# How far behind in number are socioeconomically disadvantaged pupils when they start school in England?

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# How far behind in number are socioeconomically disadvantaged pupils when they start school in England?

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## Abstract

This paper examines the gap in number skills between socioeconomically disadvantaged and non-disadvantaged children in the first year of compulsory schooling in England. Past research mostly relies on statutory assessment data collected towards the end of the first year of school and does not show the attainment gap associated with socioeconomic disadvantage when pupils begin school, nor does it measure the size of the gap. The analysis presented here uses primary data from number assessments conducted in autumn 2023 and summer 2024 with 3018 pupils in 169 schools alongside National Pupil Database records to provide a new perspective on early number attainment. It finds that pupils defined as socioeconomically disadvantaged in their first year of school achieve number assessment scores 23.6% lower than other pupils. The effect size ($g = 0.51$) remains the same in follow-up assessments at the end of the school year. These findings have implications for government policy given stated commitments to increasing the number of pupils achieving a good level of development in statutory assessments at age 5.

KEYWORDS

administrative data, early years, number, socioeconomic disadvantage

**Key insights**

**What is the main issue that the paper addresses?**

This paper uses primary data to examine the socioeconomic attainment gap in number among pupils at the start of their first year of school. Previous research has largely relied on statutory assessment data, which is collected at the end of the first school year and currently distinguishes only between pupils meeting and not meeting the expected standard.

**What are the main insights that the paper provides?**

The analysis shows that children in England defined as socioeconomically disadvantaged begin school with weaker number skills than their peers (23.6%, or 0.51 standard deviations). A substantial attainment gap remains at the end of the first school year.

## INTRODUCTION

Early years education has become central to the discourse around socioeconomic disadvantage. Renewed interest in early childhood is exemplified by the UNICEF (2025) mandate stating the rights of every child to grow up safe, healthy, educated and empowered. Mathematics has been central to discussions of socioeconomic achievement gaps and has been a focus of policy makers (Hodgen et al., 2022), particularly in relation to cultural and economic capital, and how this perpetuates inequality (Bourdieu, 1977). Bourdieu argues that family plays a critical role in an individual acquiring cultural capital (Bourdieu & Wacquant, 1992), and a growing body of research highlights the role of home in the development of numeracy skills.

In a review, Dowker (2021) finds that an impactful home numeracy environment should include mathematical activities offered by parents beyond those directly available to children. Research suggests that the relationship between parental expectations and child numeracy performance is mediated by numeracy activities (Mak et al., 2024). Other studies have shown that the activities provided by parents appear to affect their children's numeracy performance (Lefevre et al., 2002). As mathematical development is cumulative (Baroody et al., 2012), early attainment gaps are likely to widen over time. Children from low-income backgrounds typically have poorer mathematics outcomes and can already be behind before they start school (Dowker, 2008; James-Brabham et al., 2023; Short & McClean, 2021), demonstrating the importance of the home environment.

Mathematics is increasingly vital in a competitive economy requiring numerate graduates (Mujtaba et al., 2014). Early mathematics focuses on number and number sense (Raghubar & Barnes, 2017). It involves understanding the value and relationships between numbers and is a foundation for all higher-level mathematics (Feikes & Schwingendorf, 2008). There is evidence that early number sense is related to applied problem-solving ability later on (Jordan et al., 2010), and that mathematical knowledge at school entry predicts later mathematical achievement (Duncan et al., 2007), yet a systematic review identified 'a significant lack of research' on mathematics education for children under 4 years of age (Simpson & Linder, 2014). In England, this lack of research is compounded by the limitations of assessment data available for pupils in the first year of school, making it difficult to evidence the learning needs of children of this age and to identify attainment gaps associated with socio-economic disadvantage.

Early number competencies such as early numerosity, symbolic and non-symbolic representations, cardinal values and verbal counting are best promoted through active learning opportunities and are dependent on the input received by the child (Clements & Sarama, 2007). Children with a secure understanding of these principles are able to progress quickly, and difficulties in learning mathematics have been traced to weaknesses in these areas (Mazzocco & Thompson, 2005). Number abilities therefore appear highly sensitive to socioeconomic status, which highlights the importance of early input and instruction (Jordan et al., 2010). This includes the home environment and early interactions with adults in formal childcare and education settings.

Both the OECD (2025) and the Department for Education (DfE, 2024a) see teachers and schools as instrumental in breaking intergenerational inequalities and strengthening cultural capital. The Best Start in Life (DfE, 2024a) strategy emphasises the importance of early education, particularly for children from socioeconomically disadvantaged backgrounds, who often 'need more opportunities to develop the wider habits and capacities for learning that they will need for later success' (DfE, 2024a, p. 13). The UK government aims to increase the percentage of five-year-olds assessed as having a good level of development in key learning areas from 67% in 2024 to 75% by 2029 (DfE, 2025). Behind these headline figures lies a gulf in attainment between poorer pupils and their peers. Only 51.5% of socioeconomically disadvantaged pupils, defined by eligibility for free school meals (FSM), currently reach a good level of development compared with 72% of those defined as non-disadvantaged.[1] As socioeconomically disadvantaged pupils are less likely to reach a good level of development, narrowing this attainment gap would help the government to achieve its goal.

This government target reflects increased awareness of the importance of early years education. However, the metric chosen to determine whether children that start school 'ready to learn' (DfE, 2025, p. 12) is an assessment undertaken at the end of the first year of school. This is not a measure of a child's ability when they start school. As very little data is available on pupil ability during the first weeks of school, it is understandable that data collected towards the end of the first school year is used as a proxy.

In September 2021, the Reception Baseline Assessment was introduced to assess literacy, communication, language and mathematics skills within the first 6 weeks that a child is in school. Teachers are responsible for administering and marking the assessment. The numerical marks are then reported to the Department for Education, but they are not published, shared with parents, or stored in the National Pupil Database (NPD), unlike the results from other statutory assessments which can be accessed by accredited researchers under certain conditions. The Reception Baseline Assessment is intended as a measure against which pupil progress at the end of primary education (age 10–11) can be gauged (Standards and Testing Agency, 2024). However, it does not enable researchers to study the attainment gap as the results are not made available, despite recommendations for baseline assessments to be conducted when pupils arrive at new settings (Ofsted, 2014, p. 8).

The shortage of evidence on early maths and socioeconomic disadvantage is addressed in this paper, which uses primary data from number assessments conducted with 3018 pupils during their first 3 months of school to measure the attainment gap between socioeconomically disadvantaged pupils and their peers. The analysis makes two important contributions to the literature. Firstly, it generates an insight into the socioeconomic disadvantage gap in pupil number ability at an earlier stage of education than can be observed using administrative data from statutory assessments. Secondly, it gauges the extent to which socioeconomically disadvantaged pupils are behind their peers in number, using assessment data scored on a continuous scale. It shows that socioeconomically disadvantaged pupils start school with number skills substantially weaker than other pupils. Results from follow-up assessments show that the attainment gap is of a similar magnitude at the end of the first school year.

## BACKGROUND

In England, the educational performance of pupils defined as socioeconomically disadvantaged has caused concern for some time (Strand, 1999). The attainment gap between these pupils and others has been highlighted by academic researchers (Gorard, 2012; Rose et al., 2024) and in official publications (Ofsted, 2014; Social Mobility Commission, 2024). The percentage of pupils reaching the expected standard in key subjects varies by geographical area (Cattan et al., 2024), yet poorer pupils lag behind their peers at every stage of education (EPI, 2024). The links between childhood poverty and poorer outcomes in school (Joseph et al., 2024; Sylva et al., 2014) and later in life (Allen, 2011) are well established. Interest in the potential benefits of early intervention has intensified accordingly. However, data on the attainment of pupils in the first year of school is scarce compared with what is available for older children. This lack of evidence is addressed by this paper.

The Education Endowment Foundation (EEF) was founded in 2011 with the aim of severing the link between socioeconomic background and educational achievement. EEF is the largest funder of educational evaluations in England, with an emphasis on studies employing experimental designs (Dawson et al., 2018). Each of their randomised controlled trials includes additional analyses of socioeconomically disadvantaged pupils, in line with their stated aim of improving attainment among this group. EEF has commissioned over 100 trials since their inception but very few of these have involved pupils in the first or second year of primary school (known in England as Reception or Year 1). The shortage of assessment data for children of this age is probably a reason for this.

When evaluating educational interventions, EEF encourage the use of outcome measures from administrative data where possible as it has low rates of missing data and no additional data collection costs. In England, national assessments take place when children are 5, 11 and 16 years old. The assessment at age 5, the Early Years Foundation Stage Profile (EYFSP), was introduced in 2005 and has been a statutory framework since 2008 (Melhuish, 2016). It has been subject to revision but remains in use today. Results can be accessed for research purposes, yet the EYFSP data are more limited than what is available for older pupils as the marks are recorded categorically. Until 2022, pupils were assessed as exceeding, meeting or working towards the expected standard across a set of learning aims. From 2022, the three-point schema was replaced by a binary measure denoting whether or not pupils are meeting the expected standard. This reduces the scope for distinguishing between different levels of attainment among pupils of this age.

The socioeconomic disadvantage gap for early years pupils has been examined using statutory assessment data (EPI, 2024; Melhuish & Gardiner, 2020, pp. 46–48), despite the limitations inherent in the measurement format. EYFSP takes place towards the end of the first school year, and there is no publicly available attainment measure from the start of the first year. As demonstrated above, the EYFSP is sometimes presented as a measure of attainment or ability for pupils as they start school, yet it would be more accurate to call it a snapshot of the first point at which national level assessment results are published. There are also questions about the validity and accuracy of EYFSP, which is not adjusted to account for pupil age within the year group. Results are strongly predicted by month of birth, and it has been argued that EYFSP measures age rather than development (Campbell, 2022).

While the issues with EYFSP are clear, examples of using other measures are rare due to the paucity of data for children aged 4–5. There are some exceptions; for instance, Strand (1999) used data from assessments conducted in one London borough along with national test data and found that pupils eligible for FSM began school behind their peers, falling further behind during Key Stage 1 (age 6–7). This analysis used administrative data collected at local level, but such opportunities for researchers have been scarce, creating an evidence gap. The reliance on data collected at the end of the first school year as a proxy for ability at the start of school is unsurprising when alternatives are in such short supply.

As the EYFSP data is only a series of binary measures, there are limits to what it can say about differences in ability between pupils. The Education Policy Institute annual report (2024) focuses on the attainment gap between socioeconomically disadvantaged pupils (defined as being registered for FSM at any point in the past 6 years, although for children in the first year of school this means currently registered for FSM) and others. It looks at 12 of the 17 learning aims comprising the EYFSP assessments and counts the total number on which a child has reached the expected level. This provides a picture of pupil development overall, but the data does not allow for specific learning aims to be examined separately beyond the simple dichotomy of whether or not the expected level of progress has been attained. Moreover, the data offers no detail on the socioeconomic disadvantage gap in terms of how far poorer pupils are behind their peers on any given subject. This is a significant constraint, particularly regarding key subjects such as number.

The Children's Commissioner, an independent appointment by the UK government to promote and protect the rights of children, found that 29% of pupils were not meeting the expected standard across all 17 early years learning aims, rising to 45% among socioeconomically disadvantaged pupils (Children's Commissioner, 2020, p. 10). In terms of number as a specific learning area, official figures from 2023/2024 show that 65% of socioeconomically disadvantaged pupils, defined as eligible for FSM, reached the expected standard in number at the end of the Reception year, compared with 82% of non-disadvantaged pupils.[2] As maths skills at school entry have been shown to predict educational achievement later on (Duncan et al., 2007), and children with lower levels of cognitive development at age 5 demonstrate worse outcomes into adulthood (Cattan et al., 2024), this is clearly of great importance. If disadvantaged pupils are behind when they start school, there is evidence that the attainment gap persists, with poorer outcomes for pupils from poorer backgrounds continuing throughout education (EPI, 2024). However, as existing statutory data does not measure the extent of the attainment gap, it is difficult to know how far behind disadvantaged pupils really are.

To summarise, attempts to quantify the attainment gap between socioeconomically disadvantaged pupils and others at the start of school have two main limitations. Firstly, such efforts have been restricted to analysis of categorical data with no detail about the size of the gap. Secondly, the data comes from statutory tests conducted at the end of the first year of compulsory schooling, which do not measure pupil ability at the very beginning of their education. This paper addresses both of these issues by using primary data from number assessments conducted with children aged 4–5 during their first 3 months of school. The test scores allow us to see how far behind in number socioeconomically disadvantaged pupils are when they start school, giving an original perspective on the attainment gap with data collected at an earlier point than has been available previously, in a level of detail beyond the scope of binary measures used in the statutory assessments of specific learning areas.

## DATA AND METHODS

The dataset was compiled during an evaluation of an intervention designed to improve number sense among pupils during the first year of school. The intervention, Counting Collections, is developed and delivered by The University of Nottingham, and the study was funded by the EEF. In September 2022, the authors were appointed as the independent evaluator to study the impact of Counting Collections on pupil progress in number during the Reception year. The study design was a clustered randomised controlled trial, with pupils clustered into schools. Any mainstream maintained school with at least 20 pupils in the 2023/2024 reception cohort was eligible. A total of 180 schools were recruited by the developer, and these were randomly allocated to either the intervention group that delivered Counting Collections to one Reception class during the 2022/23 school year or the control group that taught Reception pupils number with a business-as-usual approach during that time.

The number of pupils participating in the evaluation was limited to 20 per class and one class per school. Schools with more than one Reception class were asked to select one. When the class size exceeded 20, the authors randomly selected 20 pupils to take part. The parents/carers of each pupil were sent a participant information sheet outlining the study and stating the legal basis for processing personal data under GDPR. Further details about the sample, including power calculations, are published in the evaluation report (Culliney et al., 2025).

## Assessing number

In designing the Counting Collections evaluation, it became clear that existing statutory assessment data, collected at the end of the Reception year and published only as a binary indicator for each learning aim, would not adequately measure the effect of Counting Collections on pupil number progress. The Sandwell Early Numeracy Test (Reception version, henceforth SENT-R), published by GL Assessment for use with pupils aged 4 to 8, was identified as an appropriate measure of number skills. It was decided that SENT-R should be administered at the beginning of the school year and again during the final weeks to assess pupil progress in number over the study period.

SENT-R has two components (A and B), which contain questions in the same format but with slight variations. In both versions, pupils are asked a series of questions alongside visual aids and manipulatives. SENT-R is suitable for measuring the impact of classroom interventions on a pre- and post-test basis and has been used this way in previous research (Torgerson et al., 2011, p. 49). It gauges five strands of numeracy: identification, oral counting, value, object counting and language. Each strand has been written to be progressively more difficult. They are not validated for use as standalone scales and, as such, have not been analysed separately. Assessors are supplied with a script. Testing continues until two consecutive incorrect answers are given under each strand or all questions are completed. Administration time therefore varies. A Cronbach's alpha value of 0.965 is reported based on the standardisation sample of 1568 pupils across 17 schools (Arnold et al., 2011). One important advantage of SENT-R over the number element of the statutory EYFSP is that it is scored on a continuous scale, which allows for number ability to be assessed beyond the simple binary of meeting expected standards or not, as has been the case with the statutory EYFSP test since 2021.

Baseline testing was conducted in 170 schools, with 3025 pupils assessed between 25 September and 24 November 2023. No assessments took place until the third week of the school year as it was decided that testing during the first 2 weeks would be too disruptive for children. Nevertheless, the data collected provides a more accurate picture of pupil ability upon entering school than the EYFSP data, which is collected at the end of the first year, not at the beginning. One school withdrew from the study before follow-up data collection. From the 169 remaining schools, 2740 pupils completed outcome testing in June and July 2024, as the study cohort reached the end of their first school year.

Pupil number assessments were administered in schools by students and teaching assistants recruited via universities and supply agencies in the study areas. These individuals received training from the subcontractor appointed by the authors to organise the testing. The assessor induction programme was codesigned by the authors, who helped to deliver some of the training and the online question and answer sessions for assessors before they began data collection. Completed assessment papers were posted back to the subcontractor for data entry and quality assurance. A random sample was sent to the evaluation team for further moderation at both baseline and follow-up. These procedures ensured consistency and data quality.

## Defining socioeconomic disadvantage

In England, the main method of defining pupil socioeconomic disadvantage is eligibility for FSM. To qualify, the parents or carers of the pupil must be in receipt of at least one state benefit from a list including Income Support or Jobseekers Allowance.[3] Parents/carers are required to register FSM eligibility with their child's school, but this does not always happen. The proportion of pupils eligible but not claiming FSM has been estimated at between 10% and 20% (Iniesta-Martinez & Evans, 2012; Lord et al., 2013); while these figures are somewhat dated, it is accepted that pupil poverty is underreported by the FSM measure (Campbell & Cooper, 2024).

Information on pupil socioeconomic disadvantage is collected via the School Census, where schools report the FSM status of each pupil to the Department for Education. The data is available at individual level to accredited researchers through the NPD and can be analysed in conjunction with attainment data also stored in the NPD or with other data collected by researchers, as is the case here. FSM status is a binary measure, with no distinction between degrees of poverty. This has prompted some criticism (see Taylor, 2018 for a discussion, also Campbell & Cooper, 2024; Hobbs & Vignoles, 2010), yet in England it remains the dominant approach to defining childhood socioeconomic disadvantage for education research. NPD response rates are close to 100%, with 3018 of the 3025 pupils completing baseline assessments in this study successfully matched to their NPD records. This is superior to alternatives such as survey datasets which often suffer from missing data.

Government statistics show that 17.7% of pupils in the Reception year group (the first year of compulsory education in England) were eligible for FSM during the study year, 2023/2024. FSM eligibility in the sample studied here was higher. Among pupils that completed baseline assessments, 24.2% (730 of 3018) were FSM according to NPD records, as were 650 (23.3%) of the 2740 pupils completing outcome assessments. These small differences suggest that attrition did not substantially change the sample profile in terms of pupil socioeconomic disadvantage, yet the overall figures mask important variation between participating schools. Not all of the schools in the follow-up assessment sample (152 of 169) had any pupils defined as FSM. Of those that did, the number of FSM pupils ranged from one to 16, from a maximum of 20 pupils per school. This illustrates the wide range of schools present in the dataset. As context is important (Campbell, 2022), the percentage of pupils defined as FSM in each participating class is included as a covariate in the multivariate analysis presented below to examine peer effects from the observed levels of socioeconomic disadvantage in each school.

## Sample profile

Table 1 shows that participating schools contained a higher proportion of pupils defined as disadvantaged (30%) than the national average (23%). The figures for each school were obtained from publicly available data that can be freely accessed online. To understand the

**TABLE 1** Profile of schools in the study for follow-up assessments in summer 2024.

| | *N* | % |
|---|---|---|
| East Midlands/South Yorkshire | 90 | 53.25 |
| North East | 40 | 23.67 |
| South West | 39 | 23.08 |
| Rural | 30 | 17.75 |
| EIA | 117 | 63.23 |
| Ofsted outstanding | 29 | 17.16 |
| Ofsted good | 128 | 75.74 |
| Ofsted requires improvement | 9 | 5.33 |
| Ofsted missing | 3 | 1.78 |
| Number of pupils per school | 344 | |
| Percentage of FSM-eligible pupils per school | 30 | |

*Source*: DfE schools data.

profile of the pupils taking part in this study, it is necessary to use individual level data from the NPD. This is classed as personal data and requires an application to the Department for Education, but when combined with the assessment data collected during this study, it provides a level of detail that cannot be achieved with aggregate data.

Participating schools were recruited by the programme developer in four geographical regions of England. They were treated as three regions in this study, as recruitment was extended from the East Midlands into South Yorkshire to ensure that the target number of schools was reached. Just over half of schools were in the East Midlands/South Yorkshire area. The remainder were in the South West or the North East. Thirty schools (17.8%) were in rural areas, and three quarters of schools (75.8%) were rated as 'Good' in their latest Ofsted inspection, similar to the national average (79%). The mean number of pupils per school was 344, slightly above the national average for primary schools (288), and the percentage of pupils classed as FSM was 30%, above the national average (23%). These figures relate to the entire school and not the specific sample of Reception pupils taking part in this study.

One possible reason for the percentage of FSM pupils in the sample exceeding the national average is that the study received support from the Department for Education Accelerator Fund. This required at least half of schools to be located in Education Investment Areas, which are defined by low educational attainment, in turn associated with higher socioeconomic disadvantage. More than half of participating schools ($N=117$, 63.2%) were in Education Investment Areas. It is also worth noting that FSM eligibility rates are lower among participants in the South West than in the other study areas. Despite this, the dataset offers the unique opportunity to measure number skills among pupils during their first weeks of school using a granular scale beyond binary assessment levels.

## ANALYSIS

Results from the baseline assessment carried out in the first 3 months of the school year show that socioeconomically disadvantaged pupils recorded lower scores (mean = 14.29, SD = 7.55) than others (mean = 18.64, SD = 8.45). These are the raw scores achieved by pupils taking the test (see Table 2). One way to look at this difference is that the mean score for socioeconomically disadvantaged pupils is 76.4% of that attained by the other pupils.

**TABLE 2** Pupil number assessment scores at start and end of reception year.

| | Start of year | Start of year (also completed summer 2024 follow-up assessment) | End of year |
|---|---|---|---|
| *Non-FSM* | | | |
| Mean | 18.37 | 18.64 | 27.52 |
| SD | 8.48 | 8.45 | 9.66 |
| *N* pupils | 2288 | 2090 | 2090 |
| *FSM* | | | |
| Mean | 14.03 | 14.29 | 22.65 |
| SD | 7.43 | 7.55 | 8.56 |
| *N* pupils | 730 | 650 | 650 |
| *Total* | | | |
| Mean | 17.32 | 17.61 | 26.36 |
| SD | 8.45 | 8.45 | 9.63 |
| *N* pupils | 3018 | 2740 | 2740 |
| *Socioeconomic disadvantage gap as %* | 23.6% | 23.3% | 17.7% |
| *Effect size (Hedges' g)* | 0.51 | 0.51 | 0.51 |

*Source*: Authors' evaluation data, NPD.

Expressed in this manner, socioeconomically disadvantaged pupils are 23.6% behind other pupils in terms of number skills at the beginning of their first year in school. Another approach is to calculate an effect size, presenting the attainment gap in standardised units by dividing the mean difference (18.64–14.29 = 4.35) by the total standard deviation of the mean (8.45). This produces an effect size of 0.51 standard deviations. If the sample is restricted to pupils that remained in the study until follow-up assessments took place in June and July 2025, the overall scores increase slightly. This reflects pupils who were lost to follow-up receiving marginally lower scores on the baseline test, yet the mean difference (18.37–14.03 = 4.34) is almost identical, again giving an effect size of 0.51 standard deviations.

This study also collected data at the end of the school year, with the same pupils undertaking follow-up assessments in number. Table 2 shows the raw scores. Pupils recorded higher scores overall on the number test at follow-up, as they had all received at least 6 months of additional schooling by the time of the second test. Scores for socioeconomically disadvantaged pupils (mean = 22.65, SD = 8.56) remained lower than those achieved by others (mean = 27.52, SD = 9.66). Expressed as a percentage, socioeconomically disadvantaged pupils achieved scores that are 82.3% of the mean for other pupils. This suggests that the socioeconomic disadvantage gap had narrowed over the first year of school. However, the total standard deviation is higher than at baseline (9.63), reflecting a widening range of attainment over the study period. The effect size ($g = 0.51$) is equal to that observed in the baseline assessments taken at the start of the school year.

The findings presented thus far show that the socioeconomic disadvantage gap observed at the start of the first year of school remains intact at the end of that year. While socioeconomically disadvantaged pupils are still behind in number after one school year, the gap has not increased, nor has the early experience of school enabled them to catch up. However, as it is possible that other factors have exerted an influence, multivariate analysis can offer further insights. The data used here were collected as part of a study into the efficacy of a classroom intervention that was delivered in around half of the schools at which these pupils were enrolled. It is possible that exposure to this programme has affected the number progress of participating pupils. Half of the schools also reported using Mastering Number, another intervention seeking to improve pupil number that is available free of charge and used at over 10,000 schools in England.[4]

Pupil progress in number over the study period was measured using multilevel modelling, with pupils clustered into schools and follow-up SENT-R scores as the outcome. Table 3 presents the results. As a reminder, this data was collected when the children were in the final 6 weeks of their first year of compulsory education, around the same time as the statutory EYFSP assessments take place for pupils of this age. Model 1 shows that socioeconomic disadvantage is associated with lower marks on the assessment ($B=-4.12$, $SE=0.43$, $p<0.05$). Once the baseline variables are included (Model 2) there remains a negative effect of socioeconomic disadvantage on number test scores, but the coefficient is reduced substantially ($B=-0.83$, $SE=0.29$, $p<0.05$). What is clear from this model is that scores on the follow-up test, taken at the end of the school year, are predicted powerfully by scores on the baseline test from the start of the school year. This applies to both school ($B=0.61$, $SE=0.07$, $p<0.001$) and pupil ($B=0.86$, $SE=0.01$, $p<0.001$) level baseline assessment scores.

In Model 3, additional covariates are included. The socioeconomic disadvantage coefficient is further diminished ($B=-0.26$, $SE=0.42$, not significant at $p<0.05$ level). Baseline assessment scores remain strong predictors. Each point scored on the baseline test is associated with 0.85 points on the follow-up test ($SE=0.02$, $p<0.001$). For school level baseline test scores, the relationship is weaker ($B=0.54$, $SE=0.07$, $p<0.001$) but the pattern remains clear. Some variation according to study region also emerges, with pupils in the North East region achieving less progress than those in the East Midlands/South Yorkshire region (the reference group, with more participants in the study sample than the other regions), and pupils in the South West outperforming the others ($B=1.21$, $SE=0.59$, $p<0.05$). This is consistent with expectations given regional differences in educational attainment. Month of

**TABLE 3** Multilevel model measuring pupil progress in number over reception year.

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| FSM | −4.12 (0.43)*** | −0.83 (0.29)*** | −0.26 (0.42) |
| Centred school mean baseline | | 0.61 (0.07)*** | 0.54 (0.07)*** |
| Centred pupil baseline | | 0.86 (0.01)*** | 0.85 (0.02)*** |
| Counting Collections | | | 0.86 (0.47) |
| Counting Collections*FSM | | | −0.82 (0.58) |
| *Region (ref East Mids./South Yorks.)* | | | |
| North East | | | −1.10 (0.56) |
| South West | | | 1.21 (0.59)* |
| Mastering Number | | | 0.39 (0.46) |
| Month of birth | | | 0.08 (0.03)* |
| % FSM | | | −3.81 (1.46)*** |
| Constant | 27.35 (0.29)*** | 26.31 (0.25)*** | 25.58 (0.93)*** |
| *N* pupils | 2740 | 2740 | 2709 |
| *N* schools | 169 | 169 | 168 |
| FSM effect size | −0.44 | −0.13 | −0.04 |

*Note*: Outcome: SENT-R (B), summer 2024. Standard errors in parentheses.

***$p<0.001$; *$p<0.05$.

birth is also associated with higher scores on the assessment ($B = 0.08$, SE = 0.02, $p < 0.05$), with older pupils obtaining higher marks than the younger ones. A higher percentage of socioeconomically disadvantaged pupils in the participating class at each school is associated with lower assessment scores even when controlling for individual socioeconomic disadvantage and the other covariates included in this model ($B = -3.81$, SE = 1.46, $p < 0.001$).

For each analysis model, the coefficient for socioeconomic disadvantage has also been converted into a Hedges' g effect size by dividing it by the square root of the total unconditional variance (school level plus pupil level). This expresses the difference in test scores between socioeconomically disadvantaged pupils and others in standardised units to facilitate comparisons with studies using different outcome measures. In Model 1, which contained no covariates apart from the socioeconomic disadvantage indicator, socioeconomically disadvantaged pupils were behind by 0.44 standard deviations. The effect size decreases to 0.04 standard deviations once the full set of covariates is included, further emphasising the importance of baseline assessment scores, pupil age and the percentage of socioeconomically disadvantaged pupils in the class.

Having established that a significant predictor of number test scores at the end of the first school year is number test scores at the start of the year, the factors predicting test scores at the start of the year are of interest. The study dataset contains little information on pupil characteristics, yet it does contain details on school characteristics, allowing for controls to be included when estimating the effect of pupil socioeconomic disadvantage on number skills. The results of the multilevel model with baseline assessment score as the outcome are presented in Table 4. Model 1 includes only the socioeconomic disadvantage indicator and shows a negative effect ($B = -3.71$, SE = 0.36, $p < 0.05$) as expected given the descriptive statistics discussed above (Table 2). Model 2 adds the regional dummies, which are not statistically significant, and the month of pupil birth, which is positively associated with number assessment scores ($B = 0.71$, SE = 0.04, $p < 0.05$). The constant in this model is also lower due to the month of birth variable, as younger pupils achieve lower test scores. The socioeconomic disadvantage coefficient decreases slightly ($B = -3.66$, SE = 0.34, $p < 0.05$) when controlling for these covariates (Tables A1 and A2).

**TABLE 4** Multilevel model with baseline number assessment scores as outcome.

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| FSM | −3.71 (0.36)*** | −3.66 (0.34)*** | −2.91 (0.50)*** |
| *Region (ref East Mids./South Yorks.)* | | | |
| North East | | 0.19 (0.61) | 0.48 (0.58) |
| South West | | −0.46 (0.61) | −1.14 (0.59) |
| Month of birth | | 0.71 (0.04)*** | 0.71 (0.04)*** |
| Mastering Number | | | −0.33 (0.47) |
| Counting Collections | | | −0.64 (0.49) |
| Counting Collections*FSM | | | −0.72 (0.68) |
| %FSM | | | −6.36 (1.33)*** |
| Constant | 18.23 (0.26)*** | 13.63 (0.43)*** | 16.04 (0.92)*** |
| *N* pupils | 3018 | 2984 | 2984 |
| *N* schools | 170 | 169 | 169 |
| FSM effect size | −0.45 | −0.46 | −0.37 |

*Note*: Outcome: SENT-R (A), autumn 2023. Standard errors in parentheses.

***$p < 0.001$.

Model 3 adds indicators of whether the school has implemented the Mastering Number intervention, and whether the school was in the intervention group for the Counting Collections trial. Neither is statistically significant, which is unsurprising as these factors would not have affected pupil number ability during their first few weeks of school. Pupil month of birth is again associated with higher baseline number assessment scores ($B=0.71$, $SE=0.04$, $p<0.05$). The percentage of socioeconomically disadvantaged pupils in the sample for each school also shows a clear negative relationship with the baseline assessment ($B=-6.36$, $SE=1.33$, $p<0.05$). Individual socioeconomic disadvantage remains a significant predictor even after controlling for month of birth and cohort socioeconomic disadvantage percentage ($B=-2.91$, $SE=0.50$, $p<0.05$). The results from these models show that socioeconomic disadvantage is a clear predictor of number skills upon starting school as measured by the SENT-R assessment, with a pronounced negative effect even when controlling for the other school level covariates.

The socioeconomic disadvantage coefficient has again been converted into effect sizes for each of the models. In Model 1, the Hedges' g effect size is −0.45 standard deviations. This becomes −0.37 standard deviations when all covariates are included (Model 3). The gap narrows when controlling for the other predictors yet remains sizeable. For context, a recent review (Ashraf et al., 2021, p. 1687) of 48 trials analysing the impact of EEF-funded interventions on the mathematics outcomes of socioeconomically disadvantaged pupils found an overall effect size of 0.00 (CIs −0.03, 0.04). When considering why these interventions struggle to demonstrate any impact on the attainment of socioeconomically disadvantaged pupils, it is relevant that they are starting school with number skills around 0.4 standard deviations behind their peers.

## DISCUSSION

This paper has examined socioeconomic disadvantage in early education as a process reproducing intergenerational inequality (Bourdieu, 1977), particularly in maths. Growing evidence links socioeconomic background and early maths ability (EPI, 2024; James-Brabham et al., 2023; Short & McClean, 2021). As mathematical learning proceeds incrementally (Baroody et al., 2012), children lacking foundational skills upon starting school will have difficulty with more advanced knowledge. The statutory curriculum assumes that the building blocks are already in place through home learning, which is known to be crucial for early maths development (Dowker, 2021; Mak et al., 2024).

The available evidence on early years attainment shows a socioeconomic disadvantage gap in maths but the data is captured at the end of the first school year and is based upon a best fit judgement measured against narrow levels of development. The EYFSP data is presented as a measure of attainment or ability for pupils when they start school but is at best a snapshot of the first point at which national level assessment results are published. There are also questions about the validity and accuracy of EYFSP (Campbell, 2022). The contribution of this paper and the original dataset used are even more important in light of these concerns.

Some limitations of the analysis presented in this paper should be acknowledged. Previous accounts of the disadvantage gap have relied on statutory data, which suffers from known drawbacks but offers universal coverage. The dataset used here is drawn from a convenience sample, with schools having voluntarily participated in the study. The percentage of pupils defined as socioeconomically disadvantaged in this sample was above the national average, although it varied between schools. While this is unlikely to have affected the findings, it would be interesting to see whether the same pattern is replicated at the national level. With participating schools drawn from four of the nine Government Office Regions, the sample encompasses a range of geographical areas. This is important given the unequal rates of attainment and socioeconomic disadvantage across different parts of the country and offers some assurance as to the generalisability of the findings.

The FSM status measure does not capture all pupils from households in sufficient socioeconomic need to be eligible for free school meals; it captures pupils who are registered, estimated at 80%–90% of those eligible (Iniesta-Martinez & Evans, 2012; Lord et al., 2013). As the remaining pupils eligible for FSM are therefore categorised as non-FSM, all statistical comparisons are likely to underestimate the difference between FSM-eligible and not eligible pupils. This could be resolved through automatic enrolment not requiring active parental registration (Campbell & Cooper, 2024), although this is not government policy at the time of writing, and the FSM measure remains the prevalent poverty indicator for education research in England.

Another potential limitation is that the assessment data used was collected over 10 weeks at the start of the first school year. Ideally this would have been completed in a shorter timeframe to measure the number skills of all pupils closer to when they begin school. However, the decision not to commence pupil assessments until at least the third week of school was taken for the benefit of children and school staff given the demands of early term time and the importance of allowing time to adjust to the school environment. Data could not be collected as quickly as hoped due to capacity constraints among the assessment team. Nevertheless, the data shows the socioeconomic disadvantage gap at an earlier stage than is possible using statutory data as long as Reception Baseline Assessment results remain unavailable, with greater precision than aggregate data relying on a binary measure.

# CONCLUSION

Having seen the socioeconomic disadvantage gap in number skills when children start school, the question is what can be done to address it. There are a few areas to consider. Research has shown that the home environment for preschool children (such as whether parents read to them) predicts attainment at EYFSP and at ages 11 and 16 (Melhuish & Gardiner, 2020), as does self-regulation (Joseph et al., 2024). Evidence around parental activities and numeracy skills is growing (Dowker, 2021; Mak et al., 2024), with research showing connections between child mathematics fluency and both heritable and rearing environmental factors (Borriello et al., 2020). Home environment is likely to be beyond the control of the school system and education policymakers yet given the evidence that it is an important factor, support for parents and carers during early years could improve educational outcomes.

Investment in preschool education is another area that might strengthen pupil number ability before the start of compulsory schooling. Previous research has found that attainment at age 4 and age 7 increased with the amount of preschool education received (Strand, 1999, pp. 184–186), although a more recent study using EYFSP data found that more time spent in childcare did not lead to higher chances of achieving a good level of development (Melhuish & Gardiner, 2020, p. 51). The government pledge to improve school readiness (DfE, 2025) has included increased support for preschool provision, with the rise in government spending on free entitlement a major policy feature of recent years (Cattan et al., 2024). While early intervention is recognised as crucial, there is evidence that intervention effects can fade as children grow older (Watts et al., 2018, p. 551), highlighting the need for support to be maintained in order to be effective. This is challenging given current workforce issues including low pay, lack of professional development, staff not having the right qualifications, and low levels of staff wellbeing (Ofsted, 2024). The government estimates that the early years workforce must grow to meet the needs of the expanded entitlement (DfE, 2024b). This would be welcome, but improved outcomes for pupils would not be guaranteed.

As this paper has used original data, the results presented are not directly comparable to those from other studies. Available statutory data only provides an observation at the end of the first year in school, and the binary indicator now used to define pupil attainment at that age is a coarse measure. What is clear is that a socioeconomic disadvantage gap exists in the subject of number when children enter school. Moreover, there is evidence that the gap remains intact towards the end of the first year in school. The removal of statutory maths tests at age 6–7 makes it difficult to examine how this gap might persist through primary education, with no further national assessments taking place until age 10–11.

Publishing results from the Reception Baseline Assessment, carried out within the first 6 weeks of a pupil starting school, could help to identify specific individual learning needs. Quantifying the disadvantage gap for pupils as they start school by using more accurate number assessments would enhance understanding of the context faced by learners and facilitate targeted support. A more personalised learning experience would be possible, which could help to bridge socioeconomic gaps in mathematics achievement (Watts et al., 2014). Reception Baseline Assessment results could also be used to help parents provide tailored numeracy learning opportunities at home. At a broader level, the data could be used to inform policy; for example, the government's Giving the Best Start in Life Framework (DfE, 2025) which pledges joined up support services through family hubs.

As it stands, Reception Baseline Assessment data is being collected without making it available to parents, teachers or researchers. This evidence on the socioeconomic disadvantage gap would also benefit the other areas of learning included in the assessment, ending the absurdity of a national data collection exercise where the data is not put to full use. With investment in childcare a major strand of government policy, this would be a useful means of monitoring progress. The lack of data and analysis means that the narrowed maths curriculum has not been challenged, and the mathematical learning needs of socioeconomically disadvantaged pupils have not received the required attention.

In the absence of the detailed data from national assessments as available for older children, the analysis presented here uses original data on the socioeconomic disadvantage gap for pupils as they start school by drawing on results from number assessments completed during the first 3 months of the first year. The data format allowed for more precise measurement of the attainment gap than the statutory assessments used in previous research. Follow-up assessment data showed that socioeconomically disadvantaged pupils were still behind their peers at the end of the first school year. Multilevel analysis found regional variations in pupil number progress at the end of the first year in school, but a more powerful predictor of number skills at that stage is number skills at the start of school, which are subject to a pronounced socioeconomic disadvantage gap. Existing evidence that poorer pupils lag others at the end of their first year of school is now explained by the fact that they are behind in the first few weeks, not only at the end of the year. This suggests that early intervention needs to start even earlier to be most effective.

## FUNDING INFORMATION

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## CONFLICT OF INTEREST STATEMENT

No conflict of interest to declare.

## DATA AVAILABILITY STATEMENT

The assessment data used in this study will be stored in the EEF Data Archive. The pupil socioeconomic disadvantage indicators are held in the National Pupil Database. The trial for which the data was collected is publicly registered: ISRCTN96349771. Some of the analysis was undertaken in the Office for National Statistics Secure Research Service using data from ONS and other owners. This does not imply the endorsement of the ONS or other data owners.

## ETHICS STATEMENT

I confirm that the research presented in this article was carried out with due consideration to all relevant ethical issues and in line with BERA's Ethical Guidelines for Educational Research. The evaluation was approved by the SHU ethics committee on 12 January 2023 (Ethics Review ID: ER50653704).

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## Endnotes

[1] https://explore-education-statistics.service.gov.uk/find-statistics/early-years-foundation-stage-profile-results.

[2] https://explore-education-statistics.service.gov.uk/data-tables/fast-track/50223024-c0be-4e50-38f2-08dd0941da2a.

[3] The full list can be found here: https://explore-education-statistics.service.gov.uk/find-statistics/school-pupils-and-their-characteristics.

[4] https://www.ncetm.org.uk/maths-hubs-projects/mastering-number-at-reception-and-ks1/, https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/mastering-number-trial.

## REFERENCES

Allen, G. (2011). Early intervention: The next steps. An Independent Report to Her Majesty's Government. https://assets.publishing.service.gov.uk/media/5a7b837d40f0b645ba3c4d09/early-intervention-next-steps2.pdf

Arnold, C., Bowen, P., Tallents, M., & Walden, R. (2011). *Sandwell numeracy test revised—Handbook*. GL Assessment.

Ashraf, B., Singh, A., Uwimpuhwe, G., Higgins, S., & Kasim, A. (2021). Individual participant data meta-analysis of the impact of educational interventions on pupils eligible for free school meals. *British Educational Research Journal*, *47*, 1675–1699.

Baroody, A. J., Eiland, M. D., Purpura, D. J., & Reid, E. E. (2012). Fostering at-risk kindergarten children's number sense. *Cognition and Instruction*, *30*, 435–470.

Borriello, G. A., Ramos, A. M., Natsuaki, M. N., Reiss, D., Shaw, D. S., Leve, L. D., & Neiderhiser, J. M. (2020). The intergenerational transmission of mathematics achievement in middle childhood: A prospective adoption design. *Developmental Science*, *23*, 1–10 .

Bourdieu, P. (1977). Cultural reproduction and social reproduction. In J. Karabel & A. H. Halsey (Eds.), *Power and ideology in education* (pp. 487–511). Oxford University Press.

Bourdieu, P., & Wacquant, L. J. D. (1992). *An invitation to reflexive sociology*. University of Chicago Press.

Campbell, T. (2022). Relative age and the early years foundation stage profile: How do birth month and peer group age composition determine attribution of a ‘good level of development’—And what does this tell us about how ‘good’ the early years foundation stage profile is? *British Educational Research Journal*, *48*(2), 371–401.

Campbell, T., & Cooper, K. (2024). *What's cooking? A review of evidence and discussion on the free school meals measure in the National Pupil Database*. Education Policy Institute. https://www.nuffieldfoundation.org/wp-content/uploads/2023/07/Whats-cooking-A-review-of-evidence-and-discussion-on-the-Free-School-Meals-FSM-measure-in-the-National-Pupil-Database.pdf

Cattan, S., Fitzsimons, E., Goodman, A., Phimister, A., Ploubidis, G. B., & Wertz, J. (2024). Early childhood inequalities. *Oxford Open Economics*, *3*(1), i711–i740.

Children's Commissioner. (2020). Best beginnings in the early years. https://assets.childrenscommissioner.gov.uk/wpuploads/2020/07/cco-best-beginnings-in-the-early-years.pdf

Clements, D. H., & Sarama, J. (2007). Early childhood mathematics learning. In J. F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 461–555). Information Age Publishing.

Culliney, M., Daniels, K., & Robson, J. (2025). *Counting collections evaluation report*. Education Endowment Foundation.
Dawson, A., Yeomans, E., & Brown, E. (2018). Methodological challenges in education RCTs: Reflections from England's education endowment foundation. *Educational Research*, *60*(3), 292–310.
Department for Education. (2024a). Best start in life part 1. https://www.gov.uk/government/publications/best-start-in-life-a-research-review-for-early-years/best-start-in-life-part-1-setting-the-scene
Department for Education. (2024b). Early years places and workforce need. https://www.gov.uk/government/publications/early-years-places-and-workforce-need
Department for Education. (2025). Giving every child the best start in life. Command Paper 1362. https://www.gov.uk/government/publications/giving-every-child-the-best-start-in-life
Dowker, A. (2008). Individual differences in numerical abilities in preschoolers. *Developmental Science*, *11*(5), 650–654.
Dowker, A. (2021). Home numeracy and preschool children's mathematical development: Expanding home numeracy models to include parental attitudes and emotions. *Frontiers in Education*, *6*, 1–9.
Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446.
Education Policy Institute. (2024). Annual report 2024. https://epi.org.uk/annual-report-2024/
Feikes, D., & Schwingendorf, K. (2008). The importance of compression in children's learning of mathematics & teacher's learning to teach mathematics. *Mediterranean Journal for Research in Mathematics Education*, *7*(2), 1–9.
Gorard, S. (2012). Who is eligible for free school meals? Characterising free school meals as a measure of disadvantage in England. *British Educational Research Journal*, *38*(6), 1003–1017.
Hobbs, G., & Vignoles, A. (2010). Is children's free school meal 'eligibility' a good proxy for family income? *British Educational Research Journal*, *36*(4), 673–690.
Hodgen, J., Foster, C., & Brown, M. (2022). Low attainment in mathematics: An analysis of 60 years of policy discourse in England. *The Curriculum Journal*, *33*(1), 5–24.
Iniesta-Martinez, S., & Evans, E. (2012). Pupils not claiming free school meals. DfE Research Report RR235. https://assets.publishing.service.gov.uk/media/5a79faf540f0b66a2fbff077/DFE-RR235.pdf
James-Brabham, E., Loveridge, T., Sella, F., Wakeling, P., Carroll, D. J., & Blakey, E. (2023). How do socioeconomic attainment gaps in early mathematical ability arise? *Child Development*, *94*(6), 1550–1565.
Jordan, N. C., Glutting, J., & Ramineni, C. (2010). The importance of number sense to mathematics achievement in first & third grades. *Learning and Individual Differences*, *20*(2), 82–88.
Joseph, A., Sylva, K., Sammons, P., & Siraj, I. (2024). Drivers of the socio-economic disadvantage gap in England: Sequential pathways that include the home learning environment & self-regulation as mediators. *British Journal of Educational Psychology*, *94*, 22–40.
Lefevre, J., Clarke, T., & Stringer, A. P. (2002). Influences of language and parental involvement on the development of counting skills: Comparisons of French and English-speaking Canadian children. *Early Child Development and Care*, *172*, 283–300.
Lord, A., Easby, J., & Evans, H. (2013). Pupils not claiming free school meals 2013. DFE Research Report RR319. https://www.gov.uk/government/publications/pupils-not-claiming-free-school-meals-2013
Mak, C., Tang, J., & Chan, W. W. L. (2024). The importance of home numeracy environment in preschoolers' spontaneous focusing on numerosity: A mediation study. *Early Childhood Research Quarterly*, *68*, 45–53.
Mazzocco, M. M., & Thompson, R. E. (2005). Kindergarten predictors of math learning disability. *Learning Disabilities Research and Practice*, *20*(3), 142–155.
Melhuish, E. (2016). Longitudinal research & early years policy development in the UK. *International Journal of Child Care & Education Policy*, *10*, 3.
Melhuish, E., & Gardiner, J. (2020). *Study of early education & development (SEED): Impact study on early Education use & child outcomes up to age five years*. Department for Education.
Mujtaba, T., Reiss, M. J., & Hodgson, A. (2014). Motivating & supporting young people to study mathematics: A London perspective. *London Review of Education*, *12*(1), 121–142.
Ofsted. (2014). Are you ready? Good practice in school readiness. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/418819/Are_you_ready_Good_practice_in_school_readiness.pdf
Ofsted. (2024). *Maintaining quality early years provision in the face of workforce challenges*. Early Years Blog. https://earlyyears.blog.gov.uk/2024/05/13/maintaining-quality-early-years-provision-in-the-face-of-workforce-challenges/
Organisation for Economic Co-operation and Development. (2025). Reducing Inequalities by Investing in Early Childhood Education and Care. https://www.oecd.org/en/publications/reducing-inequalities-by-investing-in-early-childhood-education-and-care_b78f8b25-en.html
Raghubar, K. P., & Barnes, M. A. (2017). Early numeracy skills in preschool-aged children: A review of neurocognitive findings & implications for assessment & intervention. *The Clinical Neuropsychologist*, *31*(2), 329–351.

Rose, S., Lord, P., Ager, R., Liht, J., & Schwendel, G. (2024). *Impact of school closures in key stage 1 on attainment & social skills of pupils in year 4 & year 5 in academic year 2023/2024*. Education Endowment Foundation. https://d2tic4wvo1iusb.cloudfront.net/production/documents/projects/key_stage_1_longitudinal_recovery_study_-_october_2024.pdf?v=1732797291

Short, D. S., & McClean, J. F. (2021). The relationship between numerical mapping abilities, maths achievement and socioeconomic status in 4- and 5-year-old children. *British Journal of Educational Psychology*, *93*(3), 641–657.

Simpson, A., & Linder, S. (2014). An examination of mathematics professional development opportunities in early childhood settings. *Early Childhood Education Journal*, *42*(5), 335–342.

Social Mobility Commission. (2024). State of the nation 2024. https://www.gov.uk/government/publications/state-of-the-nation-2024-local-to-national-mapping-opportunities-for-all/chapter-2-mobility-since-last-year

Standards & Testing Agency. (2024). Information for parents: Reception baseline assessment. https://assets.publishing.service.gov.uk/media/6703cfa6a31f45a9c765f203/2024_Information_for_parents_reception_baseline_assessment.pdf

Strand, S. (1999). Ethnic group, sex & economic disadvantage: Associations with pupils' educational progress from baseline to the end of key stage 1. *British Educational Research Journal*, *25*(2), 179–202.

Sylva, K., Melhuish, E., Sammons, P., Siraj, I., Taggart, B., Smees, R., Toth, K., Welcomme, W., & Hollingworth, K. (2014). *Students' educational & developmental outcomes at age 16: Effective pre-school, primary & secondary education (EPPSE 3–16) project research report*. DfE.

Taylor, C. (2018). The reliability of free school meal eligibility as a measure of socio-economic disadvantage: Evidence from the millennium cohort study in Wales. *British Journal of Educational Studies*, *66*(1), 29–51.

Torgerson, C., Wiggins, A., Torgerson, D. J., Ainsworth, H., Barmby, P., Hewitt, C., Jones, K., Hendry, V., Askew, M., Bland, M., Coe, R., Higgins, S., Hodgen, J., Hulme, C., & Tymms, P. (2011). Every child counts: The independent evaluation – Technical report. Department for Education. Ref: DFE-RR091A. https://www.gov.uk/government/publications/every-child-counts-the-independent-evaluationtechnical-report

UNICEF. (2025). UNICEF mission statement, mandate & values. https://www.unicef.ie/mission-statement/

Watts, T. W., Duncan, G. J., Clements, D. H., & Sarama, J. (2018). What is the long-run impact of learning mathematics during preschool? *Child Development*, *89*(2), 539–555.

Watts, T. W., Duncan, G. J., Siegler, R. S., & Davis -Kean, P. E. (2014). What's past is prologue: Relations between early mathematics knowledge and high school achievement. *Educational Researcher*, *43*(7), 352–360.

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## APPENDIX A

**TABLE A1** Linear regression model measuring pupil progress in number over reception year.

| SENT outcome | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| FSM | −4.90 (0.42)*** | −4.45 (0.60)*** | −0.32 (0.45) |
| Allocation | 27.55 (0.21)*** | 0.33 (0.41) | 1.09 (0.29)*** |
| Allocation*FSM | | −0.88 (0.85) | −1.05 (0.59) |
| SENT baseline | | | 0.81 (0.02)*** |
| %FSM | | | −1.39 (0.78) |
| *Region (ref East Mids./South Yorks.)* | | | |
| North East | | | −1.25 (0.31)*** |
| South West | | | 1.48 (0.32)*** |
| Mastering number | | | 0.60 (0.25)* |
| Month of birth | | | 0.13 (0.04)*** |
| Constant | 27.55 (0.21)*** | 27.37 (0.30)*** | 10.34 (0.60)*** |
| *N* | 2744 | 2744 | 2709 |
| *R* squared | 0.047 | 0.047 | 0.552 |

*Note*: Outcome: SENT-R (B), summer 2024. Standard errors in parentheses.
***$p < 0.001$; *$p < 0.05$.

**TABLE A2** Linear regression model with baseline number assessment scores as outcome.

| SENT baseline | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| FSM | −4.35 (0.35)*** | −4.45 (0.35)*** | −3.05 (0.51)*** |
| Region (ref East Mids./South Yorks.) | | | |
| North East | | 0.09 (0.37) | 0.49 (0.36) |
| South West | | −0.71 (0.38) | −1.24 (0.37)*** |
| %FSM | | | −6.52 (0.89)*** |
| Mastering number | | | −0.30 (0.29) |
| Allocation | | | −0.63 (0.33) |
| Allocation*FSM | | | −0.56 (0.67) |
| Month of birth | | | 0.70 (0.04)*** |
| Constant | 18.37 (0.17)*** | 18.54 (0.23)*** | 16.13 (0.62)*** |
| *N* | 3018 | 3018 | 2984 |
| *R* squared | 0.0486 | 0.05 | 0.149 |

*Note*: Outcome: SENT-R (A), autumn 2023. Standard errors in parentheses.
***$p < 0.001$;