast capacity building *	£153,966	£322	£3
Magic Breakfast support costs	£1,170,122	£2,448	£24
School provision of food (estimated)	£1,159,827	£2,426	£24
School staff costs (estimated)	£3,917,426	£8,195	£81
School capital costs (Magic Breakfast grant)	£244,839	£512	£5
<b>Total cost</b>	<b>£8,572,868</b>	<b>£17,935</b>	<b>£178</b>

\* Capacity building resources are intended to help schools reach all children at risk of hunger more effectively



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