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Science Education Tracker 2023: report addendum

Survey findings related to additional variables linked via the National Pupil Database

Segmentation analysis of young people: interest in science and computing

Regression analysis: demographic predictors of young people choosing a STEM career

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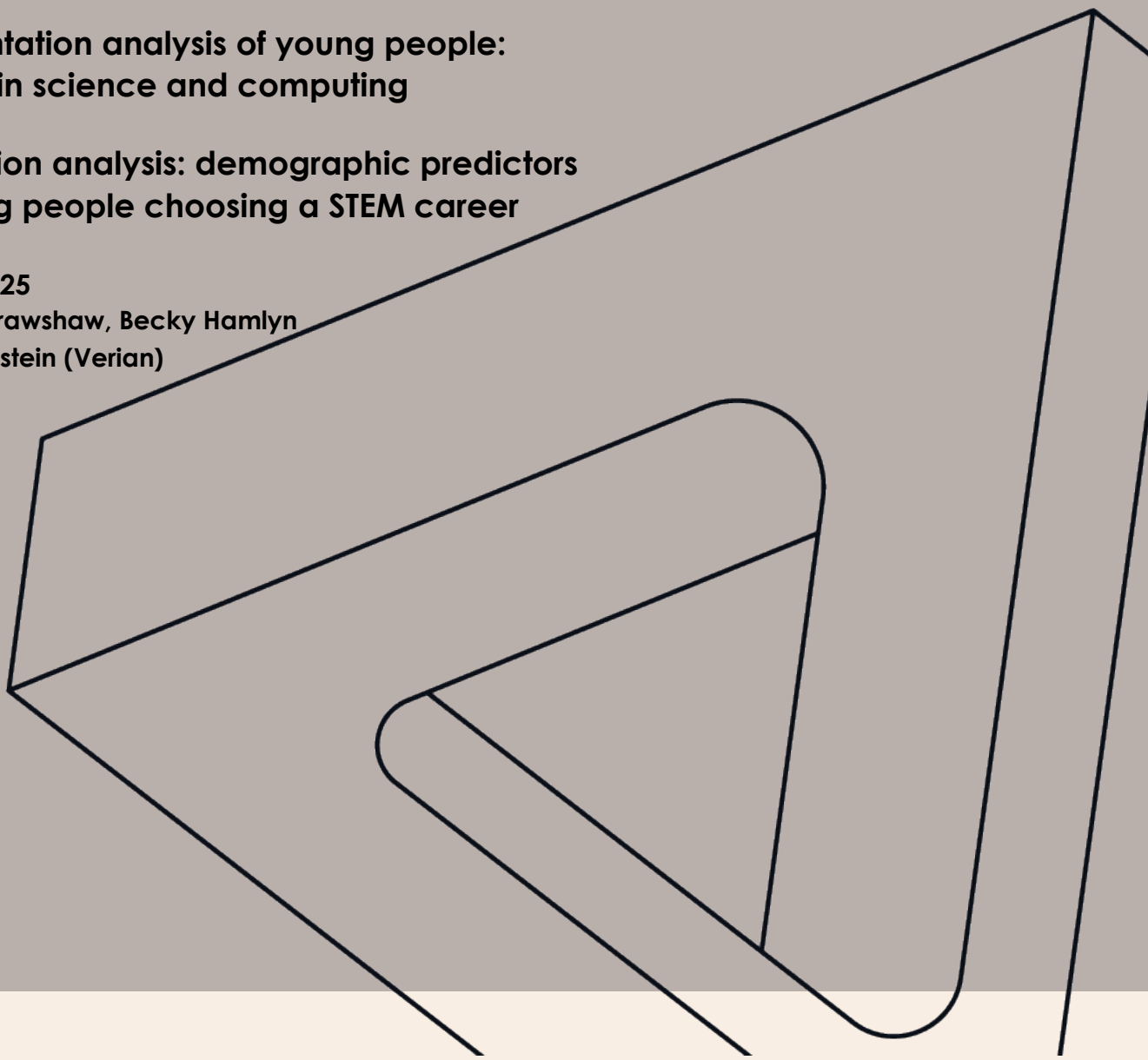

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1. Introduction: what this addendum covers

This report represents an addendum to the main report for the Science Education Tracker 2023 (SET 2023).

It covers three additional sets of analyses. These findings have been published after the main report due to a delay in the receipt of linked data from the Department for Education's (DfE's) National Pupil Database (NPD) and Individualised Learner Record (ILR), which were required for these additional analyses.

The report covers the following:

- Additional bivariate analysis based on data obtained via NPD/ILR linkage including a breakdown of the key findings by eligibility for free school meals (FSM), special educational needs (SEN) status and whether main language was English or not.
- Two segmentations investigating the underlying patterns in the population of young people with respect to interest in science and computing.
- Regression analysis examining the demographic predictors of young people considering a career in STEM, and factors associated with having family involvement in career considerations.

1.1. Background to the Science Education Tracker 2023

SET 2023 is the third in a series of studies which track evidence on key indicators for science engagement, education, and career aspirations among young people in England. Previous surveys were conducted in 2016 and 2019. All surveys have been carried out by Verian, formerly known as Kantar Public.

For SET 2023, Wellcome provided the Royal Society with a grant to manage the project. The Royal Society then entered into an agreement with EngineeringUK, its delivery partner, to manage the research contract for the project, with the Society and EngineeringUK working together closely with Verian on questionnaire development, fieldwork, data analysis and reporting, steered by an Advisory Group established by the Royal Society.

The SET 2023 survey covered 7,256 students in school years 7–13 in the academic year 2022–23 in state–funded schools across England, that is a sample of c.1,000 students per school year. The survey sample was drawn from a combination of the National Pupil Database (NPD) and the Individualised Learner Record (ILR)[1], and was administered online.

More detailed information about the methodology of the survey can be found in Chapter 1 of the main report with fuller methodological detail covered in the Technical report.

[1] Databases of students maintained the Department for Education and Education & Skills Funding Agency, respectively.

1.2. Linking survey responses to administrative data

As noted, respondents were asked to provide explicit consent for their survey responses to be linked to NPD and ILR data as part of the survey. For these respondents, the anonymised Pupil Matching References were transferred to the DfE alongside a pseudonymised survey serial and analysis weight. This weight controlled for the presence of selection bias originating from non-random NPD data linkage.

The DfE appended NPD and ILR data and ingested these files to the ONS Secure Research Service (SRS). Verian sent the survey data for these cases (alongside the pseudonymised survey serial) to be ingested to the ONS SRS. The two files were matched within the ONS SRS using the pseudonymised survey serial.

The NPD/ILR variables were based on NPD flags from Spring '21, Summer '21, Spring '22 and Summer '22. Disclosure suppression of data tables was required to protect the data from potential disclosure. The disclosure suppression for the tables was done using the standard rule that any cells with less than 10 unweighted count was considered potentially disclosive and had to be suppressed, and everything in the table that could be used to work out the suppressed count (such as net counts) was also suppressed. Other table cells were also suppressed where there was potential risk of secondary disclosure. In some cases, data suppression has limited the analysis that can be included in this report.

This work was undertaken in the SRS using data from ONS and other owners and does not imply the endorsement of the ONS or other data owners.

2. NPD-linked bivariate analysis

2.1. Executive summary

In summary, the additional data obtained via linkage to the National Pupil Database (NPD) and Individualised Learner Record (ILR) highlight the following trends.

Differences by income/disadvantage

Eligibility for free school meals (FSM) was used as a proxy measure for low-income status.

- In general, students eligible for FSM were slightly less interested in science at school and in pursuing a science or STEM career:
    - FSM-eligible students in years 7–9 were slightly less likely than non-FSM-eligible students to find science lessons at school interesting. Older FSM-eligible students in years 10–13 were slightly less likely to find biology interesting, but there was no difference by this measure for physics or chemistry.
    - FSM-eligible students in years 7–13 were slightly less interested than non-FSM-eligible students in pursuing a career in science, engineering, or maths.
- Students eligible for FSM were less likely than non-FSM-eligible students to rate their abilities in STEM subjects, being less likely to rate themselves as 'good' at science (years 7–9), the separate sciences (years 10–13) and maths (years 7–13).
- Students eligible for FSM were also less likely to have the opportunity to engage in science at school or in higher education. For example, FSM-eligible students were less likely than non-FSM-eligible students to:
    - Take a triple science pathway; undertake a range of practical work as part of science lessons; agree that science careers are 'suitable' for them; and aspire to go to university.
- FSM-eligible students were also less likely to have wider connections to science and higher education, being less likely than non-FSM-eligible students to:
    - Possess family science and STEM connections; have a parent who had been to university; receive advice and guidance about careers from a range of different sources; and undertake STEM work experience.
    - Arrange STEM work experience (where this was experienced) by themselves or via family, and more likely to arrange this via the school.

Differences by special educational needs (SEN) status of students

In general, the pattern of results for students with special educational needs (SEN) status was similar to the pattern for free school meals.

- SEN students were no less interested than non-SEN students in science at school, although they were less interested in a science career.
- SEN students were less likely than non-SEN students to rate themselves as 'good' at science (years 7–9), the separate sciences (years 10–13) and maths (years 7–13).
- SEN students were less likely than non-SEN students to engage in science or STEM in various ways. SEN students were less likely to:
    - Engage with science content online; take a triple science pathway; undertake a range of practical work as part of science lessons; aspire to study STEM after GCSE (years 7–9); agree that science careers are 'suitable' for them; and aspire to go to university.
- In terms of wider contextual factors, SEN students were less likely than non-SEN students to:

- Possess family science or STEM connections; have a parent who had been to university; receive advice and guidance about careers from a range of different sources; and undertake STEM work experience.

Differences by whether English is the young person's first language

In general, young people whose first language was not English were more likely to engage with science and STEM at school and outside school in a variety of ways.

- This group were more likely than native English speakers to:
  - Find science lessons (years 7–9) and the separate sciences (years 10–13) at school interesting; rate themselves as 'good' at science (years 7–9), the separate sciences (years 10–13), computer science and maths (years 7–13); want to take up science after GCSE (years 7–9); to take or plan to take STEM subjects in the sixth form; to aspire to university and to plan to study STEM subjects at university; to agree that science careers are suitable for them; to feel they know a lot or a fair amount about STEM careers; to be interested in all STEM careers.

For computer science and engineering, there are some differences in level of engagement by these characteristics

- Similar to science, students whose first language was not English were more likely to show an interest in computer science at school, and to show interest in a range of STEM careers, including computing/technology and engineering.
- However, in contrast to science, students with a special educational need (SEN) were more likely than those without to show an interest in computer science at school, and to show an interest in pursuing a career in this area when older.
- In contrast to science careers, for level of interest in an engineering career, there was no difference by SEN or FSM status.

2.2. Background

The additional findings reported in this section complement the findings in the main report for the Science Education Tracker 2023 (SET 2023).

As part of the SET 2023 survey, all respondents were asked their permission for administrative data from the DfE's National Pupil Database (NPD) and Individualised Learner Record (ILR) to be linked to their survey answers: 86% gave permission for their data to be linked. These administrative data included:

- eligibility status for free school meals in the last six years;
- whether English is the young person's first language;
- special educational needs (SEN) status – based on whether child has an education, health and care plan.

Due to a delay in receipt of the NPD-linked data, analysis by NPD/ILR was not covered within the initially published report and is now published in this addendum.

The additional findings are based on the n=6,188 students in the SET 2023 survey who consented to data linkage.

2.3. Format of NPD-linked findings

Section 2.4 includes a series of findings related to NPD-linked cross-breaks such as entitlement to free school meals and special educational needs (SEN) for various sections of the original report. The section number and page number of the section of the original report which these findings expand on is referenced in each set of findings, so that results can be reviewed in the context of the original report.

All differences commented on in section 2.4 are statistically significant at the 95 per cent level of confidence.

All percentages reported are weighted to account for differential non-response. For those that provided consent, Verian produced a weight to allow for standalone analysis of the respondents who explicitly consented to NPD/ILR data matching.

Where percentages do not sum to 100 per cent or to net figures, this will be due to either (i) rounding or (ii) questions which allow multiple answers.

Respondents were able to refuse to answer any question by selecting 'Prefer not to say'. 'Don't know' and 'Prefer not to say' responses are included in the base for all questions reported except where otherwise specified.

2.4. Detailed findings

2.4.1. Family science and family STEM connections

See section 2.2, pages 20–23 of the original report

The Family Science Connections Index (FSCI_Science) was constructed by scoring and combining responses across questions in the survey relating to young people knowing family members or other adults who they can talk to about science. The FSCI_Stem index used a slightly wider set of questions also including family connections in engineering and technology.

- Family science connections varied by eligibility for free school meals (FSM). Year 7–13 students eligible for free school meals were more likely to have no family science connections (32% compared with 19% who were not FSM-entitled) and less likely to have many family science connections (11% vs 21%, respectively).
- Year 7–13 students with a special educational need were more likely to have no family science connections (29% vs 21% of students with no SEN).
- A similar pattern of findings was observed for the Family STEM Connection Index (FSCI_STEM).

2.4.2. Engagement with science via media and digital channels

See section 2.6, pages 30–31 of the original report

- Year 7–13 students with a special educational need were less likely to engage with science content online such as via Instagram, TikTok, YouTube, and online news (53% seeing or reading something about science online at least once a month vs 66% of students with no SEN).

- Year 7–9 students whose first language was not English were more likely to engage with science via reading about this in books, newspapers or magazines (31% vs 23% of those whose first language was English).

2.4.3. Interest in science among young people in years 7–9

See section 3.3, pages 42–44 of the original report

- Year 7–9 students eligible for free school meals (FSM) were slightly less likely to find science lessons at school either 'very interesting' or 'fairly interesting' (68% compared with 73% who were not FSM-eligible) although this difference was more concentrated among females (60% of FSM-eligible females vs 68% of females not eligible; 75% of FSM-eligible males vs 78% of FSM-eligible males).
- Year 7–9 students whose first language was not English were also more likely to find science lessons at school interesting (79% compared with 70% of those whose first language was English).

2.4.4. Interest in science among young people in years 10–13

See section 3.4, pages 45–47 of the original report

- Year 10–13 students eligible for free school meals (FSM) were less likely to find biology lessons at school either 'very interesting' or 'fairly interesting' (68% compared with 76% who were not FSM-eligible). There was no difference by free school meal entitlement in level of interest in chemistry or physics.
- Year 10–13 students with a special educational need were less likely to find biology interesting (63% vs 75% of students with no SEN). There was no difference by special educational need status for the other two sciences. There was also no difference by SEN in level of interest in science among younger students aged 7–9.
- Year 10–13 students whose first language was not English were more likely than those whose first language was English to find all three science subjects at school interesting: biology: 81% vs 72%, respectively; chemistry: 67% vs 55%, respectively; physics: 62% vs 53%, respectively.

2.4.5. Perceived ability in STEM subjects

See section 3.5, pages 48–53 of the original report

- Free school meal (FSM) eligibility was associated with lower ratings of self-ability in STEM subjects, as measured by how 'good' ('very good' or 'fairly good') young people thought they were at the subject:
    - Year 7–9 students eligible for free school meals were less likely to rate themselves as 'good' at science at school: 44% compared with 51% who were not FSM-eligible.
    - Similarly, Year 10–13 students entitled to free school meals were less likely than those not FSM-eligible to consider themselves to be 'good' at biology (42% vs 53%), chemistry (32% vs 41%) and physics (37% vs 43%).
    - Across all year 7–13 students, a similar pattern was observed for self-ratings of ability in maths, with 51% of those entitled to free school meals thinking they were 'good' at the subject compared with 62% who were not FSM-eligible.
- Presence of a special educational need (SEN) was also associated with lower self-ratings of ability in STEM subjects:

    - For Year 7–9 students, SEN students were less likely to rate themselves as 'good' at science (40% vs 51% of students with no SEN).
    - A similar pattern was observed for Year 10–13 students in relation to the separate sciences with SEN students less likely than non-SEN students to rate themselves as 'good' at biology (35% vs 53%), chemistry (26% vs 41%) and physics (27% vs 44%).
    - Across all year 7–13 students, a similar pattern was observed for self-ratings of ability in maths, with 44% of SEN students thinking they were 'good' at the subject compared with 62% of students with no SEN.
- Pupils whose first language was not English were more likely than native English speakers to rate themselves as good at STEM subjects. For example, students whose first language was not English were more likely to rate themselves as 'good' at the following subjects:
    - Science (55% compared with 48%, Years 7–9).
    - Biology (57% compared with 48%, Years 10–13); chemistry (47% compared with 37%, Years 10–13); physics (49% compared with 40%, Years 10–13).
    - Maths (67% compared with 57%, Years 7–13).

2.4.6. Interest in computing lessons at school

In the SET 2023 survey, young people were asked how interesting they found computing lessons at school. It is important to note that in English state schools computing is compulsory in years 7–9 and optional thereafter. This means that while year 7–9 students were reflecting on current or very recent experience of studying the subject, most students in years 10–13 were reflecting on when they studied it in years 7–9 and the answers for most students (other than those who have chosen to study this beyond year 9) were therefore retrospective.

See section 5.2, pages 67–71 of the original report

- By special educational needs:
    - Year 7–9 students with a special educational need were more likely to find computer science lessons at school interesting (64% compared with 55% of students with no SEN). By comparison, there was no difference on this measure for interest in science lessons among year 7–9s.
    - A similar pattern was observed for Year 10–13 students (many of whom would have been reflecting back to when they last studied computer science): 52% of SEN pupils found the subject interesting compared with 43% of students with no SEN.
- By whether or not English is a student's first language:
    - Year 7–9 students whose first language was not English were also more likely to find computer science lessons at school interesting (66% compared with 55% with English as a first language). A similar relationship was observed for interest in science.
    - The same pattern was observed for Year 10–13 students: level of interest in computing was 57% for students whose first language was not English vs 42% for students with English as a first language.

2.4.7. Perceived ability in computing

See section 5.4, pages 72–73 of the original report

- Year 7–13 students whose first language was not English were more likely than those whose first language was English to rate themselves as 'good' at computing (41% compared with 32%).

2.4.8. Science pathway taken in years 10 and 11

See section 7.2, pages 97–99 of the original report

- According to self-reported data on type of GCSE science course, year 10–13 students eligible for free school meals (FSM) were less likely to have taken triple science GCSE (23% compared with 37% who were not FSM-eligible).
- Similarly, Year 10–13 students with a special educational need were considerably less likely to have taken triple science (17% vs 36% of students with no SEN).

2.4.9. Nature of practical work done at school

See section 6.6, pages 92–93 of the original report

A question designed to explore the more detailed nature of practical work undertaken by students in years 7–11 was asked in SET 2023.

Students eligible for free school meals (FSM), and students with a special educational need (SEN), were less likely than other students to undertake a range of different types of practical work. For older children in year 9 and above, it is possible that these associations will be related to the lower uptake of triple science among these groups of students (as noted above).

- Year 7–11 students eligible for free school meals were less likely to have done various types of practical work at school. The differences for FSM-eligible vs non-FSM eligible students are shown below:
    - Fieldwork (experiment that takes place outside a school classroom or laboratory) (23% vs 32%);
    - Carried out an experiment by myself (32% vs 41%);
    - Carried out an experiment with others (73% vs 86%);
    - Analysed results from an experiment (63% vs 80%);
    - Written up conclusions from an experiment (64% vs 80%);
    - Taken part in a class discussion about the results of an experiment (52% vs 62%);
    - Carried out a simulated experiment rather than in real life, using a website or special computer software (12% vs 15%).
- Similarly, year 7–11 students with a special educational need (SEN) were less likely to have done various types of practical work at school. The differences for SEN vs non-SEN students are shown below:
    - Fieldwork (22% vs 31%);
    - Carried out an experiment by myself (34% vs 40%);
    - Carried out an experiment with others (69% vs 86%);
    - Analysed results from an experiment (56% vs 80%);
    - Written up conclusions from an experiment (58% vs 79%);
    - Taken part in a class discussion about the results of an experiment (49% vs 61%);
    - Carried out a simulated experiment rather than in real life, using a website or special computer software (9% vs 15%).

2.4.10. Future science intentions among year 7–9s

See section 8.1, pages 105–108 of the original report

- Year 7–9 students with a special educational need were more likely to reject a post-GCSE science pathway at this early stage (42% said they were unlikely to study science beyond GCSE compared with 32% of students with no SEN).

- Year 7–9 students whose first language was not English were less likely to reject a post-GCSE science pathway (24% vs 36% whose first language was English).

2.4.11. Post-16 subject choices

See section 8.4, pages 110–116 of the original report

Year 11–13 students who were studying or intending to study for post-16 academic qualifications were asked about their subject choices/planned subject choices.

- Year 11–13 students whose first language was not English were more likely than those whose first language was English to study/intend to study a range of STEM subjects including biology (33% vs 23%), chemistry (32% vs 16%), maths (44% vs 25%) and physics (14% vs 10%).

Year 11–13 students who had either chosen their sixth form options, or who had already embarked on sixth form courses, were asked if they were happy with the choices they had made, or if they would have preferred to study different subjects.

- Students eligible for free school meals (FSM) were less likely to feel happy with their post-16 choices (67% compared with 75% of non-FSM-eligible students).

2.4.12. Intended pathways beyond year 13 among year 7–9s

See section 9.2, pages 122–123 of the original report

In SET 2023, year 7–9 students were asked if they had any plans to go to university.

- Year 7–9 students with a special educational need were less likely to 'definitely' or 'probably' want to go to university after finishing school (55% compared with 75% of students with no SEN).
- Year 7–9 students whose first language was not English were more likely to 'definitely' or 'probably' want to go to university after finishing school (89% compared with 67% of students with English as a first language).

2.4.13. Intended pathways beyond year 13 among year 10–13s

See section 9.3, pages 123–124 of the original report

In SET 2023, year 10–13 students were also asked about higher education intentions. The pattern of findings by SEN and first language was similar to that for the younger age group, with additional variation by free school meals eligibility.

- Year 10–13 students eligible for free school meals were less likely to be considering university after finishing school (32% compared with 45% of non-eligible students).
- Year 10–13 students with a special educational need were considerably less likely to be considering university after finishing school (20% compared with 46% of students with no SEN).
- Year 10–13 students whose first language was not English were more likely to be considering university after finishing school (57% compared with 38% of students with English as a first language).

2.4.14. Whether parents had been to university

See section 9.4, page 125 of the original report

Students from the following groups were less likely to report that one or both parents had been to university:

- Year 10–13 students eligible for free school meals (30% compared with 55% of non-eligible students).
- Year 10–13 students with a special educational need (38% compared with 50% of students with no SEN students).

2.4.15. Planned HE choices

See section 9.5, pages 125–128 of the original report

In SET 2023, students who were considering a university pathway were asked what subjects they were interested in studying.

- Year 10–13 students considering university whose first language was not English were more likely to be considering the following STEM subjects at university: Medicine (16% vs 5%) and Science subjects (15% vs 11%).

2.4.16. Sources of advice and guidance about careers

See section 10.2, pages 131–132 of the original report

There were some differences by NPD-linked subgroups in terms of sources of information and advice about future careers among students in years 10–13.

- Students eligible for free school meals (FSM) were less likely than non-FSM-eligible students to receive advice across a range of sources including parents (56% vs 69%), someone working in a related area (18% vs 26%), online searching (33% vs 38%), careers advisor (35% vs 40%) and careers fairs or events (18% vs 25%).
- Students with a special educational need were also less likely than non-SEN students to receive advice across a range of sources including friends (32% vs 44%), parents (57% vs 67%), siblings (17% vs 23%), online searching (27% vs 38%) and careers fairs or events (15% vs 25%).

2.4.17. Access to work experience in STEM and other areas

See section 10.3, pages 132–137 of the original report

Young people in years 10–13 were asked about any work experience undertaken.

- Students eligible for free school meals (FSM) were less likely than non-FSM-eligible students to have ever done any work experience (52% vs 62%) and more specifically were less likely to have done any work experience related to STEM (11% vs 16%).
- Students with a special educational need were less likely than non-SEN students to have ever done any work experience (49% vs 61%) and more specifically were less likely to have done any work experience related to STEM (9% vs 16%).

Young people in years 10–13 who had been on at least one science-related work experience placement were asked how their most recent science-related work experience had been arranged.

- Students eligible for free school meals were less likely than non-FSM-eligible students to arrange STEM work experience either themselves (32% vs 43%) or via family or friends (29% vs 40%) and instead were more likely to arrange this via their school (48% vs 36%).

A quarter of young people in years 10–13 (26%) reported wanting to secure science-related work experience but being unable to do so. Unmet need for STEM work experience was much higher among students whose first language was not English (45% vs 24% whose first language was not English).

2.4.18. Attitudes towards STEM careers

See section 11.2, pages 140–141 of the original report

In relation to the proportion of students across years 7–13 who agreed that 'careers that use science are suitable for someone like me':

- Students who were eligible for free school meals (FSM) were slightly less likely to agree with this (37% compared with 41% of students who were not FSM-eligible).
- Students with a special educational need were also less likely to agree with this (33% compared with 41% with no SEN).
- Students whose first language was not English were more likely to agree with this (51% compared with 37% whose first language was English).

In relation to the proportion of years 7–13 who agreed that 'careers that use science require high grades':

- Students who were eligible for free school meals (FSM) were less likely to agree with this (72% compared with 80% of students who were not FSM-eligible).
- Students with a special educational need were much less likely to agree with this (66% compared with 80% with no SEN).

2.4.19. Perceived knowledge about STEM careers

See section 11.3, pages 142–143 of the original report

Self-assessed knowledge of STEM careers was measured by asking young people in years 7–13 how much they felt they knew about the different types of things done by engineers, scientists and people working in computing or technology.

The proportion of students across years 7–13 who felt they knew 'a lot' or 'a fair amount' about engineering:

- Was higher among students whose first language was not English (43% compared with 36% whose first language was English).

The proportion of students across years 7–13 who felt they knew 'a lot' or 'a fair amount' about science careers:

- Was lower among students with special educational needs (30% vs 41% with no SEN).
- Was higher among students whose first language was not English (49% compared with 37% whose first language was English).

The proportion of students across years 7–13 who felt they knew 'a lot' or 'a fair amount' about careers in computing or technology:

- Was higher among students whose first language was not English (43% compared with 31% whose first language was English).

2.4.20. Level of interest in a STEM career

See section 11.4, pages 144–149 of the original report

In relation to the proportion of students across years 7–13 who said they were 'very interested' or 'fairly interested' in a science career, interest was:

- Slightly lower among students who were eligible for free school meals (43% compared with 47% of students who were not FSM-eligible).
- Lower among students with a special educational need (39% compared with 48% with no SEN).
- Higher among students whose first language was not English (57% compared with 44% of students with English as a first language).

In relation to the proportion of students across years 7–13 who said they were 'very interested' or 'fairly interested' in an engineering career, interest was:

- Higher among students whose first language was not English (55% compared with 45% with English as a first language).

In relation to the proportion of students across years 7–13 who said they were 'very interested' or 'fairly interested' in a computing or technology career, interest was:

- Slightly higher among students who were eligible for free school meals (41% compared with 37% of students who were not FSM-eligible).
- Slightly higher among students with a special educational need (43% compared with 37% with no SEN).
- Higher among students whose first language was not English (48% compared with 36% of students with English as a first language).

In relation to the proportion of students across years 7–13 who said they were 'very interested' or 'fairly interested' in a maths-related career, interest was:

- Slightly lower among students who were eligible for free school meals (36% compared with 40% of students who were not FSM-eligible).
- Slightly lower among students with a special educational need (35% compared with 40% with no SEN).
- Higher among students whose first language was not English (50% compared with 37% of students with English as a first language).

2.4.21. Motivations for pursuing a STEM career

See section 11.5, pages 150–151 of the original report

To investigate what is driving interest in a science career, young people in years 10–13 who expressed interest in any of the four types of STEM career were asked why, and they were able to choose as many answers as they wished from a list.

- Students eligible for free school meals were less likely than non-FSM-eligible students to cite a range of motivational factors, including enjoyment of science (41% vs 54%); feeling they were good at science (34% vs 40%); breadth of STEM career options (31% vs 38%); relevance of science to the real world (29% vs 38%); and that STEM careers benefit society (27% vs 32%), are well-respected (24% vs 31%), and can help tackle environmental challenges (9% vs 15%).
- Students with a special educational need were less likely than non-SEN students to cite a range of motivational factors, including enjoyment of science (39% vs 52%); breadth of STEM career options (24% vs 38%); relevance of science to the real world (23% vs 37%); and that STEM careers benefit society (16% vs 33%), are well-respected (18% vs 31%), and well-paid (30% vs 50%).
- Students whose first language was not English were more likely to cite a range of motivational factors including relevance to real life (41% vs 34%); being advised by a family member (22% vs 13%); a desire to help others (33% vs 25%); and a belief that STEM careers are well-paid (56% vs 45%), beneficial to society (37% vs 29%), and well-respected (36% vs 27%).

2.4.22. Perceived knowledge about engineering careers

See section 12.2, pages 156–158 of the original report

These findings are covered in section 2.4.19 above.

2.4.23. Attitudes towards careers in engineering

See section 12.4, page 161 of the original report

In relation to the proportion of students across years 7–13 who agreed that 'Engineering is a career that allows people to be creative':

- Students who were eligible for free school meals were slightly less likely to agree with this (70% compared with 75% of students who were not FSM-eligible).
- Students with a special educational need were also less likely to agree with this (65% compared with 75% of students with no SEN).
- Students whose first language was not English were slightly more likely to agree with this (78% compared with 73% of students with English as a first language).

In relation to the proportion of students across years 7–13 who agreed that 'Engineering is a career that allows people to work in various different roles':

- Students who were eligible for free school meals were slightly less likely to agree with this (64% compared with 68% of students who were not FSM-eligible).
- Students with a special educational need were also less likely to agree with this (59% compared with 69% of students with no SEN).

2.4.24. Interest in engineering as a career

See section 12.6, pages 162–163 of the original report

These findings are covered in section 2.4.20 above.

3. Segmentation analyses

3.1. Introduction

Verian carried out segmentation analysis to investigate any underlying patterns in the population of young people with respect to interest in science, engineering, maths and computer science. The motivation for this analysis was to further understanding of how the observed variation in science and computing interest was associated with factors such as young people's self-perceived ability in these subjects and features that had encouraged or discouraged them.

Two separate segmentations were conducted to account for different questionnaire routing used for young people in years 7–9 and years 10–13. Young people in years 10–13 were asked about each individual science (chemistry, biology and physics), while those in years 7–9 were asked about 'science' across a number of questions included in the segmentations.

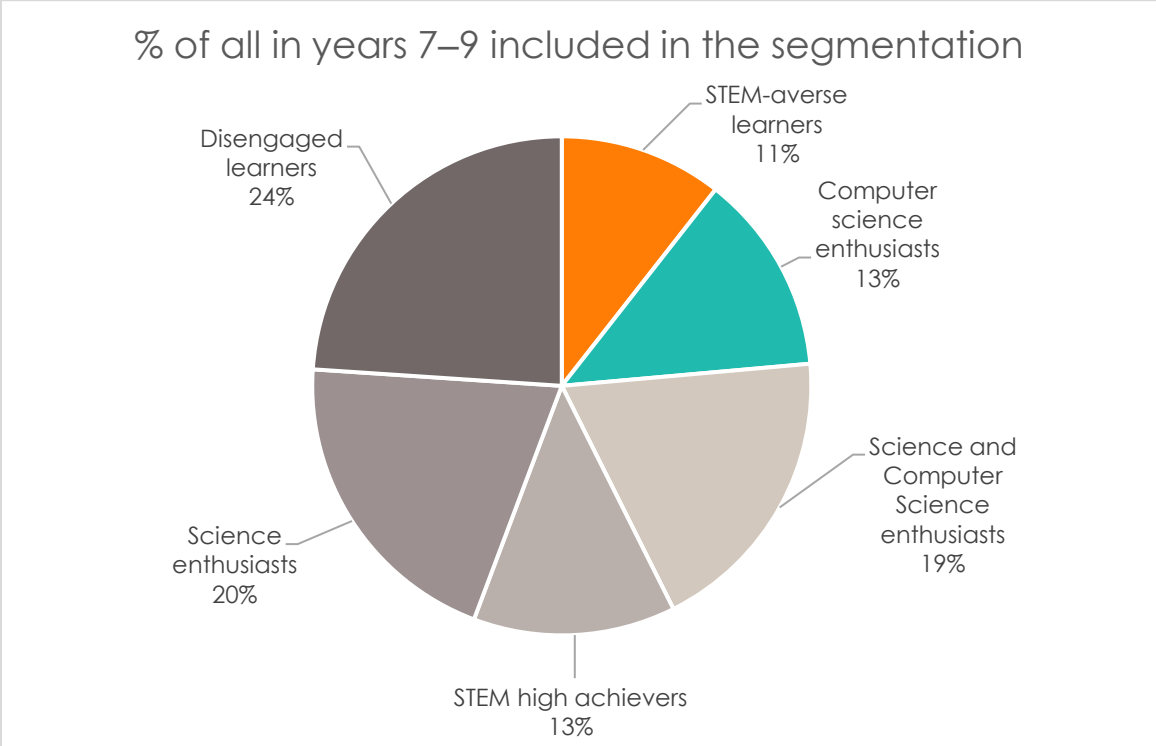
Full details of the statistical methodology used to create the segments are provided in Annex A at the end of this report.

3.2. Segmentation 1: Young people in years 7–9

3.2.1. Overview of the segments

This segmentation analysis grouped the sample into six segments. Figure 3.1 shows the proportion of young people in each segment. The segmentation is based on 3,074 young people in years 7–9.

Figure 3.1: Breakdown of young people in years 7–9 by segment (2023)



Base: all year 7–9s included in the segmentation analysis: total 3,074

3.2.2. Segmentation 1: Profile of the six segments

STEM-averse learners

This segment represented 11% of the population of young people in years 7–9.

This segment was characterised by low levels of self-reported ability in maths, science and computer science. These students did not enjoy maths, science or computer science lessons. They lacked confidence in science and computer science, reporting that they found the maths involved in these subjects difficult. They reported being put off by their teachers and did not think that either subject fitted with their future career plans. They reported a slightly higher ability in design & technology (D&T) but their performance and interest in D&T were relatively average compared to the wider population.

They were not likely to pursue science after GCSEs and did not think science or computer science fitted with their future career plans or were relevant to their future careers.

This group comprised considerably more female than male students and had a higher representation of students from a white background and fewer from Asian backgrounds. There was a slight overrepresentation from the least deprived quintiles.

Table 3.1 Profile of STEM-averse learners

		All years 7–9	STEM-averse learners
Gender	Male	51%	22%
	Female	47%	76%
Ethnicity	White	71%	78%
	Mixed	7%	8%
	Asian	13%	7%
	Black	6%	4%
	Other/Prefer not to say/Don't know	4%	3%
IDACI	1 Most deprived	25%	22%
	2	21%	19%
	3	19%	19%
	4	18%	18%
	5 Least deprived	18%	22%

Computer science enthusiasts

This segment represented 13% of the year 7–9 population.

This segment was particularly interested in computer science. They reported that they performed well, were interested in and enjoyed computer science lessons. However, they reported that they performed less well in science and D&T. They were indifferent to pursuing a career in science and instead preferred computer science or engineering. They were not motivated to study science beyond GCSE.

This group comprised more male than female students and had a slightly higher representation of students from Asian backgrounds.

Table 3.2 Profile of Computer science enthusiasts

		All years 7–9	Computer science enthusiasts
Gender	Male	51%	58%
	Female	47%	40%
Ethnicity	White	71%	70%
	Mixed	7%	5%
	Asian	13%	16%
	Black	6%	5%
	Other/Prefer not to say/Don't know	4%	3%
IDACI	1 Most deprived	25%	20%
	2	21%	22%
	3	19%	19%
	4	18%	19%
	5 Least deprived	18%	21%

Science and Computer science enthusiasts

This segment represented 19% of the year 7–9 population.

They were characterised by their enjoyment, and self-reported ability in both science and computer science. They also reported an average ability in maths and D&T. They found both science and computer science lessons engaging but struggled with the maths involved. They were interested in future careers in science, engineering and computer science.

This group comprised more male than female students and included slightly more students from Asian backgrounds, as well as students from more deprived areas.

Table 3.3 Profile of Science and Computer science enthusiasts

		All years 7–9	Science and Computer science enthusiasts
Gender	Male	51%	69%
	Female	47%	27%
Ethnicity	White	71%	69%
	Mixed	7%	6%
	Asian	13%	15%
	Black	6%	7%
	Other/Prefer not to	4%	4%

	say/Don't know		
IDACI	1 Most deprived	25%	32%
	2	21%	18%
	3	19%	19%
	4	18%	15%
	5 Least deprived	18%	16%

STEM high achievers

This segment represented 13% of the year 7–9 population. They had a high level of self-reported ability in science, computer science and maths. They were engaged with science, maths and computer science lessons, finding them all interesting and enjoyable, and they saw a clear connection between these subjects and their career aspirations. They were likely to pursue further study in science and engineering after GCSEs.

This group had a higher representation of male students and fewer female students, as well as a higher proportion of students from Asian backgrounds, and fewer from white backgrounds.

Table 3.4 Profile of STEM high achievers

		All years 7–9	**STEM high achievers**
Gender	Male	51%	68%
	Female	47%	30%
Ethnicity	White	71%	61%
	Mixed	7%	9%
	Asian	13%	19%
	Black	6%	8%
	Other/Prefer not to say/Don't know	4%	3%
IDACI	1 Most deprived	25%	22%
	2	21%	21%
	3	19%	21%
	4	18%	18%
	5 Least deprived	18%	18%

Science enthusiasts

This segment represented 20% of the year 7–9 population.

This segment was characterised by their high level of self-reported ability in science and strong dislike of computer science. They reported performing well in and enjoying science lessons, but disliked computer science which they found uninteresting. They thought science was important to their career and were likely to study science after GCSE.

This group comprised more female than male students and contained fewer students from more deprived backgrounds.

Table 3.5 Profile of Science enthusiasts

		All years 7–9	Science enthusiasts
Gender	Male	51%	39%
	Female	47%	59%
Ethnicity	White	71%	68%
	Mixed	7%	6%
	Asian	13%	15%
	Black	6%	6%
	Other/Prefer not to say/Don't know	4%	5%
IDACI	1 Most deprived	25%	20%
	2	21%	19%
	3	19%	20%
	4	18%	22%
	5 Least deprived	18%	20%

Disengaged learners

This segment represented 24% of the year 7–9 population.

They reported low levels of ability in maths, science, computer science and design and technology. They were not particularly interested in science and computer science lessons. The members of this group were no more or less motivated or demotivated by specific aspects of science or computer science lessons when compared with the overall average.

They did not think science was for them and that it did not fit with their future career plans. They were unlikely to study science beyond GCSE.

This group comprised slightly more female than male students, they were more likely to be from white backgrounds and less likely to be from Asian backgrounds. They were slightly more likely to be from more deprived backgrounds.

Table 3.6 Profile of Disengaged learners

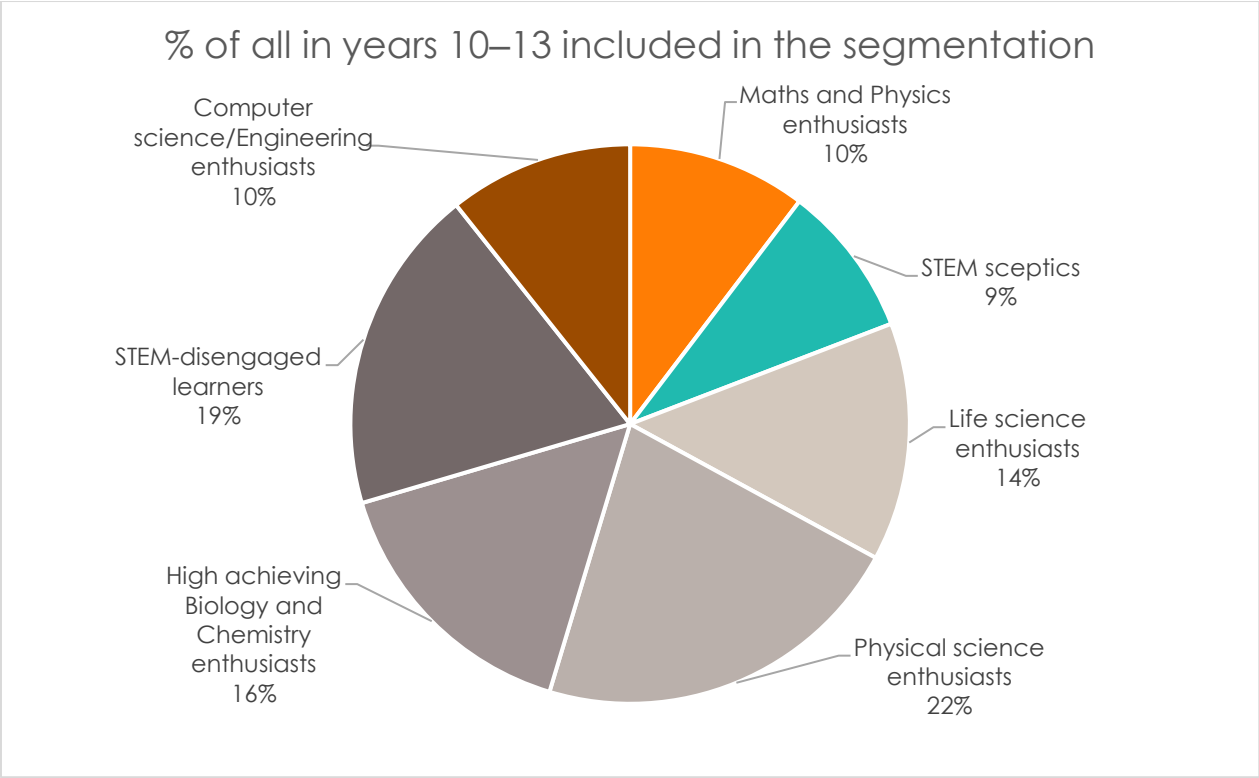
		All years 7–9	Disengaged learners
Gender	Male	51%	46%
	Female	47%	52%
Ethnicity	White	71%	78%
	Mixed	7%	5%
	Asian	13%	7%
	Black	6%	6%
	Other/Prefer not to say/Don't know	4%	5%
IDACI	1 Most deprived	25%	26%
	2	21%	24%
	3	19%	18%
	4	18%	17%
	5 Least deprived	18%	16%

3.3. Segmentation 2: Young people in years 10–13

3.3.1. Overview of the segments

This segmentation analysis grouped the sample into seven segments. Figure 3.2 shows the proportion of young people in each segment. Note the segmentation does not cover the whole year 10–13 sample as some questions used in the segmentation were based on modular subsets of the full sample. The segmentation is based on 2,040 young people in years 10–13.

Figure 3.2: Breakdown of young people in years 10–13 by segment (2023)



Base: all year 10–13s included in the segmentation analysis: total 2,040

3.3.2. Profile of the seven segments

Maths and Physics enthusiasts

This segment represented 10% of the year 10–13 population.

This segment was characterised by their reported ability and interest in maths and physics. They reported being high performers across all STEM subjects but considered themselves to be particularly strong in maths and physics. They showed above-average interest in Chemistry and Physics lessons (average interest in Biology lessons) and particularly enjoyed the maths involved in STEM subjects. They were very interested in a future career in science, engineering, computer science or maths.

This group comprised considerably more male than female students and had fewer students from a white background with students from an Asian background being overrepresented compared with most other ethnicities. Students in this group were less likely to be from the most deprived areas.

Table 3.7 Profile of Maths and Physics enthusiasts

		All Year 10–13 population	Maths and Physics enthusiasts
Gender	Male	50%	72%
	Female	47%	24%
Ethnicity	White	70%	66%
	Mixed	6%	4%
	Asian	12%	20%

	Black	7%	8%
	Other/Prefer not to say/Don't know	4%	2%
IDACI	1 Most deprived	26%	18%
	2	21%	22%
	3	18%	20%
	4	17%	17%
	5 Least deprived	17%	23%

STEM sceptics

This segment represented 9% of the year 10–13 population.

This segment was characterised by a below average reported ability across STEM subjects. This group found these subjects difficult, particularly the maths involved. They were not interested or engaged in lessons on these subjects. They did not think science is for them and were not interested in a future career in STEM.

This group comprised considerably more female than male students and included more students from a white background and fewer students from an Asian or Black background. These students tended to be from less deprived areas.

Table 3.8 Profile of Maths and STEM sceptics

		All Year 10–13 population	STEM sceptics
Gender	Male	50%	25%
	Female	47%	73%
Ethnicity	White	70%	83%
	Mixed	6%	7%
	Asian	12%	6%
	Black	7%	2%
	Other/Prefer not to say/Don't know	4%	2%
IDACI	1 Most deprived	26%	22%
	2	21%	19%
	3	18%	19%
	4	17%	18%
	5 Least deprived	17%	23%

Life science enthusiasts

This segment represents 14% of the year 10–13 population.

This segment is characterised by their ability and interest in biology. While they have an above average ability in biology, they tend to struggle with other STEM subjects. They tend to struggle with the maths involved in all chemistry, physics and computer science. They were interested in and were engaged with biology lessons and saw their teacher as a source of encouragement. They were not particularly interested in a future career in science and did not think it particularly important for their future.

This group comprises considerably more female than male students and is broadly representative of the population in terms of ethnicity. This group contains fewer students from the most deprived areas and more from less deprived areas.

Table 3.9 Profile of Life science enthusiasts

		All Year 10–13 population	Life science enthusiasts
Gender	Male	50%	22%
	Female	47%	74%
Ethnicity	White	70%	73%
	Mixed	6%	7%
	Asian	12%	9%
	Black	7%	9%
	Other/Prefer not to say/Don't know	4%	2%
IDACI	1 Most deprived	26%	17%
	2	21%	18%
	3	18%	22%
	4	17%	21%
	5 Least deprived	17%	22%

Physical science enthusiasts

This segment represented 22% of the year 10–13 population.

This segment was characterised by an above average self-reported ability and interest in physics and chemistry, and a relative average reported ability across biology, computer science and D&T. Despite their above-average self-reported ability in physics and chemistry, they were not particularly interested in a future career in science and did not think it was important to their future careers.

This group comprised more male than female students and was broadly representative of the population in terms of ethnicity. This group contained more students from more deprived areas.

Table 3.10 Profile of Physical science enthusiasts

		All Year 10–13 population	Physical science enthusiasts

Gender	Male	50%	59%
	Female	47%	38%
Ethnicity	White	70%	72%
	Mixed	6%	6%
	Asian	12%	10%
	Black	7%	9%
	Other/Prefer not to say/Don't know	4%	3%
IDACI	1 Most deprived	26%	27%
	2	21%	23%
	3	18%	19%
	4	17%	18%
	5 Least deprived	17%	13%

High achieving Biology and Chemistry enthusiasts

This segment represents 16% of the year 10–13 population.

This segment was characterised by a high level of self-reported ability and interest in biology and chemistry and thought them important to their future careers. They also reported performing well in maths and physics, but were less interested in these subjects. They were interested in a future career in science and thought that science was important for their future career.

This group comprised more female than male students. There were fewer students from a white background and more from an Asian background. They were broadly representative in terms of deprivation.

Table 3.11 Profile of High achieving Biology and Chemistry enthusiasts

		All Year 10–13 population	**High achieving Biology and Chemistry enthusiasts**
Gender	Male	50%	32%
	Female	47%	65%
Ethnicity	White	70%	65%
	Mixed	6%	6%
	Asian	12%	17%
	Black	7%	9%
	Other/Prefer not to say/Don't know	4%	4%
IDACI	1 Most deprived	26%	22%

	2	21%	18%
	3	18%	18%
	4	17%	19%
	5 Least deprived	17%	23%

STEM-disengaged learners

This segment represented 19% of the year 10–13 population.

This segment did not enjoy or report performing well across the three sciences (biology, chemistry and physics) and computer science. Particularly they found the maths difficult and did not see these subjects as fitting with their future careers. They did not think STEM was important to their future career and did not see STEM as being for them. While they reported a relatively average ability in D&T, they enjoyed this subject.

This group was broadly representative of the population in relation to gender but contained more students from white backgrounds and fewer from Asian or Black backgrounds. These students tended to be from more deprived areas.

Table 3.12 Profile of STEM-disengaged learners

		All Year 10–13 population	**STEM-disengaged learners**
Gender	Male	50%	49%
	Female	47%	49%
Ethnicity	White	70%	76%
	Mixed	6%	7%
	Asian	12%	9%
	Black	7%	5%
	Other/Prefer not to say/Don't know	4%	3%
IDACI	1 Most deprived	26%	33%
	2	21%	20%
	3	18%	16%
	4	17%	15%
	5 Least deprived	17%	17%

Computer science/Engineering enthusiasts

This segment represented 10% of the year 10–13 population.

This group were very interested in and reported performing well in computer science and, to a lesser extent, D&T. They enjoyed computer science lessons and thought this subject was relevant to their future careers. They were highly interested in a future career in computer science and, to a lesser

extent, engineering. They were less keen on the sciences and were not particularly interested in a career in science.

This segment comprised more male than female students and fewer students from white backgrounds, and slightly more from Black or other minority ethnic backgrounds. This group contained more students from more deprived areas.

Table 3.13 Profile of Computer science/Engineering enthusiasts

		All Year 10–13 population	Computer science/ Engineering enthusiasts
Gender	Male	50%	75%
	Female	47%	20%
Ethnicity	White	70%	69%
	Mixed	6%	6%
	Asian	12%	12%
	Black	7%	8%
	Other/Prefer not to say/Don't know	4%	6%
IDACI	1 Most deprived	26%	29%
	2	21%	26%
	3	18%	12%
	4	17%	16%
	5 Least deprived	17%	17%

4. Regression analysis

4.1. Introduction and method

Regression analysis was conducted to explore demographic factors influencing interest with involvement in careers in STEM subjects. Models were developed to investigate two areas:

- Demographic predictors of whether a young person is considering pursuing a career in STEM.
- Demographic predictors of having family involvement in career considerations.

Binary logistic regression[2] was employed to investigate both topics. This approach estimates the influence of a single factor on the outcome variables, while holding the other variables in the model fixed. This helps identify which of these factors are significantly associated with these outcomes.

Questionnaire variables were recoded into outcome variables:

Interest in pursuing a career in STEM

Pupils were asked how interested they were in a future career involved in:

- Science
- Engineering
- Computing or Technology
- Maths

For each question, pupils were given a score of 1 if they responded 'Fairly interested' or 'Very interested' to the question and 0 otherwise.

Factors associated with having family involvement in career considerations

Pupils were asked whether they had received any information or advice from their parents/guardians, siblings or other family members. Pupils were given a score of 1 if they responded indicating they had received information or advice from any of these groups, and 0 otherwise.

Predictor variables

Individual level characteristics and demographic variables were included in the model as predictors, as existing research indicated that these variables would be strongly associated with the outcome of interest. These included:

- Gender
- Ethnicity
- School year
- Free School Meal eligibility
- Provision of SEN support

[2] Logistic regression is a statistical technique to analyse the relationships between multiple variables where the outcome variable is binary. It finds the equation that best predicts the probability of the outcome given the variables included in the model.

The following area level characteristics were also included:

- Region
- Urban/Rural classification
- IDACI quintile

We controlled for the presence of selection bias originating from non-random NPD data linkage by re-weighting the data. Details of the full models are included in Annex B of this report.

4.2. Significant findings

This section summarises the significant findings from these models.

The principal outputs from a logistic regression are the odds ratios.

All of the predictor variables in the models were categorical variables and the odds ratio indicates the magnitude of the association of the predictor on the outcome variable when comparing one category to the reference category.

- An odds ratio **below 1** indicates that young people in the specified category were **less likely to be interested in pursuing a career in the particular subject** than young people in the reference category.
- An odds ratio **greater than 1** indicates that young people in the specified category were **more likely to be interested in pursuing a career in the particular subject** than young people in the reference category.

4.2.1. Interest in pursuing a career in STEM

Across the four models (interest in pursuing a career in science, engineering, computing or technology, and maths), several patterns emerged in the demographic factors and their interest in careers in STEM-related fields:

Gender: Across all fields, female students showed significantly lower odds of expressing interest in pursuing careers in STEM fields, compared to male students. The largest gaps were observed in engineering and computer science.

Ethnicity: Students from Asian backgrounds consistently showed higher interest in pursuing careers in STEM fields, compared to students from white backgrounds. Students from Black backgrounds were also more interested in these careers compared to students from white backgrounds.

School year: Across engineering, computing or technology and maths, interest in pursuing careers in these fields decreased as students progressed through school years. However, this trend was not observed for science.

The next section discusses the significant findings for each model exploring interest in pursuing a career in each subject.

Science

As shown in table 4.1, five predictor variables were significantly associated with a student's interest in pursuing a career in science.

Female students were less likely to report an interested in pursuing a career in science compared to males.

Young people from Asian backgrounds had significantly higher odds of expressing an interested in pursuing a career in science compared to students from white backgrounds. Students from a Black

background also had higher odds of expressing an interest in a career in science compared to white students. Those from other minority ethnic backgrounds were also more likely to express an interest in pursuing a career in science than white students.

Those who were eligible for free school meals (FSM) were less likely to show an interest in pursuing a career in science, compared to those who were not FSM-eligible.

Young people receiving SEN support were less likely to express an interest in pursuing a career in science. Those on Education, Health and Care plans were also significantly less likely to express an interest in pursuing a career in science.

Table 4.1: Significant results from regression model – Career interest: Science

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–0.117***	0.025	0.052
Ethnicity	Asian vs white	0.805***	2.237	2.237
	Black vs white	0.342***	1.408	1.408
	Any other vs white	0.234***	1.264	1.264
School year (2023/24 academic year)	year 8 vs 7	0.097	1.102	0.094
	year 9 vs 7	0.207***	1.230	0.094
	year 10 vs 7	–0.081	0.922	0.094
	year 11 vs 7	–0.061	0.941	0.095
	year 12 vs 7	–0.190	0.827	0.097
	year 13 vs 7	–0.110	0.896	0.098
Free School Meal eligibility	Eligible for FSM	–0.180***	0.835	0.068
SEN provision	Education, health and care plan vs none	–0.278***	0.757	0.128
	SEN support vs none	–0.309***	0.734	0.084

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base: all students consenting to NPD data linkage (6,212)

Engineering

In this model, six predictor variables were significantly associated with an interest in pursuing a career in engineering.

Female students had significantly lower odds of expressing an interest in pursuing a career in engineering compared to male students.

Young people from an Asian background were significantly more likely to show an interest in pursuing a career in engineering, compared to students from a white background. Those from Black backgrounds also had a positive association with interest in a career in engineering. Young people

from other minority ethnic backgrounds were also more likely to express an interest in a career in engineering than white students.

As students progressed through school years, their interest in engineering decreased. For example, year 13 students were less likely than Year 7 students to express an interest in a career in engineering.

Students who receive SEN support were less likely to express an interest in a career in engineering. Those on Education, Health and Care plans were also significantly less likely to express an interest in pursuing a career in engineering.

Students from urban areas had lower odds of expressing an interest in engineering compared to their rural counterparts.

Table 4.2: Significant results from regression model – Career interest: Engineering

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–1.462***	0.232	0.056
Ethnicity	Asian vs white	0.565***	1.759	1.759
	Black vs white	0.270***	1.310	1.310
	Any other vs white	0.154**	1.167	1.167
School year (23/24 academic year)	year 8 vs 7	–0.112	0.894	0.099
	year 9 vs 7	–0.210***	0.811	0.100
	year 10 vs 7	–0.394***	0.675	0.100
	year 11 vs 7	–0.645***	0.525	0.102
	year 12 vs 7	–0.837***	0.433	0.104
	year 13 vs 7	–0.760***	0.468	0.106
Free School Meal eligibility	Eligible for FSM	0.014	1.015	0.072
SEN provision	Education, health and care plan vs none	–0.470***	0.625	0.133
	SEN support vs none	–0.141	0.868	0.088
Urban/Rural	Urban vs Rural/missing	–0.182***	1.015	0.072

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base: all students consenting to NPD data linkage (6,212)

Computing and Technology

Three predictor variables were significantly associated with reporting an interest in pursuing a career in computing and technology.

Female students had significantly lower odds of reporting an interest in pursuing a career in computing and technology compared to their male counterparts.

Students from Asian backgrounds had significantly higher odds of showing an interest in pursuing a career in computing and technology compared to students from white backgrounds. Students from Black backgrounds were also more likely to be interested in a career in computing and technology compared to their white counterparts. Those from other minority ethnic backgrounds were also more likely to express an interest in pursuing a career in computing and technology.

Interest in computing and technology declined progressively through school years.

Table 4.3: Significant results from regression model – Career interest: Computing and technology

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–1.283***	0.277	0.057
Ethnicity	Asian vs white	0.664***	1.943	1.943
	Black vs white	0.578***	1.782	1.782
	Any other vs white	0.238***	1.269	1.269
School year (2023/24 academic year)	year 8 vs 7	–0.259***	0.771	0.099
	year 9 vs 7	–0.508***	0.602	0.100
	year 10 vs 7	–0.649***	0.523	0.101
	year 11 vs 7	–0.885***	0.413	0.104
	year 12 vs 7	–0.824***	0.439	0.105
	year 13 vs 7	–0.663***	0.515	0.106

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base: all students consenting to NPD data linkage (6,212)

Maths

Five predictor variables were significantly associated with an interest in pursuing a career in maths.

Female students had significantly lower odds of expressing an interest in maths, compared to their male counterparts.

Students from an Asian background had significantly higher odds of being interested in a career in maths compared to white students. Students from Black backgrounds were also more likely to be interested in a career in maths than white students.

Students in years 12 and 13 showed significantly lower odds of being interested in a career in maths compared to students in year 7.

Students who were eligible for free school meals (FSM) had lower odds of expressing an interest in pursuing a career in maths compared to those who were not FSM-eligible.

Students receiving SEN support were significantly less likely to express an interest in pursuing a career in maths.

Table 4.4: Significant results from regression model – Career interest: Maths

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–0.572***	0.565	0.054
Ethnicity	Asian vs white	0.583***	1.792	1.792
	Black vs white	0.225**	1.253	1.253
	Any other vs white	0.114	1.121	1.121
School year (2023/24 academic year)	year 8 vs 7	0.018	1.018	0.096
	year 9 vs 7	0.064	1.066	0.096
	year 10 vs 7	–0.074	0.929	0.096
	year 11 vs 7	–0.191	0.826	0.098
	year 12 vs 7	–0.446***	0.640	0.101
	year 13 vs 7	–0.508***	0.602	0.103
Free School Meal eligibility	Eligible for FSM	–0.187***	0.829	0.071
SEN provision	Education, health and care plan vs none	–0.093	0.912	0.129
	SEN support vs none	–0.328***	0.720	0.087

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base: all students consenting to NPD data linkage (6,212)

4.2.2. Factors associated with having family involvement in career considerations

Three predictor variables were significantly associated with having family involvement in discussions around future career considerations.

Students from Black backgrounds were more likely to have family involvement in career considerations compared to students from white backgrounds. Students from the 'Any other' category were less likely to have family involvement in future career considerations than students from white backgrounds.

Students who were eligible for free school meals were less likely to have family involvement in career considerations compared those that were not FSM-eligible.

Students who were on an Education, Health and Care plan, were less likely to have family involvement in career considerations compared to those with no SEN provision. Students receiving SEN support were also less likely to have family involvement in career considerations.

Table 4.5: Significant results from regression model – Factors associated with having family involvement in career considerations

Category	Variable	Coefficient	Odds ratio	Standard error
Ethnicity	Asian vs white	–0.218	0.804	0.804
	Black vs white	0.051***	1.053	1.053
	Any other vs white	–0.205***	0.814	0.814
Free School Meal eligibility	Eligible for FSM	–0.280***	0.756	0.100
SEN provision	Education, health and care plan vs none	–0.448***	0.639	0.186
	SEN support vs none	–0.487***	0.615	0.126

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base: students in years 10–13 consenting to NPD data linkage (3,443)

Annex A: Segmentation method

Verian conducted two segmentations to investigate the underlying patterns in the population of young people with respect to interest in science and computing. The motivation of this analysis was to understand better how the observed variation in science and computing interest was associated with factors such as young people's self-perceived ability in these subjects and features that had encouraged or discouraged them. A similar segmentation was conducted in 2019, and this segmentation is intended to refresh and update that analysis.

Similar to 2019, we employed Latent Class Analysis (LCA) as the method for the segmentation. This method lends itself to statistical testing and validation techniques. It also enables comparisons of goodness of fit between different model specifications.

The segmentation analysis includes a similar range of variables included in the 2019 analysis. One key difference from the 2019 analysis is that we have conducted two separate segmentations, for years 10–13 and years 7–9. This is because respondents in years 10–13 were asked about each science individually (chemistry, biology and physics), while those in years 7–9 were asked about 'science' across a number of questions in the model.

Before conducting the segmentation, associations between the variables were examined to ensure that no two variables were highly correlated. Variable choice for the segmentation was informed by the desire to understand more about the interactions between motivational factors, ability and self-perception for pupils with different backgrounds. A detailed breakdown of the variables used is given below in Table A.1.

Table A.1: Breakdown of the variables used in the segmentation analysis

Topic	Description	Variable name	Segmentation
Ability	Good at science/ biology/ chemistry/physics, computer science, D&T and maths	Good	Y7–Y9 asked about 'science' Y10–Y13 asked about biology/chemistry/ physics
Enjoyment	Enjoyment of science/ biology/ chemistry/physics, computer science, D&T and maths	SchSubEnj2/ SchSubEnj	Y7–Y9 asked about 'science' Y10–Y13 asked about biology/chemistry/ physics
Lesson interest	Lessons interesting in science, computer science/ Lessons interesting in biology, chemistry, physics, computer science	SciInt	Y7–Y9 asked about 'science' Y10–Y13 asked about biology/chemistry/ physics
Encouragement	Factors encouraged to learn science/ biology/ chemistry/physics, computer science	SciEnc CompEnc	Y7–Y9 asked about 'science'

			Y10–Y13 asked about biology/chemistry/ physics
Discouraged	Factors put off learning science/ biology/ chemistry/physics, computer science	SciDis CompDis	Y7–Y9 asked about 'science' Y10–Y13 asked about biology/chemistry/ physics
Career – suitability	Science careers suitable for someone like me	SciCar	All
Career – interest	Interest in STEM careers	CarIntA–D	All
Career – understanding	Understanding science is important for me in my future career	SciUse	All
Relationship with science	Relationship with science	Identsci	All
Study interest	Likely to study after GCSE	SciGCSELik	Y7–Y9

Full question wording can be found in the questionnaire annex (Annex B) of the Technical report.

Two separate Latent Class Analysis (LCA) models were conducted. In each segmentation, the number of segments was chosen by balancing the trade-off between model fit (here, minimising the Bayesian Information Criterion (BIC)) and limiting the number of segments to reduce the complexity of the output. Each latent class model specification was iterated through between two and ten segments; for segmentation 1 we selected six as the number of segments as a greater number of segments led to only a very small reduction in the BIC. For segmentation 2, we selected seven segments. The final model specification (that is, the variables included in the model) was also chosen by minimising the BIC criterion.

Likelihood-ratio statistics are often used to assess the goodness of fit of LCA models. However, this validation method has considerable drawbacks when cross-tabs are sparsely populated, which is the case for many of the variables used in the analysis. Therefore, we examined the similarity of individuals within each segment and the dissimilarity of the segments with respect to the variables used in the segmentation using Fleiss' kappa. This statistic was used as it was the most appropriate indicator of intra-class correlation for ordinal and categorical data.

For each segment, we found that the individuals were significantly more similar than they could have been due to chance alone – with values of the kappa statistic ranging between 0.20 and 0.34. Furthermore, it was shown that any associations between segments was random (yielding a kappa value very close to 0).

Annex B: Regression model details

Predictor variables

The following variables were included as predictor variables in the models:

Table B.1: Predictor variables

Variable	Recoding	Values
Gender	Recoded into binary Male/Female	0 Male* 1 Female/Non-Binary/Identify in another way/DK/PNTS
Ethnicity		1 White* 2 Asian 3 Any other
IDACI	Recoded to 5	1 Most deprived 2 3 4 5 Least deprived/missing *
Region	Missing recoded into reference category	1 North East 2 North West 3 Yorkshire and The Humber 4 East Midlands 5 West Midlands 6 London 7 South East 8 South West 9 East of England/Missing*
Urban/Rural	Recoded to 1 Urban/missing	1 Urban/missing 2 Rural*
FSM	Missing recoded to 0	0 Not Eligible for FSM* 1 Eligible for FSM
SEN Provision	Missing recoded to 0	0 None* 1 E – Education, health and care plan 2 K – SEN support

School year (23/24 academic year)		7* 8 9 10 11 12 13

The following tables show the results for all predictor variables in all models.

Table B.2: Career interest: Science

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–0.117***	0.025	0.052
Ethnicity	Asian vs white	0.805***	2.237	2.237
	Black vs white	0.342***	1.408	1.408
	Any other vs white	0.234***	1.264	1.264
School year (2023/24 academic year)	year 8 vs 7	0.097	1.102	0.094
	year 9 vs 7	0.207***	1.230	0.094
	year 10 vs 7	–0.081	0.922	0.094
	year 11 vs 7	–0.061	0.941	0.095
	year 12 vs 7	–0.190	0.827	0.097
	year 13 vs 7	–0.110	0.896	0.098
Free School Meal eligibility	Eligible for FSM	–0.180***	0.835	0.068
SEN provision	Education, health and care plan vs none	–0.278***	0.757	0.128
	SEN support vs none	–0.309***	0.734	0.084
Region	North East	0.035	1.035	0.145
	North West	–0.114	0.892	0.105
	Yorkshire and The Humber	–0.038	0.962	0.111
	East Midlands	–0.212**	0.809	0.113
	West Midlands	–0.137	0.872	0.109
	London	–0.056	0.945	0.106

	South East	–0.158	0.854	0.099
	South West	–0.093	0.911	0.111
Urban/Rural	Urban vs Rural/missing	0.026	0.835	0.068
NPD deprivation indicators	IDACI quintile 1 vs 5	–0.129	0.879	0.087
	IDACI quintile 2 vs 5	–0.237***	0.789	0.086
	IDACI quintile 3 vs 5	–0.108	0.898	0.086
	IDACI quintile 4 vs 5	–0.205***	0.814	0.086

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base all students consenting to NPD data linkage (6,212)

Table B.3: Career interest: Engineering

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–1.462***	0.232	0.056
Ethnicity	Asian vs white	0.565***	1.759	1.759
	Black vs white	0.270***	1.310	1.310
	Any other vs white	0.154**	1.167	1.167
School year (2023/24 academic year)	year 8 vs 7	–0.112	0.894	0.099
	year 9 vs 7	–0.210***	0.811	0.100
	year 10 vs 7	–0.394***	0.675	0.100
	year 11 vs 7	–0.645***	0.525	0.102
	year 12 vs 7	–0.837***	0.433	0.104
	year 13 vs 7	–0.760***	0.468	0.106
Free School Meal eligibility	Eligible for FSM	0.014	1.015	0.072
SEN provision	Education, health and care plan vs none	–0.470***	0.625	0.133
	SEN support vs none	–0.141	0.868	0.088
Region	North East	0.166	1.181	0.154
	North West	0.203**	1.225	0.111

	Yorkshire and The Humber	0.107	1.112	0.118
	East Midlands	0.191	1.210	0.119
	West Midlands	0.185	1.204	0.115
	London	0.300***	1.350	0.113
	South East	0.030	1.030	0.105
	South West	–0.055	0.947	0.118
Urban/Rural	Urban vs Rural/missing	–0.182***	1.015	0.072
NPD deprivation indicators	IDACI quintile 1 vs 5	0.018	1.018	0.092
	IDACI quintile 2 vs 5	0.094	1.098	0.091
	IDACI quintile 3 vs 5	0.034	1.035	0.092
	IDACI quintile 4 vs 5	0.066	1.068	0.092

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base all students consenting to NPD data linkage (6,212)

Table B.4: Career interest: Computing and technology

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–1.283***	0.277	0.057
Ethnicity	Asian vs white	0.664***	1.943	1.943
	Black vs white	0.578***	1.782	1.782
	Any other vs white	0.238***	1.269	1.269
School year (2023/24 academic year)	year 8 vs 7	–0.259***	0.771	0.099
	year 9 vs 7	–0.508***	0.602	0.100
	year 10 vs 7	–0.649***	0.523	0.101
	year 11 vs 7	–0.885***	0.413	0.104
	year 12 vs 7	–0.824***	0.439	0.105
	year 13 vs 7	–0.663***	0.515	0.106
Free School Meal eligibility	Eligible for FSM	–0.054	0.947	0.073
SEN provision	Education, health and care plan vs none	0.162	1.175	0.132
	SEN support vs none	0.108	1.115	0.088
Region	North East	0.024	1.024	0.158
	North West	0.057	1.058	0.113

	Yorkshire and The Humber	0.039	1.040	0.119
	East Midlands	–0.132	0.876	0.123
	West Midlands	0.127	1.135	0.117
	London	0.060	1.061	0.114
	South East	–0.006	0.994	0.107
	South West	–0.062	0.940	0.121
Urban/Rural	Urban vs Rural/missing	0.179	0.947	0.073
NPD deprivation indicators	IDACI quintile 1 vs 5	0.136***	1.146	0.094
	IDACI quintile 2 vs 5	0.092	1.097	0.093
	IDACI quintile 3 vs 5	–0.041	0.960	0.094
	IDACI quintile 4 vs 5	0.031	1.032	0.094

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base all students consenting to NPD data linkage (6,212)

Table B.5: Career interest: Maths

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	–0.572***	0.565	0.054
Ethnicity	Asian vs white	0.583***	1.792	1.792
	Black vs white	0.225**	1.253	1.253
	Any other vs white	0.114	1.121	1.121
School year (2023/24 academic year)	year 8 vs 7	0.018	1.018	0.096
	year 9 vs 7	0.064	1.066	0.096
	year 10 vs 7	–0.074	0.929	0.096
	year 11 vs 7	–0.191	0.826	0.098
	year 12 vs 7	–0.446***	0.640	0.101
	year 13 vs 7	–0.508***	0.602	0.103
Free School Meal eligibility	Eligible for FSM	–0.187***	0.829	0.071
SEN provision	Education, health and care plan vs none	–0.093	0.912	0.129
	SEN support vs none	–0.328***	0.720	0.087
Region	North East	–0.075	0.928	0.151
	North West	–0.038	0.963	0.108

	Yorkshire and The Humber	0.001	1.001	0.114
	East Midlands	–0.133	0.876	0.117
	West Midlands	–0.074	0.929	0.112
	London	0.175	1.191	0.109
	South East	–0.099	0.906	0.102
	South West	–0.040	0.961	0.115
Urban/Rural	Urban vs Rural/missing	0.076	0.829	0.071
NPD Deprivation Indicators	IDACI quintile 1 vs 5	0.072	1.075	0.090
	IDACI quintile 2 vs 5	0.015	1.015	0.089
	IDACI quintile 3 vs 5	0.114	1.121	0.089
	IDACI quintile 4 vs 5	–0.009	0.991	0.090

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

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Table B.6: Factors associated with having family involvement in career considerations

Category	Variable	Coefficient	Odds ratio	Standard error
Gender	Female vs male	0.083	0.275	0.076
Ethnicity	Asian vs white	–0.218	0.804	0.804
	Black vs white	0.051***	1.053	1.053
	Any other vs white	–0.205***	0.814	0.814
Free School Meal eligibility	Eligible for FSM	–0.280***	0.756	0.100
SEN provision	Education, health and care plan vs none	–0.448***	0.639	0.186
	SEN support vs none	–0.487***	0.615	0.126
Region	North East	–0.128	0.879	0.211
	North West	–0.072	0.930	0.153
	Yorkshire and The Humber	0.115	1.122	0.167
	East Midlands	–0.085	0.919	0.165
	West Midlands	0.091**	1.095	0.158
	London	0.172	1.187	0.159
	South East	0.124	1.133	0.148
	South West	–0.058	0.944	0.166
Urban/Rural	Urban vs Rural/missing	–0.036	0.756	0.100
NPD deprivation indicators	IDACI quintile 1 vs 5	–0.431	0.650	0.128

	IDACI quintile 2 vs 5	–0.238	0.788	0.130
	IDACI quintile 3 vs 5	–0.155	0.857	0.133
	IDACI quintile 4 vs 5	–0.194	0.823	0.133

*Results significant at 95% are marked **, results significant at 99% are marked ***.*

Base all students consenting to NPD data linkage (3,443)

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