Report
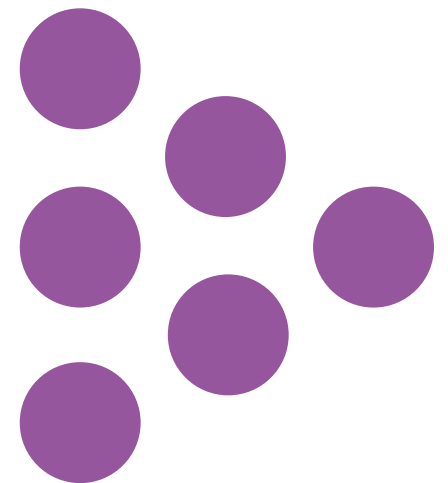
Being Present: the Power of Attendance and Stability for Disadvantaged Pupils

How pupil and cohort background factors link to the KS4 outcomes of disadvantaged pupils

National Foundation for Educational Research (NFER)

Being Present: the Power of Attendance and Stability for Stability for Disadvantaged Pupils

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This report is the result of a research project carried out by Zoe as part of a graduate training programme to develop her skills and understanding of different datasets.

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Acknowledgments

Executive Summary

Improving the Key Stage 4 (KS4) outcomes of pupils from disadvantaged backgrounds is a priority. Disadvantaged pupils, on average, achieve lower grades than their more advantaged peers and they make less progress across secondary school (Shaw *et al.*, 2017). This translates into poorer labour market outcomes for the group and reduced economic productivity for the country. By improving the progress and attainment of this group, not only can we boost social mobility for these young people and reduce the attainment gap, but potentially boost economic growth.

Building on previous research, our study simultaneously investigates how a broad range of pupil and cohort factors are associated with the KS4 outcomes of disadvantaged pupils. We look at both the significance and strength of each association. This is in order to understand the relative importance of each factor. We hope this research will be used by policymakers and practitioners in order to inform policy and resource provision.

Some of the factors we look at, such as absence at KS4 and KS2 attainment, are more easily open to influence by policymakers and practitioners compared to other factors in our study, such as gender and ethnicity. Background factors, such as gender and ethnicity, were included to ensure any association between these factors and outcomes was controlled for, before exploring the relationships between factors more easily open to influence.

We found the following factors had the strongest links to KS4 outcomes, relative to all other factors in our models:

- **Attainment 8 (A8) scores** were most strongly associated with a pupil's KS4 absence rate, KS2 attainment and Special Educational Needs and Disabilities (SEND) status. Fixed-term exclusion rates and moving schools were also associated with Att8 scores for disadvantaged pupils.

- **Progress 8 (P8) scores** were most strongly associated with a pupil's KS4 absence rate, their exclusion rate during secondary school and whether or not they moved schools during KS4.

On average, the association between being absent from school and KS4 outcomes is worse for disadvantaged pupils than their more affluent peers. The difference is small but statistically significant. For example, if a disadvantaged pupil missed six weeks of school at KS4, their P8 score would be predicted to be an additional 0.05 lower than a more affluent pupil with the same absence rate.

On average, the association between moving schools during KS4 is worse, for disadvantaged pupils compared to a more affluent peer. The difference is statistically significant. For example, a disadvantaged pupil's Att8 score would be predicted to be, on average, an additional 1.2 points lower than a similar but more affluent peer who had moved schools.

The average absence and movement rates of a year group are associated with the KS4 outcomes of disadvantaged pupils in that group. The better the group attendance and the more stable the

year group, the better the predicted outcomes for disadvantaged pupils. This is the case even after controlling for pupil background factors. Other cohort factors, such as the proportion of a pupil's peers with SEND or English as an Additional Language (EAL) in their year group, were not found to be related to the outcomes of disadvantaged pupils when all the other factors were taken into account.

KS4 outcomes for disadvantaged pupils vary much more within schools than between schools. This is in line with prior research (see Shaw *et al.*, 2017). Based on NFER's previous research in the area ([Macleod *et al.* 2015](#)) these findings suggest that disadvantaged pupils are a diverse group of young people who are likely to benefit from personalised and targeted intervention rather than purely universal approaches to support.

For the 2015/16 cohort, 30 per cent of the gap in Att8 scores can be explained by the between group differences in absence, exclusion and movement rates, along with differences in KS2 scores. This suggests that a sizable portion of the gap in outcomes, between disadvantaged pupils and their more affluent peers, is associated with the underlying group differences in rates of secondary absence, exclusion and pupil transfers, along with differences in prior attainment.

For the 2015/16 cohort, 55 per cent of the gap in P8 scores can be explained by the between group differences in absence, exclusion and movement rates during secondary school. This suggests that over half of the gap in outcomes between disadvantaged pupils and their more affluent peers is associated with the underlying group differences in absence, exclusion and pupil

transfer rates. Improving these underlying factors for disadvantaged pupils should therefore substantially boost outcomes for the group.

Implications for school leaders

- Secondary schools really can make a difference to the outcomes of disadvantaged young people, even after controlling for a host of background factors such as gender, ethnicity, EAL, SEND and home area deprivation.

- Prioritising resources to improve individual and year group attendance, support KS4 transfers and address challenging behaviour is likely to improve outcomes for disadvantaged pupils during secondary school.

- Targeted support, in these areas, designed to address the individual barriers to education that pupils face are likely to be more fruitful in improving outcomes than universal interventions for all disadvantaged pupils within a school.

Implications for policy makers

- Supporting secondary schools to reduce absence, improve behaviour and support within-secondary phase transfers are all key areas of policy focus to boost outcomes of disadvantaged pupils and reduce group gaps in progress and attainment.

- Disadvantaged pupils are not a homogenous group. The complexity of their backgrounds needs to be considered when designing policy, at all levels, to support and boost these pupils' attainment.

1 Introduction

1.1 Improving disadvantaged pupils' social mobility through education is a priority

The social mobility strategy _Unlocking Talent, Fulfilling Potential_ (DfE, 2017c) demonstrates the government's commitment to increasing social mobility through education. The strategy builds on previous policies, such as the introduction of pupil premium funding (2011) and Opportunity Areas (2016), in order to help disadvantaged pupils achieve their potential. One of the four key ambitions within the strategy is to close the attainment gap in schools between disadvantaged pupils and their more affluent peers.

The educational outcomes of pupils from disadvantaged households in England are significantly lower than their more affluent peers and the gap gets wider as pupils get older (EEF, 2018). Disadvantaged pupils are also less likely than their more affluent peers to make good progress at secondary school, regardless of their attainment at primary school (Shaw _et al._, 2017). However, some disadvantaged pupils perform considerably better than others.

Disadvantaged pupils' results vary considerably both within schools and between schools. The variation in how disadvantaged pupils perform within schools has been linked to several pupil background factors such as the pupil's home area (Shaw _et al._, 2017) and gender (Kirby and Cullinane, 2016). The variation between schools has also been associated with several school-level cohort factors, for example the percentage of pupils eligible for pupil premium funding (Macleod _et al._, 2015).

Improving educational success and progress for disadvantaged pupils at secondary level is important, as secondary attainment is strongly associated with labour market outcomes. Achieving good results in key assessments e.g. in GSCE English and mathematics (Hayward _et al.,_ 2014), making astute subject choices (Conlon _et al.,_ 2015) taking higher level qualifications (BIS, 2011; Hayward _et al.,_ 2014; Lindley and Manchin., 2014) and attending elite universities (Britton _et al.,_ 2016) consistently lead to better labour market outcomes for young people, regardless of their social background. It is therefore important to understand how disadvantage impacts on education outcomes and pupils' progress during their secondary education.

Understanding, and promoting educational success is not just a matter of social justice, it is also important for our economy. Research by Jenkins _et al_. (2017) estimates that by improving social mobility in the UK to the average level of western Europe, Britain's economic productivity and gross domestic product would increase by two per cent or £39 billion (at 2016 prices). The social mobility strategy also argues that if the attainment of disadvantaged pupils in the North East rose to the same rate as London, the overall gain to the British economy would be £3.5 billion.

In order to inform policy and practice, promote social mobility and reduce the attainment gap, it is important to understand how

secondary school outcomes are related to pupils' lives during KS3 and KS4.

2 What background factors are associated with the progress and attainment of pupils at secondary school?

Evidence shows us that pupils' KS4 outcomes are associated with a number of different background factors.

The factors that are related to a pupil's final GCSE attainment can be grouped broadly into two main categories. The first category are factors that concern an individual's background and circumstances (pupil-level factors) such as a pupil's gender. The second category includes factors related to pupils' common school experiences (school-level factors) such as the influence of their cohort e.g. size of a pupil's year group. Both sets of factors are related to the KS4 attainment of each pupil.

Pupil background factors that are associated with KS4 attainment include, but are not limited to:

- KS2 prior attainment (Greaves *et al*, 2014)

- the geographical area a young person lives in (Shaw *et al*., 2017; Blanden *et al*., 2015)

- individual absence rates (DfE, 2016, Sebba *et al*., 2015)

- SEND status (Shaw *et al*., 2017)

- moving/transferring schools (Sebba *et al.,* 2015)

- exclusion (Sebba *et al*., 2015)

- gender (Kirby and Cullinane, 2016)

- ethnicity (Kirby and Cullinane, 2016)

- aspiration level of pupils/parents (Strand 2014, Baars *et al*., 2016)

- socio-economic differences (De Vries and Rentfrow, 2016; Baars *et al*., 2016)

- cultural norms (Demie and Lewis, 2014, Baars *et al.,* 2016).

A pupil's attainment and progress is also associated with the school environment, which varies considerably across the country. A school's environment is made up of both the features of the school (such as location, size, type, teaching quality, school culture, Ofsted rating) and the school's intake (cohort factors). NFER's report *Supporting the Attainment of Disadvantaged Pupils: Articulating Success and Good Practice* (Macleod *et al*., 2015) found that schools with smaller year groups, lower rates of cohort absence, and higher proportions of disadvantaged pupils were associated with higher attainment for disadvantaged pupils. The report Hierarchy, Markets and Networks (Greany and Higham, 2018) shows that schools' intakes and the stability of those intakes vary considerably across the country as well as over time.

3   Aims of this research

This research sets out to better understand how disadvantage relates to pupils lives during secondary school. Our work builds on previous research in this area by simultaneously looking at the associations between a host of different background factors at both pupil- level and school-level, for the new accountability measures Attainment 8 (Att8) and Progress 8 (P8). It also builds on research by exploring whether or not certain key associations differ by pupil premium eligibility.

This research focuses on addressing the following questions:

- What pupil and cohort background factors appear to have the strongest link with the new attainment and progress measures? Thus which areas should policymakers and practitioners focus their resources on for maximum impact.

- To what extent are disadvantaged pupils' KS4 outcomes associated with cohort factors, after their own individual circumstances are considered? To explore how much influence, if any, a schools intake has on the outcomes of disadvantaged pupils.

- To explore, if there were any particularly strong associations between certain background factors and attainment, if the association varied by pupil premium eligibility? This was to see whether or not the KS4 outcomes of disadvantaged pupils were differentially effected by important influential factors. A particularly strong association, at both pupil and school level, we will label as a 'key driver'.

We were also interested in exploring the proportion of the attainment gap explained by any of the models we constructed. This was to further understand which factors, out of those explored, appeared to best explain the differences in outcomes between disadvantaged pupils and their more affluent peers.

Disadvantage

This research defines disadvantaged pupils as those eligible for pupil premium funding in Year 11, the final year of KS4. Most pupils who receive the pupil premium funding have been eligible for Free School Meals (FSM) in the last six years.

We selected pupil premium pupils, rather than pupils currently eligible for FSM, as research by Education Data lab in their *Long Term disadvantage series* (2017) shows the results of pupils eligible for pupil premium funding are more similar to the results of pupils currently eligible for FSM compared to pupils who have never been eligible for the benefit. The effects of economic disadvantaged therefore do not go away as soon as the pupil is not eligible for FSM. To more wholly capture economic disadvantage we have therefore selected pupil premium pupils as our study's group.

4   Methodology

To perform the analysis we used the data of about 525,770 secondary school pupils. All pupils who were in mainstream schools and were in Year 11 during the 2015/16 academic year were selected.

This pupil data comes from the National Pupil Database (NPD), which contains information on all pupils attending state-funded schools in England. The NPD data that we have used in this project covers:

- Pupils' individual background factors– e.g. gender, ethnicity, SEND status, EAL status
- Pupils' academic attainment e.g. KS4 and KS2 attainment.
- Pupils' absence and exclusions records e.g. number of fixed term exclusions and the number of sessions absent across each term during secondary school.

We investigated the associations between background factors (cohort wide or pupil specific) and secondary outcomes by creating a series of multi-level models. This statistical technique enabled us to account for variation in pupils' results at both school and pupil level simultaneously.

We created four models to address the associations between both types of background factors and KS4 outcomes.

- Two models looked at the links between background factors and KS4 outcomes for disadvantaged pupils (n=138, 673). One model had Att8 scores as the outcome measure and the other model had P8 scores as the outcome measure. We used these models to assess which background factors had the strongest links, relative to each other, to KS4 outcomes for disadvantaged pupils. The association between cohort factors and outcomes was also explored by these models.

- Two models, (n= 523,780) addressed the relationship between background factors and KS4 outcomes for all pupils. One model looked at the links between background factors and Att8 scores. A second model did the same for P8 scores. These models were used to compare whether or not links between KS4 outcomes and key background factors differed by pupil premium eligibility. The extent to which these models explain the attainment and progress gap was also explored by these models.

Further details about our methodology, along with a full list of the variables included in the models can be found in Appendix A. Appendix B shows the outputs for the disadvantaged pupil models.

Attainment 8 (Att8)

Att8 is the total points scored by a pupil across eight subjects at the end of KS4. Each point refers to one grade in the new 9-1 GCSEs. If the students sat an 'old-style' GCSE A*-U these grades were converted by DfE to point scores (DfE, 2017a). The eight subjects fit into four groups: English, mathematics, Ebacc (e.g. geography, history, sciences, and languages) and other (all other GCSEs and other acceptable qualifications). Pupils do not have to sit eight subjects but any subject not filled is scored zero. Mathematics and English qualifications (if two sorts of English are sat by a pupil) are counted twice. KS4 point scores in our cohort ranged from 0 to 83.5 points. The average point score for disadvantaged pupils was 42.8 compared with 53.8 points scored by their more affluent peers. An increase of one point means that the pupil scored one grade higher in one of their Att8 subjects (for example, they achieved a score of 8 instead of a 7 in that subject).

Progress 8 (P8)

P8 is a measure of how much progress a pupil has made between KS2 and KS4, compared to other pupils with similar KS2 scores. It takes a pupil's Att8 score and subtracts the expected Att8 score. The expected Att8 score is the national average Att8 score for all pupils with similar prior attainment. A positive score means the pupil is performing better at KS4 than average for their prior attainment group. A negative score means the pupil is performing worse at KS4 than the average score for their KS2 attainment group. For example, a Progress 8 score of +1 means the pupil is scoring, on average, one grade boundary higher in all their Att8 subjects than would be expected based on their KS2 attainment. Progress 8 scores in our cohort ranged from -7.15 to +5.19. On average, disadvantaged pupils scored around a third of a grade less, P8 score -0.30, than would be expected bearing in mind their prior attainment. More affluent pupils on average scored around a tenth of a grade higher, +0.11 P8 score, than would be expected based on their prior attainment. If a pupil's P8 score increased by 0.10 this is the equivalent of them performing an average of ten per cent per grade better in all their Att8 subjects. Such a pupil would potentially cross over a grade boundary in several subjects.

4   Results

4.1   Pupil specific background factors and KS4 outcomes

All the pupil specific (pupil-level) background factors we included were significantly associated with the KS4 outcomes of disadvantaged pupils[1]. The models show that: KS2 attainment, overall absence at KS3 and KS4, moving schools during KS4, exclusion rates, gender, SEND status, English as an Additional Language (EAL) status, home postcode deprivation and ethnic background are all individually associated with KS4 outcomes for disadvantaged pupils. This is the case even when they are all considered together.

We compared the different factors on a standard index using effect sizes. In this case, the effect size means the proportion of one standard deviation in the outcome measure (Att8 score or P8 score) that is associated with one standard deviation change in any one background factor. We adopted this measure so we could investigate the strength of one factor, be it pupil specific or cohort wide, compared to another.

For example, fixed term exclusions in the Att8 model had an effect size of 14.0. This means that for every one standard deviation increase (2.1 exclusions) we would predict that a pupil's Att8 score would fall by an average of 14 per cent of a standard deviation, or 2.4 Att8 points.

The standard deviation for Att8 scores in our model was 17.1 and for P8 scores was 1.21. The greater the effect size (positive or negative), the stronger the association.

Figure 1 shows the effect sizes (represented by the small red diamond shapes), and their 95 per cent confidence intervals (represented by the vertical lines either side of the red diamonds), for all individual pupil-level factors related to disadvantaged pupils' Att8 scores. Figure 2 shows the same information for P8 scores.

In Figure 1, KS2 attainment (effect size 36.4) and being from certain ethnic backgrounds (e.g. Chinese, effect size 43.6) had the strongest positive associations with Att8 scores. KS4 absence rates (-30.6 effect size) and SEND identification (-48.5 SEN Support, -63.4 Education Health and Care Plan/ Statement) were the factors with the strongest negative associations with Att8 scores, compared to all other factors within our models. Our models predict changing these variables would have a much greater effect on scores than, for example, changes to the deprivation of the pupil's home area (effect size 5.9), calculated from the Income Deprivation Affecting Children Index (IDACI).

KS4 absence (effect size -41.3) had the strongest association with P8 scores, out of all the factors we introduced into our model. Moving schools during GCSEs (effect size -23.8) as well as fixed-term exclusion rates (effect size -16.9) were also strongly related to P8 scores for disadvantaged pupils. As with Att8 scores, being from certain ethnic backgrounds was strongly associated with higher P8 scores.

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[1] Collinearity of all factors was tested for in both the P8 and Att8 models. Some school-level cohort variables, e.g. mean cohort IDACI were removed from the models as they were too similar to the pupil level background factors. All pupil level factors were found to be significant distinct predictors.

Figure 1: SEND status and KS4 absence have the strongest negative associations with the attainment of disadvantaged pupils at KS4
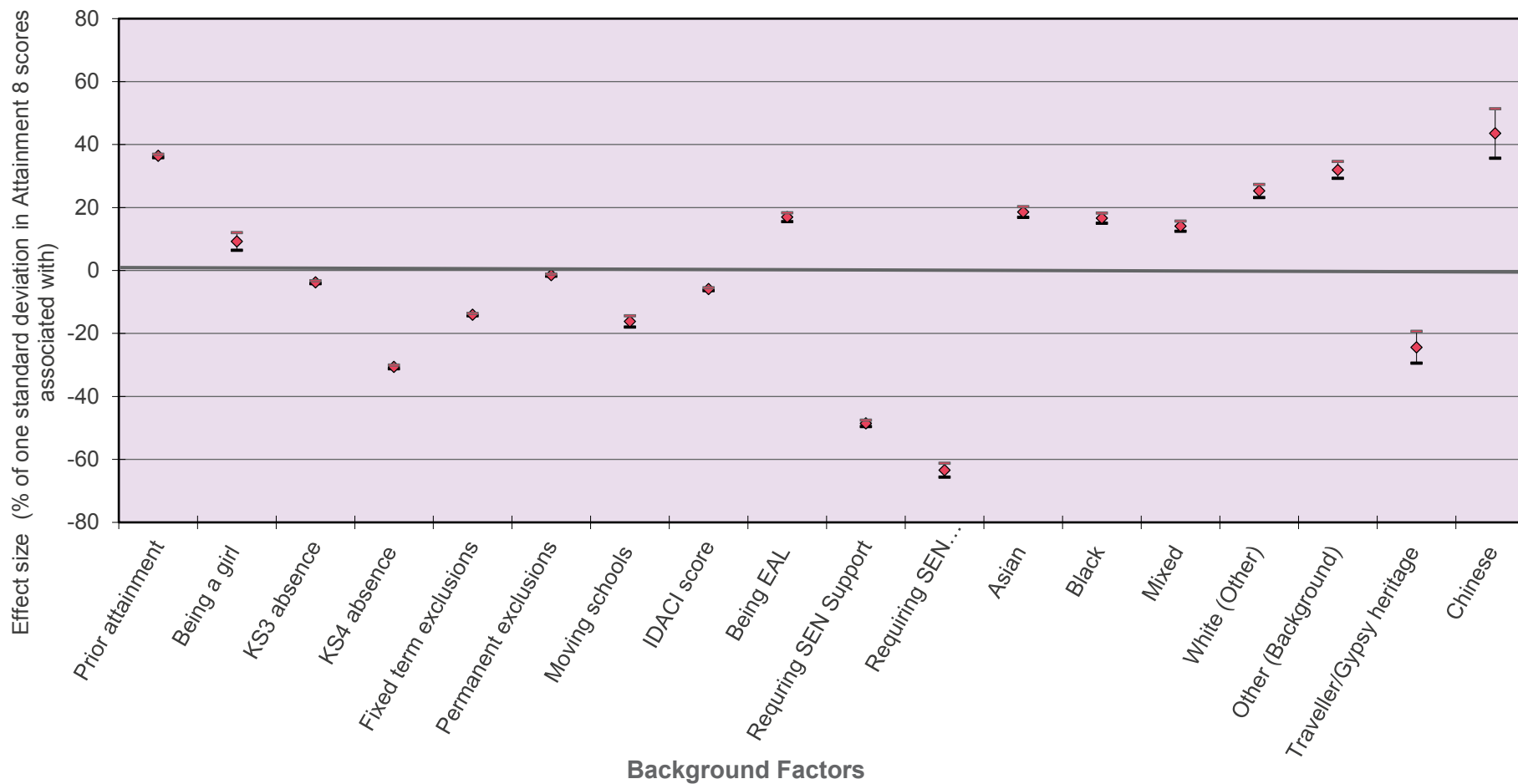
Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

Figure 2: Overall absence at KS4 and moving schools during KS4 have the strongest negative associations with the progress of disadvantaged pupils between KS2 and KS4
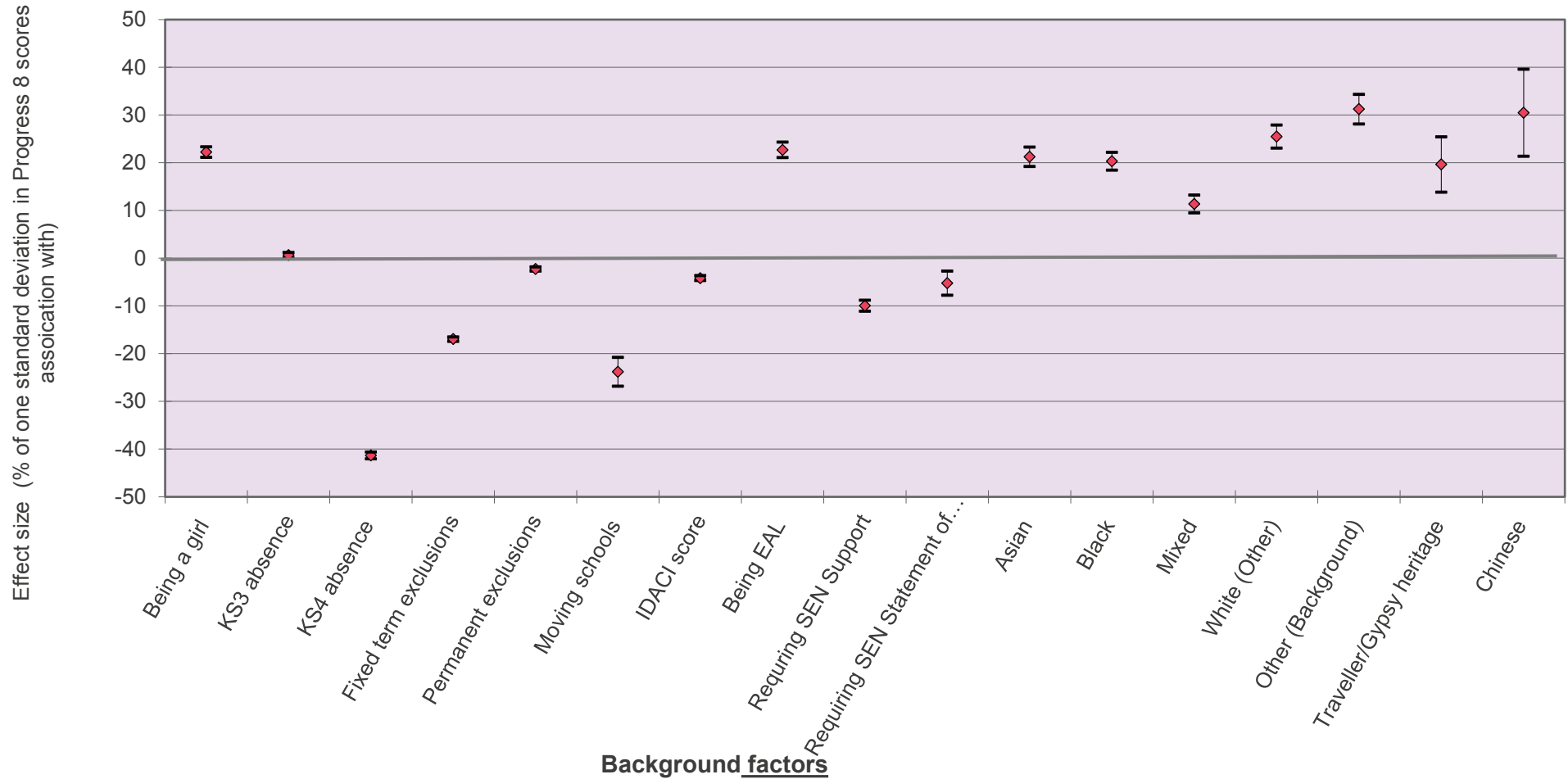
Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

This section now addresses in more detail how some of these pupil specific factors were associated with the KS4 outcomes of disadvantaged pupils.

In line with previous research (Greaves *et al*, 2014) KS2 results are strongly linked to KS4 attainment. The association differs by gender.

Disadvantaged pupils in our study scored an average of 24.9 points at KS2 compared to their more affluent peers who scored 26.8 points. Disadvantaged pupils, as a group, therefore are starting off from a lower attainment base when they enter secondary education compared to their more affluent peers.

Our models predict[2] a strong positive association between KS2 results and Att8 scores for disadvantaged pupils. We also found that the association between KS2 and KS4 results varies by gender. Our model predicts that for every 1 point increase in a pupil's KS2 score we would expect a boy's KS4 Att8 score to increase by an average of +0.9 points. A girl's would be predicted to increase by an average of + 1.0.

Figure 3 shows the association between Att8 scores and KS2 average point scores for a White British girl and boy, where all the other background factors are kept the same.

Figure 3: Improved KS2 outcomes predict improved Att8 scores for disadvantaged pupils
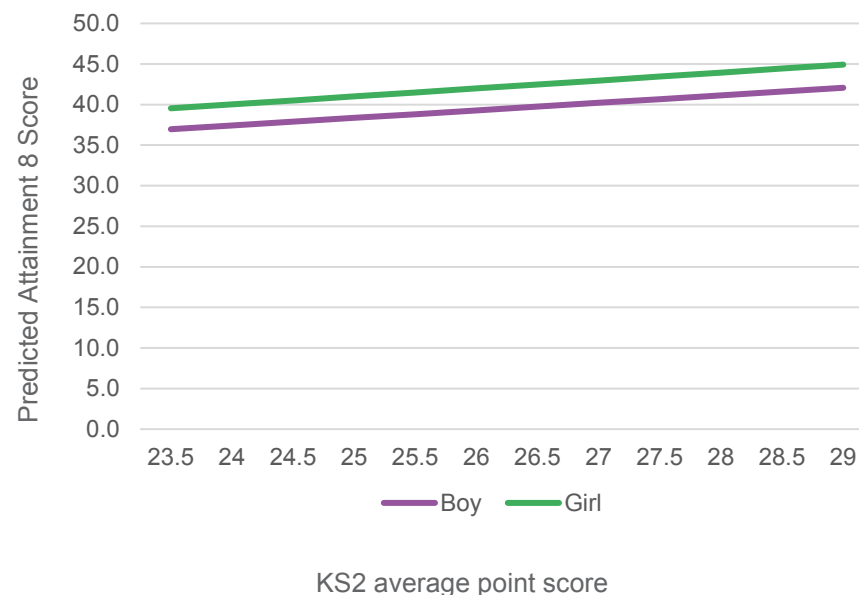
Source: National Pupil Database, KS4 Exam dataset for the academic year 2015-16, n=138,673

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[2]Multi-Level Models are statistical models of parameters that vary at more than one level   This technique can be used to predict the change in the outcome variable e.g. Att8 score when any one of the input variables e.g. KS2 average point score is changed by a value of 1 and all other input variables remain the same. It can therefore tell us how sensitive KS4 outcomes are to changes in certain factors. It is important to note that the models cannot account for all aspects of a pupil's life, as not all factors influencing KS4 outcomes (such as aspirations and motivation) can be isolated and quantified. The predictions and the associations highlighted here therefore show general trends and the average expected associations between outcomes and the factors we have cited.

Pupil absence rates are strongly associated with KS4 outcomes

There are many diverse reasons behind pupil absence such illness, low self-esteem and caring duties (Malcolm *et al*., 2003). Addressing absence is therefore not a straightforward or easy affair, although it is open to influence by practitioners (see discussion section for further comments).

In our 2015/16 Year 11 group, overall pupil absence rates ranged from 0 to 91.5 weeks across KS3 (years 7, 8 and 9) and ranged from 0 to 69.8 weeks across KS4 (years 10 and 11). The median[3] absence rate for disadvantaged pupils, was 5.4 weeks in KS3 and 3.7 in KS4. This is considerably higher than the median for their more affluent peers who missed 3.2 weeks in KS3 and 2.2 weeks in KS4.

As shown in Figures one and two, absence during KS4 had one of the strongest negative associations with Att8 and P8 scores, compared to all the factors within our model. We found that for every week of school missed at KS4 by a disadvantaged pupil, their Att8 score would be predicted to reduce by an average of 0.8 points. This relationship between absence and Att8 score did not differ by gender.

Figure 4: Disadvantaged pupils miss more school than their more affluent peers
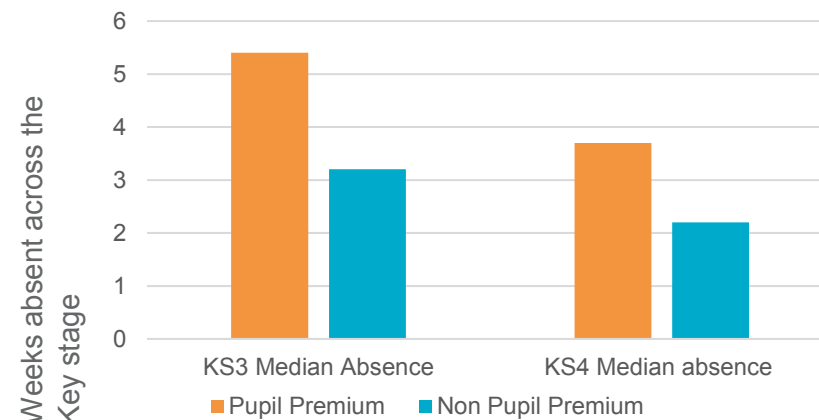
Source: National Pupil Database, absence and exclusion statistics for the academic years 2010/11 to 2015/16. n=523,780.

When we looked at the link between KS4 absence and P8 scores, we found the link varied slightly but significantly by gender. On average:

- A girl's P8 score would be predicted to be 0.08 lower for every week absent.

- A boy's P8 score would be predicted to be 0.07 lower for every week absent.

Figures five and six show the associations between absence and KS4 outcomes for a white British girl and boy, where all the other pupil and cohort background factors are kept the same.

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[3] Medians have been presented here as absence data was significantly skewed for both disadvantaged pupils and their more economically advantaged peers.

Figure 5: Higher pupil absence predicts lower Att8 scores for disadvantaged pupils
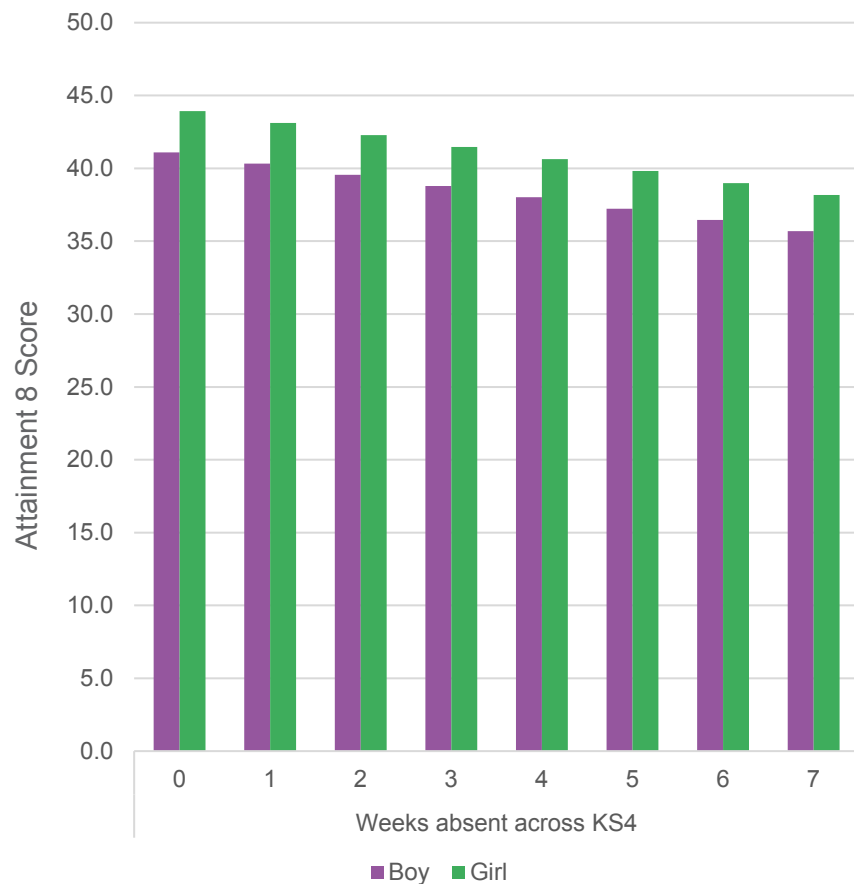
Attainment 8 Score

Weeks absent across KS4

■ Boy ■ Girl

Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

Figure 6: Higher pupil absence predicts lower P8 scores for disadvantaged pupils

Progress 8 Score

Weeks absent across KS4

■ Boy ■ Girl
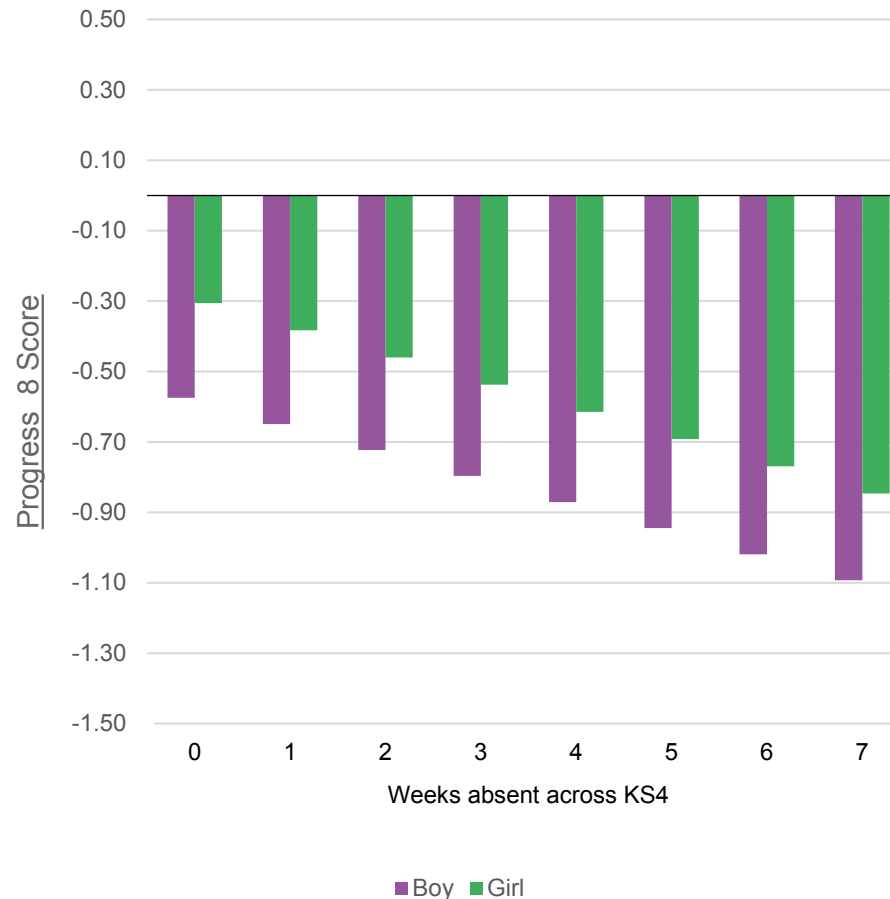
Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

Moving schools during KS4 is associated with lower KS4 outcomes for disadvantaged pupils.

Pupil movement is a complicated area and the reasons behind moving schools are often linked to the personal family circumstances of the pupil (Dobson *et al*, 2004). This factor is therefore less amenable to direct influence by policy makers and practitioners than some of the other factors we address; but, the transfer process, when pupils move between schools, can be supported by both policy makers and practitioners.

On average, 4.3 per cent of disadvantaged pupils in our cohort moved schools during years 10 and 11; whereas 2.4 per cent of non-pupil premium pupils moved during the same period.

Our models show a significant negative association between moving school across Years 10 and 11 and KS4 outcomes for disadvantaged pupils. Figure two suggests that that this link is particularly strong, compared to other factors, in terms of progress.

We can illustrate this by considering two disadvantaged pupils with the same background factors, one of whom moves schools and the other who stays in the same school during KS4. The model predicts that the pupil who moved school will achieve an Att8 score which is 2.8 points lower than the pupil that stayed in one school. This effect was not significantly different for girls or boys in terms of attainment.

Looking at P8 scores, we found the effect of moving was strong, relative to other factors, and differed significantly by gender. This suggests that pupils' secondary progress scores are particularly sensitive to pupil movement.

- A disadvantaged girl's P8 score was predicted to be lower, on average, by 0.40 if they moved during KS4 compared to if they stayed in one school.

- A disadvantaged boy's P8 score was predicted to be lower, on average, by 0.29 if they moved during KS4 compared to if they stayed in one school.

Figure 7: Moving schools is associated with significantly lower P8 scores for disadvantaged pupils, especially for girls

Change in P8 Score
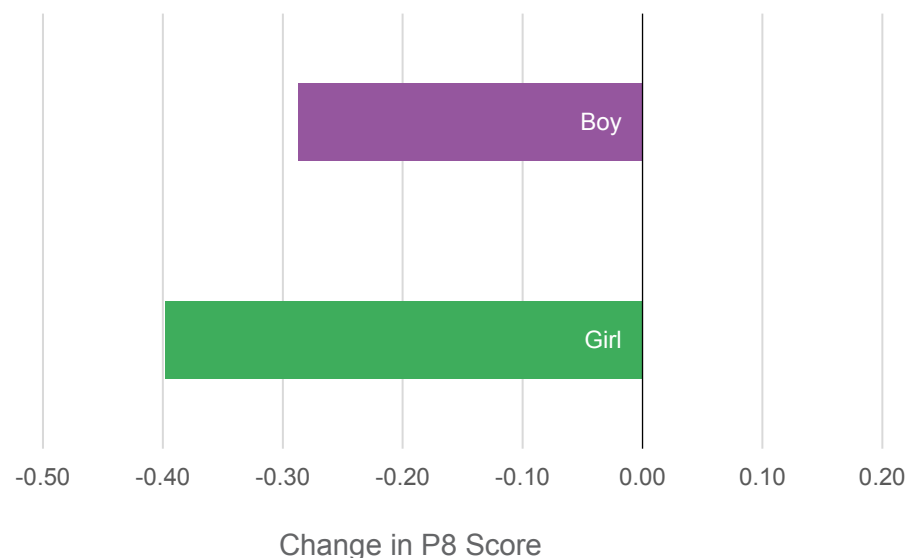
Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

Rates of fixed term and permanent exclusions are associated with lower KS4 outcomes for disadvantaged pupils.

Fixed and permanent exclusions are indicators of poor in-school behaviour by a pupil (DfE, 2017b). Poor behaviour itself is often an indicator of many other underlying challenges that a pupil is facing, e.g. SEND, bullying or difficult family circumstances, which the pupil is unable to successfully manage independently. Poor behaviour does not necessarily only impact that pupil's learning (DfE, 2012), but can disrupt the learning of other pupils in the same class or school.

Figure 8: A higher proportion of disadvantaged pupils have at least one fixed term exclusion during secondary schooling

Source: National Pupil Database, Exclusion statistics for the academic years 2010/11 to 2015/16. n=532,780

Within our cohort, 21.2 per cent of disadvantaged pupils had at least one fixed term exclusion throughout secondary school compared with 7.9 per cent of their more affluent peers.

Permanent exclusions were rare in our cohort of mainstream pupils. Overall, 0.4 per cent of disadvantaged pupils had at least one permanent exclusion on their record compared with 0.1 per cent of their more affluent peers.

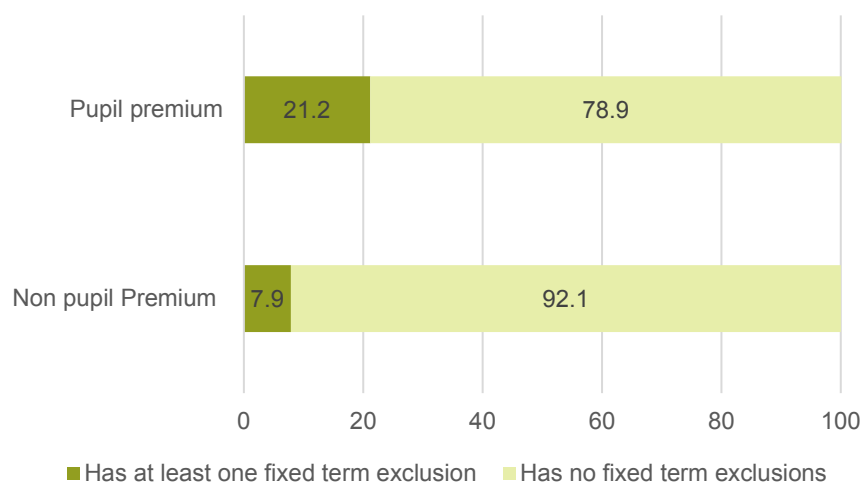We found a significant negative association between exclusion rates and KS4 outcomes for disadvantaged pupils. Our models suggest that for every fixed term exclusion, on average a pupil's:

- Att8 score would be predicted to be 1.1 points lower than an equivalent pupil with one fewer fixed-term exclusions. This is more than an entire grade boundary.

- P8 score would be predicted to be 0.09 lower than an equivalent pupil with one fewer fixed-term exclusions. This is the equivalent to the pupil performing nine per cent of a grade lower in all their Att8 subjects.

Permanent exclusions, although very rare, also had a significant negative association with KS4 outcomes. If a pupil was permanently excluded the models predict that, on average their:

- Att8 score would be 4.0 points less than a similar pupil who had not been permanently excluded

- P8 score would be 0.44 less than a similar pupil, who had not been permanently excluded.

Gender, EAL status, SEND status, home area and ethnicity are all strongly associated with the attainment and progress of disadvantaged pupils.

Disadvantaged pupils' progress and attainment were strongly associated with the other five background factors that we included: gender, EAL status, home area deprivation, SEND status and ethnicity. We acknowledge that policymakers and practitioners are less able to directly influence these factors; however, understanding the associations may help inform policy and practice about how and where to target support for pupils with particular background profiles, which could bolster attainment[4].

Disadvantaged girls, on average, were predicted to progress more (+0.27 P8 score) and attain higher (+1.6 Att8 score) than boys.

Disadvantaged pupils identified as being EAL[5] were predicted to score, on average, 2.9 Att8 points higher and have more positive P8 scores (+0.28) than their disadvantaged non EAL counterparts.

Disadvantaged pupils in more affluent neighbourhoods were predicted, on average, to score significantly higher than similar peers who lived in more deprived areas. For example a pupil who lived in an area with 14 per cent deprivation would be predicted to score 1.0 Att8 points higher and have a higher P8 score (+0.05) compared to a similar pupil who

lived in an area with 32 per cent deprivation, the average for disadvantaged pupils.

Almost double the proportion of disadvantaged pupils in our cohort had some form of SEND identification. Twenty per cent of disadvantaged pupils had some form of SEND identification compared with 10.3 per cent of their more affluent peers.

Disadvantaged pupils with SEN support or an Education Health and Care plan (EHCP) were predicted to have significantly lower outcomes, than their disadvantaged peers who did not have some form of SEND identification.

Our analysis shows that the relationship for Att8 scores and SEND was particularly strong, compared to other factors (Figure 1). On average, pupils with SEN support were predicted to score 8.3 points lower than a similar pupil with no SEND identification. Pupils with EHCPs were predicted to score, on average, 10.8 Att8 points lower than a similar pupil with no SEND identification.

P8 scores were also predicted to be significantly lower for disadvantaged pupils identified as requiring SEN support or an EHCP. The strength of the relationship was however weaker than that for attainment (Figure 2). On average, the P8 scores of pupils with SEN support were predicted to be 0.12 less than their peers who did not have any SEND identification. Pupils with EHCPs were predicted to

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[4] For example modifications to SEND policies and practices could have an impact upon the associations between SEND status and outcomes. Also, changes in wider housing and area policy, and targeted support to key areas, could influence the association between area deprivation and outcomes. The Opportunity Areas policy by DfE is an example of targeted policy, providing support in key areas where social mobility is low.

[5] EAL status encompasses all children who have English as an Additional Language. These could be pupils newly arrived to the UK and/or are new to the English language as well as pupils who are fully bilingual in English.

score lower, by 0.06 on average, than a similar disadvantaged pupil who had no SEND identification.

Being from a White British background was associated with lower Att8 scores than being from any other cultural heritage, apart from being of Traveller and Gypsy heritage. The results were similar for P8, with one exception: all black and minority ethnicities (including Traveller and Gypsy) were associated with higher P8 scores than pupils from White British backgrounds. This was the case even after accounting for all other background factors. More details about which cultural backgrounds are included in each grouping can be found in Appendix A.

Figures 9 and 10 show the predicted associations between KS4 outcomes and ethnicity, when compared to a White British pupil.

Figure 9: Disadvantaged pupils from most minority ethnic groups are predicted to have higher Att8 scores than disadvantaged pupils from White British backgrounds
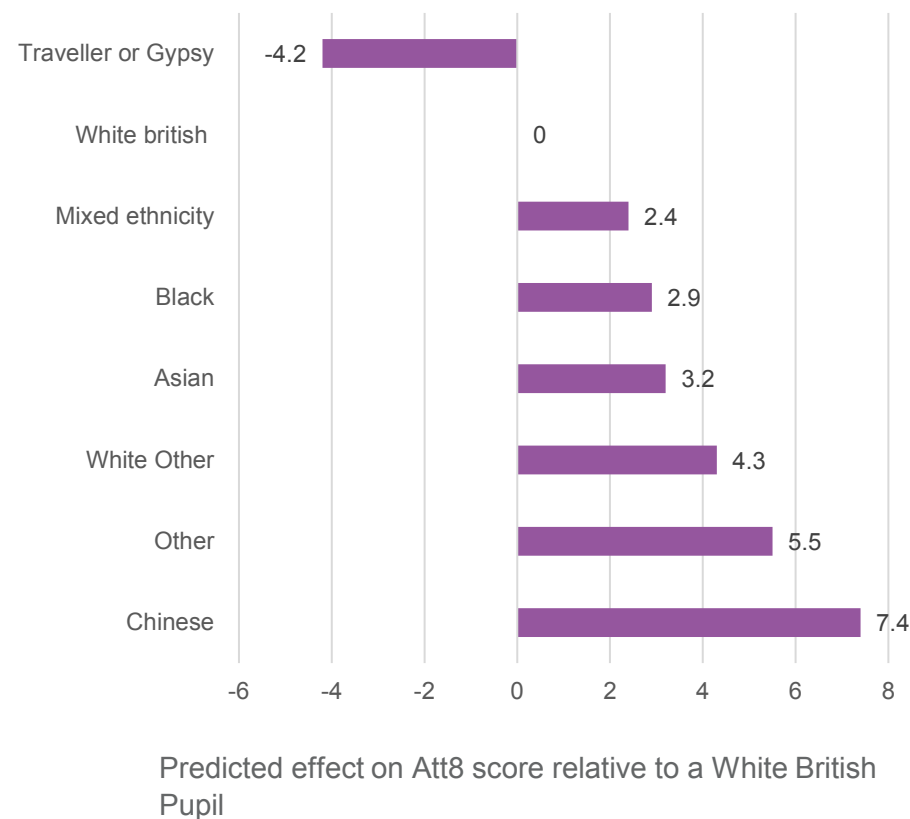
Predicted effect on Att8 score relative to a White British Pupil

Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

Figure 10: Disadvantaged pupils from all minority ethnic groups are predicted to make greater progress than disadvantaged pupils from White British backgrounds
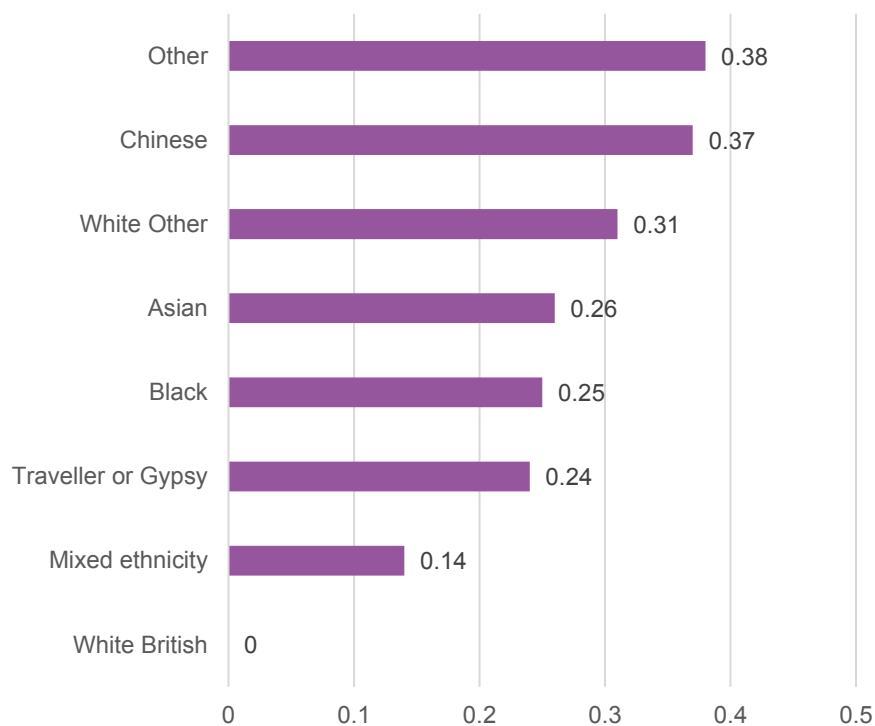
Predicted effect on P8 score relative to a White British pupil

Source: National Pupil Database, KS4 Exam dataset for the academic year 2015/16, n=138,673

4.2 Cohort composition and outcomes

Common school experiences, such as the influence of a school's cohort on a pupil's attainment, are school-level factors. These cohort factors are another possible influence on an individual's KS4 outcomes. We included a range of cohort factors in our models to explore a potential link between cohort factors and the KS4 outcomes of disadvantaged pupils. The "cohort" is here defined as all pupils in an individual's year group. We were particularly interested in seeing if cohort factors were associated with disadvantaged pupils' KS4 outcomes, after controlling for pupil specific background factors.

The results of our models and effect size analysis suggested that certain cohort factors were significantly associated with outcomes for disadvantaged young people. The strength of the relationships were however, on average, much weaker than that of the individual pupil-level factors. For example, KS4 absence (at pupil-level) had an effect size of -30.5 (-5.22 Att8 points) whereas average KS4 cohort absence (at school-level) had a significant but smaller effect size of -1.7 (-0.29 Att8 points).

We found several cohort factors did not significantly link to the KS4 outcomes of disadvantaged pupils, after taking into account the individual pupil-level factors. Cohort factors that were not related to the outcomes of disadvantaged pupils included:

- the percentage of pupils in a year group identified as EAL

- the percentage of pupils in a year group identified as needing any type of SEND support

- the average home postcode deprivation of the year group

- the year group's size.

We found that the percentage of pupils eligible for pupil premium within a school year was slightly but significantly negatively associated with the overall attainment of pupils, when taking into account pupils' background factors. It was not associated with progress.

Cohort absence rates are associated with pupil outcomes.

Average cohort absence rates across KS3 and KS4 varied between schools. Absence rates for almost all schools (98 per cent), ranged from 2.9 to 7.7 weeks at KS3 and 2.2 to 7.4 weeks at KS4. The standard deviation was 1.0 week in KS3 and KS4.

Lower rates of cohort absence across KS3 and KS4 were associated with improved outcomes for disadvantaged pupils. In particular lower cohort absence was associated with improved P8 scores.

For example, if a school reduced their average cohort absence by one week in KS3 the models predict the P8 scores of disadvantaged pupils in that school would increase by an average of 0.04. This is the equivalent of an average of 4 per cent of a grade in each Att8 subject. At KS4, if a school reduced their average cohort absence by one week, the model suggests that the P8 scores of disadvantaged pupils in that school would be expected to increase by an average of 0.03. This effect was significant even after accounting for all pupil background factors, including a pupil's own absence rate.

The rate of cohort movement during Year 10 and Year 11 is negatively associated with progress and attainment of disadvantaged pupils.

For most schools (98 per cent), 2.3 per cent of pupils moved schools during Year 10 and Year 11. Cohort movement across Year 10 and Year 11 ranged from 0.2 to 10.9 per cent.

Our models suggest that increased cohort stability, i.e. lower cohort movement over Year 10 and Year 11, is associated with improved outcomes for disadvantaged pupils attending the school. For example, a pupil attending a school where one per cent of its cohort leave or enter during KS4 compared to one with five per cent of its cohort leave or enter during KS4 would score on average:

- 0.5 Att8 points higher

- 0.06 P8 points higher

4.3 Cohort factors make a small but significant contribution to the variation in disadvantaged pupils' results

To see how our models compared with previous research (such as Shaw *et al*., 2017), we investigated how much of the variation in disadvantaged pupil scores was associated with differences between individual pupils and how much was associated with differences between schools. This was to see whether the KS4 outcomes of pupils varied more within or between schools, when taking into account all the pupil and cohort background factors we introduced.

In line with previous research (Shaw *et al.* 2017), by far the greatest variation in pupils' results was seen within schools rather than between schools. After accounting for the influence of all pupil-level and school-level (cohort) factors we addressed, we found that 8.5 per cent of the residual variation in disadvantaged pupils' Att8 scores was associated with differences between schools and 91.5 per cent was associated with differences between pupils within the same school. The same pattern emerged for P8 scores with 10.1 per cent of the residual variation in disadvantaged pupils scores' being associated with between school differences and 89.9 per cent of the residual variation being associated with differences between pupils within the same school.

As highlighted earlier, cohort factors also had smaller effect sizes than pupil factors within our models. Combined, this suggests that disadvantaged pupils are a diverse group as the differences in pupils' scores are found more within schools than between schools. It also tells us that differences in pupil background factors seem to explain more of the variation in scores than school-level factors, such as cohort wide factors, as noted in previous research.

5   Does the association between certain pupil factors and KS4 outcomes vary by pupil premium eligibility?

The association between KS4 absence and P8 is slightly but statistically more negative for disadvantaged pupils.

KS4 absence was significantly more negatively associated with a disadvantaged pupil's progress, compared to the progress of their more affluent peers. The differences between these two groups was, however relatively small, unless pupils have high rates of absence. For example, our models predict that a disadvantaged pupil's P8 score would be 0.03 lower than a similar but more affluent peer if they both missed four weeks of school during KS4. This is after controlling for all other factors.

The association between moving school and KS4 outcomes is significantly more negative for disadvantaged pupils.

For disadvantaged pupils, there is a significantly more negative association between moving schools and KS4 outcomes compared to their more affluent peers. Our models predict that the association between moving school and progress would be an additional 0.06 worse (P8 score) for a disadvantaged pupil compared to their more affluent peer. The association with attainment was also be predicted to be worse, on average, by an additional 1.2 points. This is after controlling for all other factors.

6   What proportion of the attainment or progress gap is related to the factors within our models?

For the 2015/16 Year 11 group, 69 per cent of the gap in Att8 scores and 75 per cent of the gap in P8 scores was related to the pupil and cohort factors we explored. The gap is the difference between the average Att8 and P8 score of a pupil premium pupil compared to the average Att8 or P8 score for a more affluent peer (non-pupil premium).

Attainment gap

We find that 30 per cent, 3.4 points, of the Att8 gap is explained by between group differences in the following pupil-level and school-level (cohort) factors:

- Pupil specific (pupil level): KS2 attainment, absence, exclusions and KS4 movement rates.
- Cohort (school-level): absence, exclusions and KS4 movement rates.

An additional 39.2 per cent of the Att8 gap, 4.3 points, is explained by between group differences in:

- Pupil specific (pupil-level): gender, EAL, SEND status, ethnicity and home area deprivation.
- Cohort (school-level): other cohort intake factors such as the percentage of pupil premium pupils and the ethnic mix of the cohort.

Progress gap

Our P8 model explains 75 per cent of the overall progress gap between disadvantaged pupils and their more affluent peers.

We find that the majority (55 per cent) of the overall progress gap, 0.22 points, can be explained by between group differences in:

- Pupil specific (pupil-level): absence, exclusions and KS4 movement rates.
- Cohort (school-level): absence, exclusions and KS4 movement rates.

An additional 20.3 per cent of the progress gap, 0.08 points, is explained by the following pupil and school-level factors:

- Pupil specific (pupil-level): gender, EAL, SEND status, ethnicity and home area deprivation.
- Cohort (school-level): other cohort intake factors such as the ethnic mix of the cohort.

7 Discussion

This analysis found that individual pupil gender, prior attainment, ethnicity, SEND status, absence, movement, exclusions and geography are all individually associated with the new KS4 outcomes for disadvantaged pupils. Our work has therefore shown that many of the pupil-level associations found in prior research (e.g. Greaves *et al.*, 2014, Sebba *et al.*, 2015, DfE 2016, Kirby and Cullinane., 2016, Shaw *et al.*, 2017) still hold true for the new accountability measures. These factors are also still significantly related to KS4 outcomes even when we control for the effects of a host of other pupil and cohort background factors.

Our findings here mirror those of Sebba *et al.*, 2015, who focused on understanding the variability within the KS4 outcomes for a subgroup of disadvantaged pupils, Looked after Children (LAC). Like Sebba, we found that absence rates, exclusions and moving schools we key factors that explained a large proportion of the variation in GCSE outcomes and a significant part of the disadvantage certain pupils face. This is particular true for P8. Our findings, although limited to the 2015/16 Year 11 cohort, extend Sebba's work by suggesting the same general pattern for LAC is true for the pupil premium group more widely. We now discuss each of these three key factors in more detail.

7.1 Absence

Our research shows that individual (and cohort) absence rates appear to be significantly associated with the new KS4 outcomes, even after controlling for the other background factors. This is in line with existing literature (Macleod *et al.,* 2015., DfE, 2016) which found a negative

association between absence rates and attainment for pupils under the previous accountability measures.

Our analysis adds to the existing evidence by highlighting that not only is there an association, but that the association is particularly strong compared to all other factors we introduced. We have found that in particular P8 scores are highly sensitive to changes in absence rates for disadvantaged pupils. This suggests that small improvements in KS4 absence could potentially improve the outcomes of disadvantaged pupils' more than small improvements in other areas.

Although our research finds that absence rates are strongly associated with outcomes, it is important to acknowledge that reducing absence is a challenging and complex task for practitioners and policymakers. There has been a wide body of research looking truancy management. For example Ken Reid's 2013 book *An Essential Guide to Improving attendance in your school: Practical resources for all school managers* highlights the complexity of the task and previous research (such as DfE, 2016; and Malcolm *et al.*, 2003) has drawn attention to the multiple factors behind pupil absence which are individual to the pupil such as:

- illness
- caring responsibilities
- ability to make and keep friends
- loss of confidence in their academic abilities
- dislike of particular subjects, teachers and lessons

- socio-cultural expectations
- (lack of) parental engagement with school.

This finding along with our previous research (Macleod *et al.* 2015) suggest to us that targeted and personalised attendance intervention, in addition to a clear and consistent attendance policy, are therefore likely to be the most effective ways to improve attendance. This is in order to address the specific barriers pupils face.

The study *Absence from School: A study of its Causes and Effects in Seven LEAs* (Malcolm *et al.,* 2003), spoke to pupils with poor attendance records and found that most said their parents were unaware that they were truanting from school. This suggests that improving communication between schools and parents could benefit learners' outcomes and also reduce absence. One approach to improving parental engagement and communication with school, and hence improving outcomes, has been investigated in a trial Texting Parents (Miller *et al*, 2016). This intervention aimed to improve parental engagement amongst secondary school parents by regularly texting them about such things as what their child is learning, whether or not they've handed in their homework, and upcoming school events and assessments. The trial has been classed as 'promising', finding that texting parents had a small positive effect on pupils' attendance and attainment.

7.2 Movement

In line with previous research (Sebba *et al*., 2015), our models show that moving schools during KS4 is negatively associated with KS4 outcomes for disadvantaged pupils. Our results build on this work, by showing that the negative association between moving schools and outcomes is significant at both pupil and school level and for disadvantaged pupils in general, not just for LAC. Not only are outcomes linked to whether or not the pupil moves schools during KS4, but outcomes are also linked to the proportion of their peers that leave and enter the year group over these two years.

Previous research on mobility (Dobson *et al*., 2004) suggests that the reasons pupils move school are usually related to their personal household circumstances. This means that schools have limited control over pupil movement. Schools however can take ownership over the transfer process, ensuring they support pupils entering and leaving their establishment. There has been an extensive body of research (for example Gutman and Midgley, 1999; Galton., *et al.,* 2003; Symonds, 2015) looking at how best to manage the transfer process during the move from primary to secondary but less research has focused on best practice in supporting school transfers during the secondary years. Our findings suggest that it is particularly important for schools to focus on managing transfers well, both for the individual pupil and the others in their year group.

7.3 Exclusions

As with absence and movement, we found that for disadvantaged pupils' exclusions strongly and negatively link to the new KS4 outcomes, particularly progress. This is consistent with previous research (Sebba *et al*., 2015), focusing on LAC. Our study has shown that this finding is equally relevant to pupil premium pupils as a whole.

Exclusions are often used as a disciplinary measure (Stamou *et al.,* 2014) and can be seen as indication that pupils are struggling to

successfully manage their behaviour at school. As with movement and absence, existing evidence shows us that there are many underlying reasons for poor behaviour, including mental health concerns, unidentified SEND or family problems (DfE, 2017b). Research by the Office of the Children's Commissioner (2013), also suggests that these reasons are often specific to the individual, although certain groups of young people— namely boys, those from certain minority backgrounds and those that are identified as having SEND – are far more likely to be excluded than their peers.

The review *Creating a Culture: How School Leaders Can Optimise Behaviour* (Bennett, 2017) argues that creating and maintaining a consistent school culture is vital for promoting good behaviour. The most successful schools had clear and detailed behaviour guidelines that were rigorously implemented by all staff and supported by senior leadership. Successful schools intervened when a pupil exhibited poor behaviour. This suggests that targeted, early intervention to resolve underlying causes behind poor behaviour is key to improving pupil behaviour and reducing exclusions.

7.4 Variation due to pupil premium eligibility

The predicted effect of pupil-level movement or absence varied by pupil premium eligibility. This was the case even when we accounted for the influence of all other factors on outcomes. Although relatively small, the variation was statistically significant. It suggested that being absent or moving schools was, on average, worse for a disadvantaged pupil compared to their more affluent peers. This is concerning as in our study disadvantaged pupils were disproportionately more absent than their peers and moved schools more frequently.

The differences we are seeing between the groups could be due to systematic differences in the underlying reasons behind absence and moving schools. For example recent analysis (DfE, 2018) found that the proportion of unauthorised absence was much higher for FSM eligible pupils than their more affluent peers. The differences in associations therefore could potentially be linked to between group differences in underlying reasons and type absence pupils have.

With regards to movement, a potential reason for the difference in the effect could again be due to systematic differences between the groups in the underlying reasons behind why a pupil moves school. For example, disadvantaged pupils may be more likely to move for negative reasons, compared to their more advantaged peers.

7.5 Cohort factors

One of the things worth discussing is the cohort-level factors that were individually correlated with KS4 outcomes, but were less influential once pupil-level factors were taken into account. Our study found that several cohort factors, e.g. the proportion of the year identified with SEND, were no longer significantly associated with outcomes, when the pupil-level factors were considered. Yet, several other cohort factors appear to have a small but significant associations with outcomes. Some of these, such as absence rates, are constant with previous research (Macleod *et al.,* 2015). However, others are different. For example we did not find that the size of the year group was significantly associated with poorer performance of disadvantaged pupils for either of the new accountability measures (P8 or Att8). We also did not find a significant association between the proportion of a cohort who were disadvantaged and P8 scores for disadvantaged

pupils. These two findings contradict our previous research (Macleod *et al.*, 2015) which found that larger year groups were negatively correlated with KS4 outcomes whereas higher proportions of disadvantaged pupils were positively correlated with KS4 outcomes for disadvantaged pupils. We think this is likely to be because our new analysis takes both pupil-level and school-level factors into account simultaneously, whereas our previous research (Macleod *et al.,* 2015) focused on school-level factors alone.

8   Conclusion

We set out to answer three key questions in order to better understand how disadvantage relates to KS4 outcomes across secondary school. This was in order to inform policy and resource provision across secondary school.

Firstly we wanted to find out which factors had the strongest association with the new KS4 attainment and progress measures. We found that actual Att8 scores are strongly associated with pupil-level SEND identification, KS2 attainment and KS4 absence rates. They are also associated with secondary school fixed-term exclusions rates and moving schools during KS4. Progress, between KS2 and KS4 (P8), was most strongly associated with KS4 absence, moving schools during KS4 and fixed-term exclusion rates. In line with previous research we found that disadvantaged pupils were more likely to be absent, move schools and have fixed exclusions compared with their more affluent peers. In effect, as a group, their secondary schooling is less stable. Our cohort of disadvantaged pupils also entered secondary school with lower prior attainment and had higher rates of SEND.

We then wanted to find out the extent to which a pupil's cohort is associated with their outcomes, after pupil-level factors are considered. This was to explore what influence, if any, a peer group might have over KS4 outcomes. Overall we found that the peer group associations were weak, compared with pupil-level factors. We also found that many of the cohort (school-level) factors we introduced were no longer significantly associated with the outcomes of disadvantaged pupils, once pupil-level factors had been taken into consideration. This

included the year group size and the proportion of pupils with EAL or SEND identification.

Our final avenue of investigation was to identify 'key drivers' and explore if the associations between them and KS4 outcomes varied by pupil premium eligibility. From our findings we identified two key drivers to focus on. These were pupil-level KS4 absence and KS4 movement. This was because both factors were strongly associated with attainment and progress of disadvantaged pupils. They were also significantly associated with outcomes at both pupil and cohort level. We found that the associations between these two key drivers and outcomes did differ by pupil premium eligibility. On average, moving school or being absent had a slightly more negative association with outcomes for disadvantaged pupils, compared to their more affluent peers. The differences were small but statistically significant. Our analysis cannot tell us the cause of these differences, but it does highlight this as an important avenue to explore. This is because disadvantaged pupils appear to be differentially negatively affected by these important factors.

Overall our results confirm much of the existing literature surrounding disadvantaged pupils and their outcomes. Our findings however extend the existing body of research by consolidating findings into a few models, addressing the new accountability measures and highlighting that small changes to certain variables, such as KS4 absence, KS4 movement and secondary exclusion rates could significantly improve the group and individual outcomes of disadvantaged pupils. As a result, changes in these areas in particular could improve disadvantaged pupils KS4 outcomes and consequently their future life chances and our economic productivity.

9   Implications

Our research findings, although based on one cohort, are important. They give key indications about where resources should be prioritised and how policy should be designed during the secondary phase. This is in order to boost outcomes for disadvantaged pupils and reduce the attainment gap.

Our findings demonstrate that secondary schools really can make a significant difference to a disadvantaged pupil's KS4 outcomes, even after controlling for a host of background factors. In order to improve outcomes for disadvantaged pupils and reduce the attainment gaps, our findings reinforce the significance prioritising resources to address:

- attendance
- behaviour
- the transfer process between schools.

This is for three reasons. KS4 outcomes, and in particular progress across secondary school, is highly sensitive to changes in these areas. Small improvements could therefore lead to relatively big results on outcomes. Group differences in these areas appear to explain much of the attainment gap seen across secondary school. Being absent from school or moving schools appears to have a more adverse effect on disadvantaged pupils outcomes, than the outcomes of their more affluent counterparts.

Schools and policymakers are already actively working to improve some of these factors, such as attendance and behaviour. For example DfE publishes regular statistics and advice on attendance and

recently (2017) commissioned a review on in school behaviour by Tom Bennett, discussed earlier. Our findings however highlight that although the adverse effects of poor attendance and behaviour have been known for some time, there are still large group differences between disadvantaged pupils and their more affluent peers in these key background factors across secondary school.

Our data, along with our previous research (Macleod *et al.*, 2015) also suggests that providing targeted support for those pupils that require it, is likely to be more effective in improving pupils' outcomes than relying solely on universal behaviour or attendance interventions targeted at all pupils. This is because previous research shows us that in order to improve these areas we need to identify and address the underlying root causes behind a pupil's actions, which are often specific to the individual. What poverty is associated with – e.g. lower attendance - and how to remove those barriers – e.g. bullying, mental health concerns - should be focused on. This is in order to boost outcomes for individual pupils and the disadvantaged group overall.

Resolving the range of underlying causes, in order to improve these areas, is therefore likely to require significant time and resources. Bearing this in mind, schools may require the support of specialist external agencies such as the Child and Adolescent Mental Health Service (CAMHS).

Due to the strength of the associations we have found between these background factors and outcomes, our work re-emphasises these three areas should be core priorities for secondary school leaders and policymakers going forward.

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Appendix A: Technical methods

This appendix describes the four models we have used to estimate the link between certain background factors and attainment.

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┌─────────────────────────┐
│ Attainment data         │ ─────┐
│ (dependent              │      │
│ variable)               │      ↓
└─────────────────────────┘

┌─────────────────────────┐     ┌──────────┐    ┌──────────┐
│ (L1) Pupil              │ ──→ │ L2       │ ─→ │ Results  │
│ background              │     │ Model    │    │ /Output  │
│ factors                 │     └──────────┘    └──────────┘
│ (explanatory            │      ↑
│ variables)              │      │
└─────────────────────────┘      │

┌─────────────────────────┐      │
│ (L2) School or          │ ─────┘
│ Cohort factors          │
│ (Explanatory            │
│ variables)              │
└─────────────────────────┘
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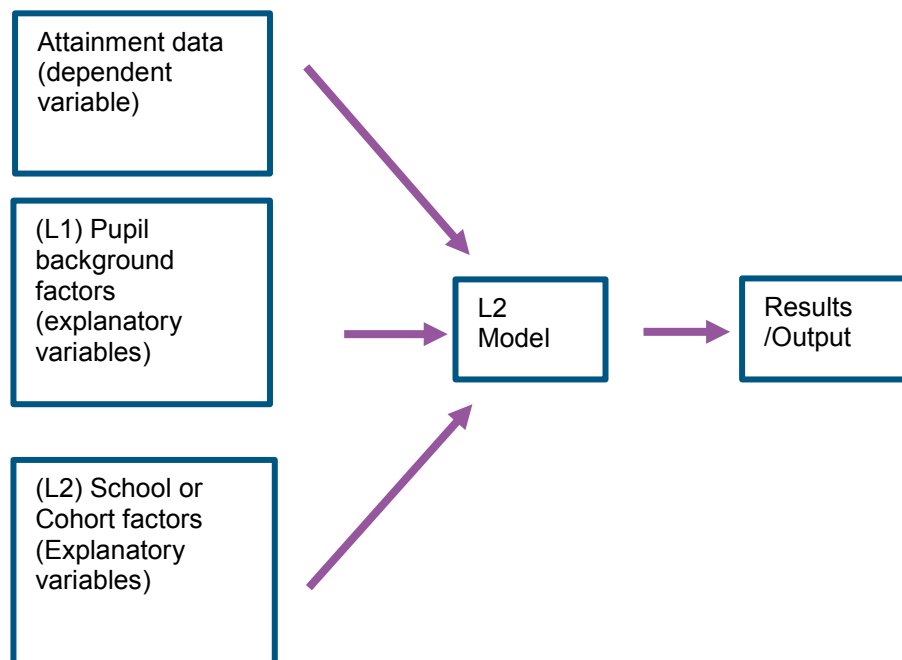
All four models are two-level hierarchical models, where pupils are only assigned to their final mainstream school.

Two models focus exclusively on the data from pupil premium pupils. These models have been used to investigate what background factors, at both pupil and school-level, appear to have the strongest link with attainment and progress for pupil premium eligible pupils. We have also used these models to look at the extent to which a pupil premium pupil's KS4 attainment and progress is associated with their cohort factors.

For these two models we used the data of 138, 673 pupil premium pupils, who studied in 3,092 different schools across England. This represents 99.5% of all possible pupil premium pupils in mainstream secondary education who took their KS4 exams in 2015/16.

A pupils Att8 score is the dependent variable in the model used to address attainment. Pupil premium pupils in our models scored an average of 42.82 Att8 points and their scores range from 0 to 83.5. P8 score was the dependent variable for the model addressing progress. The mean P8 score for the pupils in our models is -0.30, this ranged from -7.15 to +5.19.

We created two further models using all pupils and the same dependent variables. These two 'all pupils' models are used to better understand if the link between certain background factors and attainment or progress is the same for all pupils. These models have data from 523,780 pupils in 3,099 schools across England. This is all pupils in mainstream schools who had available data on their pupil premium eligibility. Pupil premium eligibility was here introduced as a dummy variable fixed effect at the end of the pupil-level factors. Interaction effects between two variables were used to investigate whether or not the link between background factors and attainment or progress was the same for all pupils or if it varied by pupil premium eligibility. For more information see the description of the variable below.

We now report a list of all the variables tested within the models. These were introduced initially as fixed effects. Some factors have been excluded from the final models as they were not found to significantly relate to attainment or progress of pupils.

Pupil factors

Prior KS2 attainment: This is the average point score a pupil achieved during KS2 SATS. It is the average of their Reading, Writing and Maths fine graded point scores combined and then divided by three. Since this cohort of pupils sat their exams KS2 testing has undergone reform so now standardised scores for all pupils are produced.

Gender: a binary variable. If the pupil was boy it was coded 0; if they were a girl it was coded 1.

Ethnicity: coded by a series of binary variables using DfE minor ethnic codes. For each variable if a pupil was of that particular ethnicity it was coded 1 if they were not it was coded 0. The sub groups that made up the ethnic groups were: Asian (Bangladeshi, Indian, Pakistani and Any other Asian), Black (Black Caribbean, Black African, Any other black background), Mixed race (White/Black African, White/Asian, White/Caribbean, and Any other mixed), White other (White other and White Irish) and Traveller/Gypsy (Gypsy Roma, Traveller). The White British and Chinese groups had no subgroups. Other was the category

given to all remaining pupils whose ethnic background was designated 'other' after accounting for all the groups above.

Overall absence during KS3: the total number of half day absences reported for the pupil across KS3, Year 7, 8 and 9.

Overall absence during KS4: the total number of half day absences reported for the pupil across KS4, Year 10 and Year 11.

Overall number of fixed-term exclusions: the total number of fixed-term exclusions the pupil has had throughout secondary education.

Overall number of permanent exclusions: the total number of permanent exclusions that the pupil has had throughout secondary education. Note pupils in this dataset were still in fully time mainstream education at the end of Year 11. Pupils who left mainstream education before 2015/16 are not captured in this report.

Moving during Yr10 and Yr11: this is a binary variable to flag whether or not a pupil moved school after the 12th September of Year 10, i.e. during their GCSE studies. 0 means the pupil did not move, 1 means the pupil did move during this period.

Income Deprivation Affecting Children Index (IDACI)[6] of their Yr11 home postcode: This a continuous variable with the range of 0-1. For the models, this scale was converted into 0-100, in order to more

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[6] IDACI score is a geographic measure of disadvantage created by the government. Neighborhoods (Lower layer Super Output Areas, LSOA) are scored between 0-1. The score represents the percentage of children aged 0-15 living in income-deprived households within the LSOA. Income deprived households are households whose equalised income is 60% below national median, before housing costs. The higher the score the higher level of economic deprivation within the area.

accurately see the link between changes of home postcode area deprivation and progress and attainment at secondary school.

Pupil Premium eligibility: Code 0 identified pupils as not eligible for pupil premium and code 1 identified pupils eligible for the funding. This was only introduced into the two models looking at all pupils.

English as an Additional Language status: binary variable was created. Code 1 was assigned to pupils who were confirmed as English as an Additional Language (EAL). Code 0 was assigned to all other pupils.

SEND status: Binary variables were coded for each of the three main statues as defined by DfE, SEN support, Education Health and Care Plan (EHCP) and Statements. As EHCPs are replacing the statement process these were combined. The result was two binary variables, one for SEN Support (Yes = 1, No = 0) or EHCP/statement (Yes = 1, No=0). Within the models 0 in both therefore referred to pupils with no SEND identification.

Cohort factors

Size of the cohort group (Year size): the sum total of all valid and unique pupil records for a cohort within a school.

School admissions type: a series of four binary variables to identify schools by admission types. The schools admissions types are: Comprehensive, Selective, Secondary Modern and Other. Code 0 identified schools not of that school admissions type and 1 identified schools in each of the groups.

Average cohort prior KS2 attainment: the mean attainment of all pupils in a cohort.

Average cohort absence during KS3: the mean absence rate for all pupils in a cohort across KS3.

Average cohort absence during KS4: the mean absence rate for all pupils in a cohort across KS4.

Mean fixed-term exclusions for the cohort: the mean number of fixed term exclusions within a cohort.

Percentage of the cohort who have had at least one permanent exclusion: the percentage of pupils within a cohort that had been permanently excluded during their secondary education at least once.

Percentage of the cohort who are eligible for PP: the percentage of a cohort identified as being eligible for pupil premium funding.

Percentage of the cohort who were identified as EAL: the percentage of the cohort identified as having English as an additional language.

Percentage of the cohort with SEND need: percentage of the cohort identified as having either SEN support or an ENCP/statement.

Percentage of the cohort who have moved schools during GCSEs: percentage of the cohort identified as having moved schools in Year 10 or 11, after the first few weeks of Year 10.

Mean IDACI score of the Yr11 cohorts' home postcodes: This a continuous variable with the range of 0-1. This variable is the mean IDACI score of all pupils in a cohort. (For more information about IDACI scores see the footnote on page 18.)

Ethnic Mix of the cohort: a series of variables denoting the percentage of each major ethnic group in a school. These were calculated from the pupil-level data.

Appendix B: Modelling results

Model   1: Predicted associations between background factors and Att8 scores for pupil premium students in Year 11 during the 2015/16 academic year

Pupil and cohort factors	Co.	S.E.	Z-score	P-value	95% Confidence interval		Sig.
KS2 average point score	+0.93	0.01	136.28	0.00	0.92	0.94	***
Pupil gender	+1.58	0.25	6.43	0.00	1.10	2.07	***
KS3 Overall absence per ½ day session	-0.01	0.00	-15.70	0.00	-0.01	-0.01	***
KS4 overall absence per ½ day session	-0.08	0.00	-98.83	0.00	-0.08	-0.08	***
Fixed term exclusion	-1.09	0.02	-70.02	0.00	-1.12	-1.06	***
Permanent exclusion	-3.98	0.51	-7.84	0.00	-4.98	-2.99	***
Moving during GCSE years.	-2.75	0.16	-17.71	0.00	-3.06	-2.45	***
Home postcode deprivation	-0.06	0.00	-25.20	0.00	-0.06	-0.05	***
English as an additional language	+2.90	0.12	23.76	0.00	2.66	3.14	***
Identified as having Special Education Needs Support	-8.27	0.09	-93.64	0.00	-8.45	-8.10	***
Identified as having an Education health and care plan	-10.81	0.19	-56.19	0.00	-11.19	-10.43	***
Being of Asian ethnicity	+3.18	0.15	21.22	0.00	2.88	3.47	***
Being of Black ethnicity	+2.85	0.14	20.07	0.00	2.57	3.13	***
Being of mixed ethnicity	+2.40	0.14	17.31	0.00	2.13	2.68	***

Pupil and cohort factors	Co.	S.E.	Z-score	P-value	95% Confidence interval		Sig.
Being of White (other) ethnicity	+4.32	0.18	23.66	0.00	3.96	4.68	***
Being of Other ethnicity	+5.46	0.23	23.43	0.00	5.00	5.91	***
Being for Traveller or Gypsy heritage	-4.15	0.44	-9.47	0.00	-5.01	-3.29	***
Being of Chinese ethnicity	+7.43	0.68	10.86	0.00	6.09	8.77	***
Cohort average absence KS3 per ½ day session	-0.06	0.01	-6.6	0.00	-0.08	-0.04	***
Cohort average absence KS4 per ½ day session	-0.03	0.01	-3.02	0.00	-0.05	-0.01	**
Average cohort fixed exclusion rate throughout secondary	+0.77	0.22	3.54	0.00	0.35	1.20	***
Percentage of the cohort that moved during GCSEs	-0.12	0.03	-4.2	0.00	-0.18	-0.06	***
Percentage of the cohort who have had a permanent exclusion	-0.40	0.14	-2.85	0.00	-0.68	-0.13	**
Percentage of the cohort who are eligible for pp. funding	-0.03	0.01	-5.85	0.00	-0.05	-0.02	***
Cohort is selective	+12.16	0.47	26.15	0.00	11.25	13.07	***
Percentage of the cohort who are identified as being of Chinese ethnicity	+0.23	0.11	2.12	0.03	0.02	0.45	*
Percentage of the cohort who are identified as being of Black ethnicity	+0.03	0.01	3.05	0.00	0.01	0.04	**
Percentage of the cohort who are identified as being of Other ethnicity	+0.12	0.02	5.24	0.00	0.08	0.17	***
Interaction effect between gender and KS2 attainment	+0.05	0.01	5.44	0.00	0.03	0.07	***

Pupil and cohort factors	Co.	S.E.	Z-score	P-value	95% Confidence interval		Sig.
Interaction effect between KS4 absence and gender for every ½ day session	-0.00[6]	0.00	-5.45	0.00	-0.01	0.00	***
Constant	25.43	0.52	48.67	0.00	24.41	26.46	

Number of Observations = 138,673

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[6]Per session the effect is -0.0009. If this is aggregated to weeks this is -0.009 per week or an additional -0.01 when rounded to two decimal places. The relationship is therefore only likely to be different for persistent absentees.

Model 2: Predicted associations between background factors and P8 scores for pupil premium students in Year 11 during the 2015/16 academic year

Pupil and cohort factors	Coefficient	S.E.	Z- Score	P-value	95% Confidence interval		Sig.
Pupil gender	+0.269	0.007	39.110	0.000	0.256	0.283	***
KS3 overall absence per ½ day session	0.000	0.000	2.490	0.013	0.000	0.000	**
KS4 overall absence per ½ day session	-0.007	0.000	-115.240	0.000	-0.008	-0.007	***
Fixed term exclusion	-0.094	0.001	-73.300	0.000	-0.096	-0.091	***
Permanent exclusion	-0.438	0.042	-10.450	0.000	-0.520	-0.356	***
Moving during GCSE years.	-0.287	0.019	-15.420	0.000	-0.324	-0.251	***
Home postcode deprivation	-0.003	0.000	-15.640	0.000	-0.003	-0.002	***
Identified as having English as an additional language	+0.275	0.010	27.580	0.000	0.255	0.295	***
Identified as having Special Education Needs Support	-0.120	0.007	-16.930	0.000	-0.134	-0.106	***
Identified as having an Education Health and Care Plan	-0.063	0.016	-4.050	0.000	-0.093	-0.032	***
Being of Asian ethnicity	+0.258	0.013	20.450	0.000	0.233	0.282	***
Being of Black ethnicity	+0.246	0.012	21.420	0.000	0.224	0.269	***
Being of Mixed ethnicity	+0.138	0.011	12.070	0.000	0.116	0.160	***
Being of White (other) ethnicity	+0.309	0.015	20.660	0.000	0.280	0.338	***
Being of Other ethnicity	+0.378	0.019	19.870	0.000	0.341	0.416	***
Being for Traveller or Gypsy heritage	+0.238	0.036	6.650	0.000	0.168	0.308	***

Pupil and cohort factors	Coefficient	S.E.	Z- Score	P-value	95% Confidence interval		Sig.
Being of Chinese ethnicity	+0.369	0.056	6.560	0.000	0.259	0.480	***
Average cohort KS2 attainment	-0.012	0.003	-3.480	0.000	-0.018	-0.005	***
Cohort average absence KS3 per ½ day session	-0.004	0.001	-4.610	0.000	-0.005	-0.002	***
Cohort average absence KS4 per ½ day session	-0.003	0.001	-3.820	0.000	-0.005	-0.001	***
Percentage of the cohort that moved during GCSEs	-0.014	0.003	-5.270	0.000	-0.020	-0.009	***
Percentage of the cohort that have been permanently excluded during secondary education	-0.028	0.012	-2.270	0.023	-0.052	-0.004	*
Cohort is selective	+0.199	0.039	5.050	0.000	0.122	0.276	***
Percentage of the cohort from Asian backgrounds	-0.002[7]	0.000	-4.570	0.000	-0.003	-0.001	***
Interaction effect between KS4 absence and gender per ½ day session	0.000[8]	0.000	-4.430	0.000	0.000	0.000	***
Interaction effect between gender and pupil movement	-0.111	0.025	-4.420	0.000	-0.160	-0.062	***
Constant	0.147	0.101	1.450	0.146	-0.051	0.345	

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Number of observations: 523, 780

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[7] Although statistically significant, the association between the two is very small, so that in real life the association would make little discernible difference to outcomes.

[8] The interaction effect between the two is -0.0003 per half day session. If this is aggregated to weeks it would be an additional negative association of -0.003 per week and -0.012 per month of absence across KS4.

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