UCAS

A MULTILEVEL MODELLING APPROACH TO INVESTIGATING UCAS PREDICTED VS ACHIEVED GRADES

KEY POINTS

- This research explores how the gap between UCAS predicted and achieved A level grades differs between applicant groups. It focuses on the largest homogeneous subgroup:18-year-old applicants from England applying in the 2019 admissions cycle with three predicted A levels.
- A contextual effects model identified differences at both applicant and school level.
  - Applicant level differences included:
    - » Applicants from Asian, Black, and Other ethnic groups achieve further below UCAS predicted grades than their peers from the White ethnic group.
    - » Female applicants, and male applicants from single sex schools[1] achieved further below UCAS predicted grades than male applicants from mixed schools.
    - » Disadvantaged applicants (defined using IDACI score) achieved further below UCAS predicted grades than advantaged applicants.
    - » Students with higher prior attainment (included as a statistical control) achieved closer to UCAS predicted grades.
  - School contextual effects included:
    - » Applicants attending schools with lower prior attainment at GCSE achieved further below UCAS predicted grades. This was the strongest contextual effect.
    - » Applicants in schools with HE choices with lower entry requirements (relative to UCAS predicted grades) and higher average disadvantage achieved further below UCAS predicted grades.
    - » Those attending sixth form colleges achieved closer to UCAS predicted grades than those attending other school types.
- Nontrivial school differences remained after adjustment for model factors.

Predicted-achieved gap
Throughout this report, for brevity, the term 'predicted-achieved gap' is used to describe the difference between UCAS predicted grades and achieved grades. Achieved grades that are further below UCAS predicted grades are described as having a larger 'predicted-achieved gap'.

1 Defined as schools with only male applicants in the modelling sample. Consequently, some schools described as 'single sex' may have included both male and female pupils in the wider population.

CONTENTS

INTRODUCTION

Background

UCAS predicted grades, made by teachers and other advisers for applicants with pending qualifications, are a feature of the current United Kingdom (UK) Higher Education (HE) admissions process. Their use in the admissions process, and the weight placed on them, varies across courses and institution. This research provides new insight into differences between applicant groups in achievement relative to UCAS predicted grades.

Role of UCAS predicted grades in UK HE admissions

Most 18-year-old applicants from the UK apply to HE with UCAS predicted grades. These relate to 'pending qualifications' - those due to be awarded after the application is submitted - and are submitted by referees in applicants' schools.

UCAS predicted grades are used by universities and colleges to understand an applicant's potential. They are defined as "the grade of qualification an applicant's school or college believes they're likely to achieve in positive circumstances." They support a flexible admissions process allowing those with achieved qualifications to apply alongside those still studying.

UCAS predicted grades are only one piece of information a university or college may use. Other elements include qualifications achieved prior to application (for example, GCSE, AS Level, National 5 or Higher qualifications), performance at interview, provider or course specific admissions tests, background, personal statement, and reference[2].

UCAS predicted grades are generally higher than achieved results

UCAS predicted grades typically exceed achieved grades. In this research (based on 106,940 18 year old applicants from the 2019 cycle domiciled in England[3]), applicants on average achieved 2.45 grades (or 'points') below predictions across three A levels. This is equivalent to an applicant predicted AAA on average achieving between ABB and BBB. Details of the mapping of grades to points are given in the Analysis section below.

What does this research provide?

This research provides insight into how applicants from different demographic groups achieve relative to UCAS predicted grades.

It uses multilevel modelling. This takes account of the hierarchical nature of the data: applicants nested within schools. Additionally, it provides insight into the size of the predicted-achieved gap by applicant group. It is based on the 2019 admissions cycle. This cycle is the most recent in which both A levels and prior GCSE attainment were assessed through examination, and GCSE grading was not affected by pandemic arrangements.

Results are highlighted for key 'variables of interest', relating to applicant characteristics and school context. Other variables, including applicant level prior attainment, are included in the model as statistical controls.

2 The predicted grades described here differ from those collected prior to 2015 by examination boards.

3 This cycle was chosen as the most recent admissions and examination cycle not impacted by changes to grading standards during the pandemic.

ANALYSIS

Modelling sample

The analysis focused on a homogeneous subgroup of applicants who applied for entry to HE in the 2019 cycle. This subgroup was selected on the basis that each applicant could be described by a common set of examination and socio-economic metrics. Basing the model on this subgroup allowed a single model to be fitted to the largest homogeneous sub cohort. However, it does mean that the results are not necessarily generalisable to the entire applicant population.[4]

Figure 1 gives a broad overview of the inclusion criteria, starting from the 'base' of applicants domiciled in England and applying from a school in England. These criteria, including those for matching predicted and achieved A levels, are defined in further detail below.

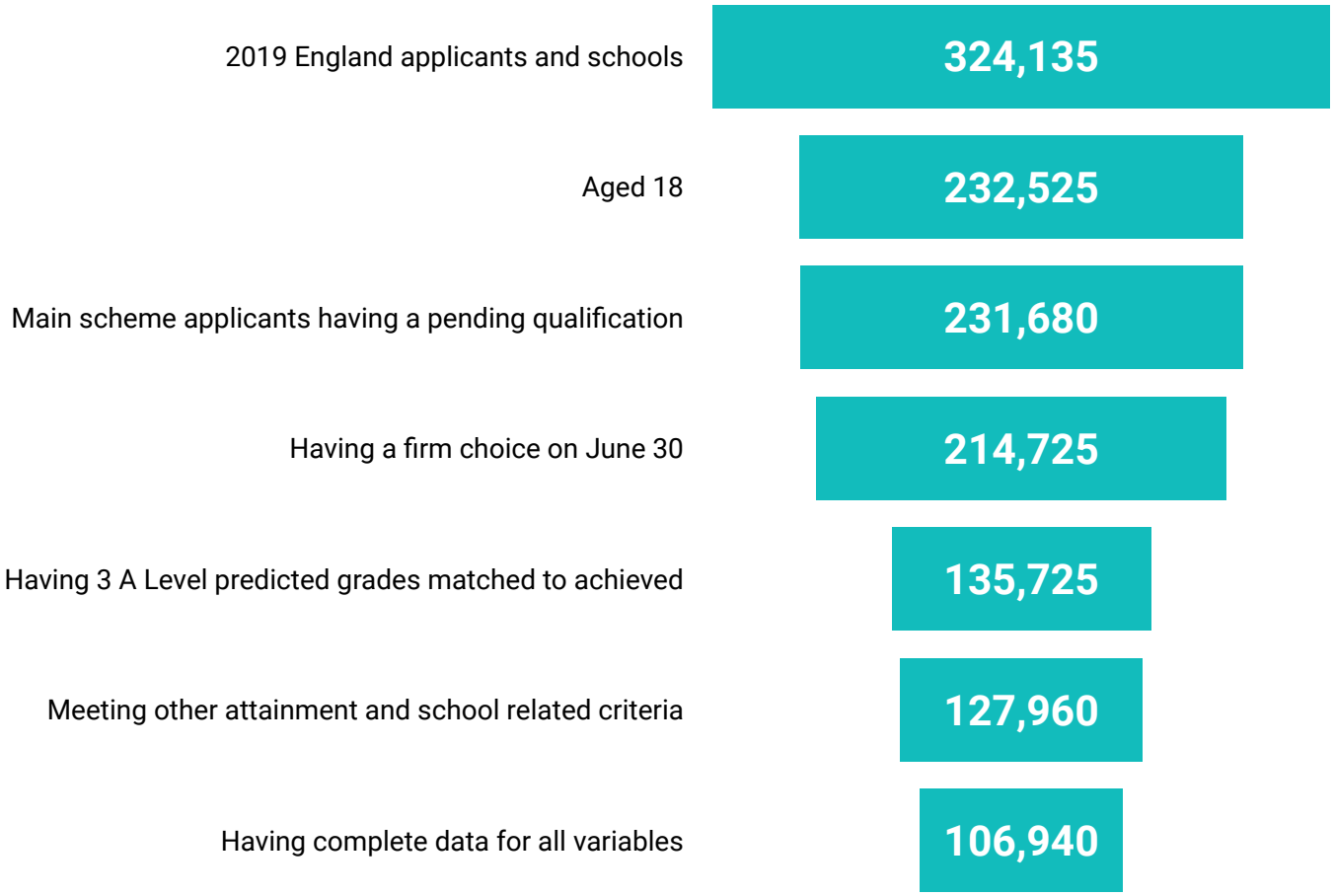

Figure 1: Number of applicants meeting inclusion criteria

Applicant characteristics

- The application was made in the 2019 cycle through the UCAS main scheme.[5] This cycle was chosen as the most recent admissions and examination cycle not impacted by changes to grading standards during the pandemic.
- The applicants were 18 years old and domiciled in England.
- The application was not withdrawn at the 30 June deadline.
- There were no missing values for the applicant characteristic variables used in modelling.

Applicant attainment and school type

- The applicant was predicted at least three A levels at grades A* to E. As illustrated by the funnel above, the majority (63.2%) of 18-year-old applicants from England with a firm choice on June 30 had three predicted A

4 This includes those taking fewer than 3 A levels. It also includes those taking other qualifications.

5 "Main scheme" means applying with choice options up until 30 June after which applications go direct to Clearing.

levels matched to achieved.[6]

- The applicant achieved at least three A levels at grades A* to U (in subjects with UCAS predicted grades).
- The applicant had no achieved A levels at the point of application.
- The applicant applied with at least three GCSE results and achieved specified minimum prior attainment criteria.[7]
- The application was made through an academy, grammar school, independent school, further education college, sixth form college, or state school[8] in England.

Firm choice characteristics

- The applicant held a firm choice on 30 June.
- The entry requirements for the firm choice course included a three A level grade requirement. This was necessary to make valid comparisons between entry requirements, predicted grades and achieved grades.

Overall, there were 127,960 18 year old applicants domiciled in England, who applied through the UCAS main scheme in the 2019 cycle, with a firm choice offer on 30 June and meeting the attainment and school related criteria above. Incorporating all the inclusion criteria specified above reduced the pool to 106,940 applicants from 2,508 schools.

Dependent variable

The dependent variable was the predicted-achieved gap: the difference between UCAS predicted and achieved A level grades[9]. Specifically, UCAS predicted grades minus achieved grades. A positive value indicates that UCAS predicted grades were higher than achieved.

Predicted and achieved A level attainment were measured by assigning points to grades. Grade A* was given the value 6, grade A the value 5 and so on down to grade U which was given the value 0, as shown in Table 1. The points corresponding to the best three predicted A levels were summed to give the total predicted points for each applicant. Similarly, points from the best three achieved A levels were summed to give the total achieved points.

Table 1: Conversion of A level grades to points

A level grade	Points
A*	6
A	5
B	4
C	3
D	2
E	1
U	0

Figure 2 presents the distribution of the dependent variable in the modelling sample. It shows that total achieved A level points were generally lower than UCAS predicted points. On average, applicants achieved 2.45 points below UCAS predicted grades and 79.9% achieved lower grades than predicted. Extreme values have been grouped in the plot for convenience. However, the ungrouped variable was used in modelling.

6 UCAS predicted and achieved A levels were matched by detailed subject description. A levels with a predicted grade in the UCAS application without a corresponding achieved grade in the same subject were excluded from the analysis. A levels with an achieved grade and without a UCAS predicted grade were also excluded.

7 At least three GCSEs, not including IGCSEs. Minimum criteria: mean grade in the 'best 8' GCSE and IGCSEs was at least 4, equivalent to a grade C.

8 School type data used in modelling is based on the latest information as at the 2019 cycle.

9 Specifically, the dependent variable was calculated as the total UCAS predicted A level points minus the total achieved A level points. Subjects of the UCAS predicted and achieved A levels were not accounted for when making the calculation. For example, an applicant could be predicted and achieve a grade profile of ABB, but the subject in which the A grade is predicted may be different from that of the achieved A grade.

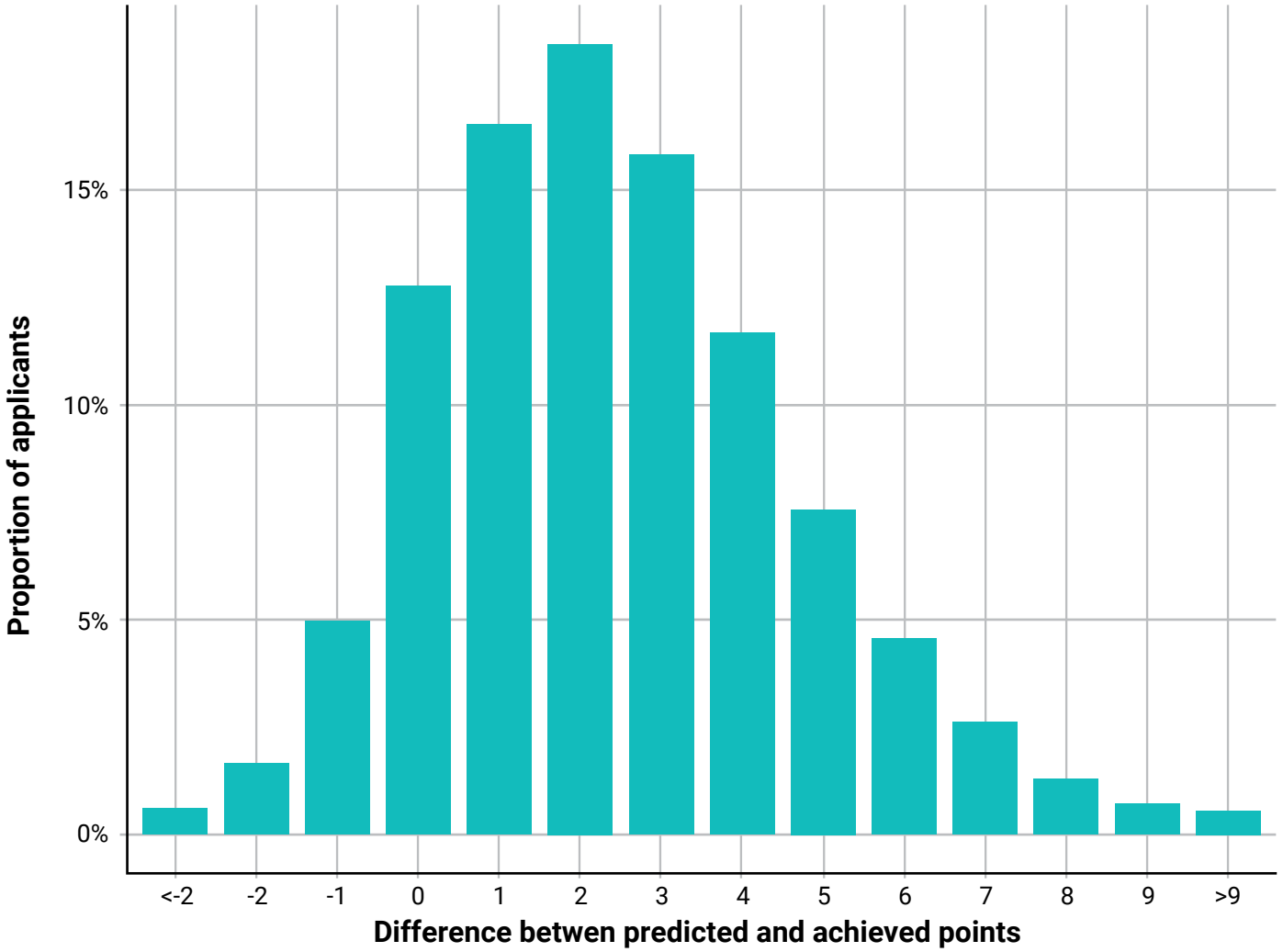

Figure 2: The distribution of the difference between total UCAS predicted and achieved A level points

Modelling approach

We fitted[10] a linear random intercepts model to describe factors associated with the predicted-achieved gap. In addition, multilevel modelling recognises the natural hierarchy in the data – here, applicants nested within schools.

We included school means of some of the applicant level fixed effects in the model. Consequently, the interpretation of each of the applicant covariates is a 'within' school effect (compares applicants within the same school) and the school mean is a contextual effect (Raudenbush and Bryk, 2002).

In multilevel modelling the variance partition coefficient (VPC) describes the proportion of variation in the dependent variable that is attributable to the school. There were 106,940 applicants and 2,508 schools in the modelling sample. The VPC for the variance components model[11] was 0.189. We fitted the model using the lme4 package for R (v1.1.27.1; Bates et al., 2015).

To address the central question of equality between subgroups of the applicant population, the model includes variables describing applicant deprivation, ethnic group, gender, region, school type and school context. Additional main effects (described in the Fixed effects included in the model section below) were included as controls based on statistical significance. Diagnostic checks were performed on the model using the sjPlot (v2.8.10; Lüdecke, 2021) and performance packages (v0.9.0; Lüdecke et al., 2021). The final model explained 29.1% of the variation in the dependent variable[12] and was a significant improvement on a null model. The final model VPC was 0.079.

10 All analyses were performed using R Statistical Software (v4.1.2; R Core Team, 2021)

11 The random intercepts model with no fixed effects.

12 The marginal R^2 was 0.230 and the conditional R^2 was 0.291. The marginal R^2 considers only the variance of the fixed effects, while the conditional R^2 takes both the fixed and random effects into account. These values were calculated based on Nakagawa et al. (2017)

Fixed effects included in the model

Both applicant level and school level variables were included in the model. Some are 'variables of interest' whereas others are included as statistical controls.

Table 2 below shows applicant level variables included in the model.

We included both a measure of prior attainment ('Best 8 mean'), and that variable squared ('Best 8 mean squared') to reflect the non linear relationship between predicted-achieved gap and prior attainment.

Applicant level variables

Table 2: Applicant level variables used in the model

Variable	Type	Variable of interest?	Description
Deprivation	Applicant characteristic	✓	Level of deprivation in the applicant's local area, measured using Income Deprivation Affecting Children Index (IDACI) score (Ministry of Housing, Communities and Local Government, 2019). Henceforth 'Deprivation'. Grand mean centred.
Ethnic group	Applicant characteristic	✓	High level ethnic group as declared by the applicant. Categories: Asian, Black, Mixed, Other, Unknown, White.
Gender	Applicant characteristic	✓	Gender as declared by the applicant on the UCAS application form. Categories: Male, Female.
A level subjects	Attainment		A series of binary flags indicating the subjects in which predicted grades were held. Subjects are listed in full in the model parameter estimates accompanying this report.
Best 8 mean	Prior attainment		Mean grade in the applicant's eight highest graded GCSEs[13]. Grand mean centred. Included as a measure of applicant ability.
Best 8 mean squared	Prior attainment		The square of the Best 8 mean. Included as a measure of applicant ability.
Degree subject	Firm choice		Degree subject, JACS 3.0 subject area (HESA, n.d.) in which the firm offer was held.
Entry requirements	Firm choice		Firm choice entry requirements (relative to predicted grades). The difference between firm choice entry requirements and UCAS predicted grades. Grand mean centred.
Higher tariff provider	Firm choice		Firm choice was a higher tariff provider (binary flag).[14]
Predicted points	Attainment		UCAS predicted A level grades converted to points, as described above. Included to model the floor and ceiling effect inherent in the relationship between predicted and achieved A-level points. Grand mean centred.
Predicted and achieved four or more A levels	Attainment		The applicant was predicted and achieved four or more A levels (binary flag).
Unconditional offer	Firm choice		Unconditional offer held at firm choice (binary flag).

13 Including both GCSE and IGCSE qualifications. IGCSE is an academic qualification taken by students internationally as well as in the UK. Used as an alternative to GCSE.

14 From a grouping of providers based on the average levels of attainment of their UK 18 year old accepted applicants (summarised through UCAS Tariff points). The groups are higher tariff, medium tariff, and lower tariff.

While deprivation (measured using IDACI score) is not technically an applicant level variable, it is described as one throughout this report, as a non-school level variable that reflects the applicant's circumstances.

School level variables

School level variables used in the model are described in Table 3 below.

Aggregated variables are based on applicants in the modelling sample. The classification of schools as 'single sex' and 'mixed' is based on applicants in the modelling sample only. Consequently, some schools described as 'single sex' may have included both male and female pupils in the wider population.

At applicant level the model includes 'Best 8 mean' and 'Best 8 mean squared', to reflect the non-linear relationship between prior attainment and the modelled outcome within schools. School level versions of both variables were tested in model development. However, at school level, only the school level average of the linear term 'Best 8 mean' was statistically significant. Consequently, the school level average of 'Best 8 mean squared' was not included in the final model.

While 'region' is technically not a school level variable, it is included in the table below due to the alignment between applicant and school region in most schools.

Table 3: School level variables used in the model

Variable(s)	Type	Variable(s) of interest?	Description
Mean deprivation	Aggregated applicant characteristic	✓	The school mean of 'deprivation'. School mean centred.
% Asian ethnic group % Black ethnic group % Mixed ethnic group % Other ethnic group % Unknown ethnic group	Aggregated applicant characteristic	✓	Percentage of applicants in each ethnic group, other than White, in the school. Centred at school level, to the mean across all schools (henceforth, 'school mean centred').
Male single sex school Female single sex school	Aggregated applicant characteristic	✓	Binary flags indicating applicants of the school, within the modelling sample, were all males or all females.
Region	Applicant characteristic	✓	Region of applicant domicile.
School type	School characteristic	✓	Categories: Academy, Grammar school, Independent school, Further education college, Sixth form college, State school
Mean best 8 mean	Aggregated attainment	✓	The school mean of 'best 8 mean'. School mean centred.
Mean entry requirements	Aggregated firm choice	✓	The school mean of 'entry requirements'. School mean centred.
Mean predicted points	Aggregated attainment		The school mean of 'predicted points'. School mean centred.

Interaction terms

We tested interactions between variables in the model[15]. Some were statistically significant. However, they explained very little variation in the dependent variable, and none altered the direction of relationship between variables of interest and the modelled outcome. For this reason, and to aid interpretability, the final model, described in this report, excludes interaction terms.

15 We used the *earth* package for R (v5.3.1; Milborrow, 2021) to help identify interaction terms and non-linear relationships.

RESULTS

Overview

Results presented in this section show how the predicted-achieved gap related to the variables of interest described in 'Fixed effects included in the model' above, with statistical adjustment for all other variables.

Relationships with the predicted-achieved gap

Table 4 below summarises relationships between variables of interest and the predicted-achieved gap.

While differences are described as 'effects' below and throughout this report, this does not imply the relationships described are necessarily causal.

Table 4: Variables of interest – relationship with the predicted-achieved gap

Larger predicted-achieved gap Attainment further below predicted grades.	**Smaller** predicted-achieved gap Attainment closer to predicted grades.
Applicant characteristics ▶ Asian, Black, and Other ethnic groups.[16] ▶ From areas of higher deprivation (IDACI).	**Applicant characteristics** ▶ White ethnic group. ▶ From areas of lower deprivation (IDACI). ▶ Males in mixed schools.
Contextual (school) variables ▶ Lower mean prior attainment.* ▶ Lower mean entry requirements (relative to UCAS predicted grades).* ▶ Higher mean deprivation.	**Contextual (school) variables** ▶ Higher mean prior attainment.* ▶ Higher mean entry requirements (relative to UCAS predicted grades).* ▶ Lower mean deprivation. ▶ Sixth form colleges.

Above, "*" indicates variables included as controls at applicant level. However, when aggregated to school level they are 'variables of interest'. This is because they relate to the applicant's educational context – in the same way as the type of school attended.

Model estimates

Table 5 below includes model estimates for selected fixed effects.

Model estimates are interpreted in more detail in subsequent sections.

Joint tests for each categorical variable below, namely ethnic group, region, and school type, showed the effects of these variables were statistically significant ($p<0.001$).

Additional notes on the table:

- The dependent variable is the predicted-achieved gap: the difference between UCAS predicted and achieved grades (predicted – achieved), across the applicant's best three A levels.
- However, all student groups achieve below UCAS predicted grades on average. So, a positive coefficient for the Asian ethnic group indicates that, on average, this group has a larger predicted-achieved gap than those from the White ethnic group (the reference category), all else equal. That is, applicants from the Asian ethnic group achieve further below their predicted grades than those from the White ethnic group.
- The coefficient for the Asian ethnic group is 0.472. This means those from the Asian ethnic group achieve nearly half a grade further below their predictions (across three A levels) than those from the White ethnic group, on average.
- The reference category of categorical variables is given in parentheses.

16 Comparisons described between ethnic groups exclude the 'Unknown' ethnic group (applicants with unreported ethnic group).

- The variable reflecting deprivation is measured using IDACI score expressed as a percentage from 0 to 100, prior to centering. For example, 16.5 indicates 16.5% of families in the applicant's Lower Layer Super Output Area (LSOA), with children aged under 16, are income deprived. The coefficients shown are associated with 1 percentage point change in IDACI score.
- The variables reflecting percentage in each ethnic group at school level are also expressed as a percentage on a scale from 0 to 100, prior to centring. So again, coefficients shown are associated with a 1 percentage point change.
- The model included applicant level and school level predicted grades as statistical controls. As shown in Table 5 below, higher applicant level and school level predicted grades were both associated with a greater predicted-achieved gap.

Table 5: Model estimates for selected fixed effects

Variable - reference category in parentheses	Value	Coefficient	Standard error	Significance
Applicant effects				
Deprivation		0.007	0.001	***
Ethnic group (White)	Asian	0.472	0.021	***
	Black	0.361	0.030	***
	Mixed	0.181	0.028	***
	Other	0.359	0.046	***
	Unknown	0.106	0.072	
Gender (Female)	Male	-0.377	0.015	***
Best 8 mean		-1.020	0.010	***
Best 8 mean squared		-0.118	0.005	***
Entry requirements (relative to predicted points)		-0.100	0.006	***
Predicted points		0.205	0.006	***
Contextual (school) effects				
Mean deprivation		0.017	0.003	***
% Asian ethnic group		0.001	0.001	
% Black ethnic group		0.005	0.002	**
% Mixed ethnic group		0.003	0.003	
% Other ethnic group		-0.011	0.004	**
% Unknown ethnic group		0.012	0.007	
Male single sex school		0.254	0.079	**
Female single sex school		-0.084	0.052	
Region of domicile (London)	East Midlands	-0.188	0.055	***
	East of England	-0.036	0.043	
	North East	0.087	0.083	
	North West	0.101	0.057	
	South East	-0.053	0.040	
	South West	-0.058	0.056	
	West Midlands	0.060	0.053	
	Yorkshire and The Humber	0.021	0.060	

Variable - reference category in parentheses	Value	Coefficient	Standard error	Significance
School type (Academy)	Further education	-0.029	0.087	
	Grammar	0.228	0.109	*
	Independent	0.083	0.046	
	Sixth form college	-0.279	0.058	***
	State	-0.063	0.036	
Mean best 8 mean		-0.877	0.046	***
Mean entry requirements (relative to predicted points)		-0.255	0.041	***
Mean predicted points		0.249	0.033	***
Significance: '*'p<0.001, '**' p<0.01, '*' p<0.05				

Understanding applicant level effects

To complement the model estimates above, we provide intuitive quantification of the effects of variables of interest below. Throughout, 'one grade further below predictions refers to an increase in the predicted-achieved grade difference of one grade across three A levels.

An example of 'one grade further below predictions': for two students with UCAS predicted grades AAA (equivalent to 15 points) a student achieving BBB (12 points) is one grade further below predictions than a student achieving ABB (13 points).

In the following section model estimates are described as 'x in n achieving one grade further below predictions' for ease of interpretation. For example, a coefficient of 0.4 in the table above is equivalent to 4 in 10 applicants from the relevant group achieving one grade further below predictions across three A levels.[17]

Pairwise comparisons between all categories of categorical variables were used to assess differences between groups, for example between Asian and White ethnic groups. These were corrected for multiple comparisons using the multivariate t (mvt) adjustment from the emmeans package (v1.7.3; Lenth, 2022). All the comparisons described below are statistically significant.

In addition, since the effect of gender differs between single sex and mixed schools, applicant and school effects are reported together in this section.

Of all ethnic groups, those from the White ethnic group achieved closest to UCAS predicted grades

Compared with White applicants, model estimates were equivalent to around:

- 1 in 2 Asian ethnic group applicants achieving one grade further below predictions.
- 1 in 3 Black and Other ethnic group applicants achieving one grade further below predictions.
- 1 in 6 Mixed ethnic group applicants achieving one grade further below predictions.

Leckie and Maragkou (2024) also investigated the predicted-achieved gap using in the 2019 admissions cycle, with adjustment for GCSE attainment, A level subjects and applicant and application characteristics. Consistent with the current research, they found that applicants from the White ethnic group achieved closer to UCAS predicted grades.

Male applicants in mixed schools achieved closer to UCAS predicted grades

Compared with male applicants in mixed schools, model estimates were equivalent to around:

- 4 in 10 female applicants in mixed schools achieving one grade further below predictions.
- 3 in 10 female applicants in single sex schools achieving one grade further below predictions.
- 1 in 4 male applicants in single sex schools achieving one grade further below predictions.

17 However, it is also equivalent to 2 in 10 applicants achieving two grades further below predictions.

The difference in predicted-achieved gap between males in single sex schools and female applicants in mixed schools or single sex schools was not statistically significant.

Similarly, Leckie and Maragkou (2024) found that (with statistical adjustment) male applicants achieved closer to predictions.

As described previously, in the current analysis whether the school was assigned as single sex or not was based on applicants in the modelling sample. Consequently, some schools described as 'single sex' may have included both male and female pupils in the wider population.

Applicants from areas of low deprivation achieved closer to UCAS predicted grades

Coefficients for IDACI are harder to interpret, as a continuous variable with a less familiar scale.

We applied population values for the 20th and 80th percentile to define 'lower' (advantaged) and 'higher' deprivation (disadvantaged) areas[18]. Model estimates were equivalent to, on average, around 1 in 7 disadvantaged applicants achieving one grade further below predictions than their advantaged peers.

Though we tested the interaction between deprivation and prior attainment, this did not show that disadvantaged applicants with higher prior attainment achieved closer to predictions than their advantaged peers.

Leckie and Maragkou (2024) also reported that students from areas of higher deprivation, defined using the Index of Multiple deprivation (IMD), achieved further below predicted grades.

Understanding school level effects

As with applicant level effects, the school level effects described below are independent of all other model variables. That includes the corresponding applicant level variable. For example, the effect of school mean prior attainment is beyond that of the applicant's own prior attainment.

For continuous variables, the values associated with the 20th and 80th percentiles across schools in our dataset are used to quantify differences between schools with 'lower' and 'higher' values respectively. Values associated with these percentiles (the value of the variable at the given percentile before the variables were centred at the school mean) and associated average predicted-achieved gap are detailed in Table 6 below.

For example, for the variable 'Mean best 8 mean':

- The 20th percentile was 6.15. This was associated with a mean predicted-achieved gap of 3.27 grades, across three A levels.
- The 80th percentile was 7.15. This was associated with a mean predicted-achieved gap of 2.39 grades, across three A levels.

Table 6: 20th and 80th percentile values for school level continuous variables

Variable	Percentile	Described below as	Variable value	Mean predicted-achieved gap
Mean best 8 mean	20th	Lower mean prior attainment	6.15	3.27
	80th	Higher mean prior attainment	7.15	2.39
Mean entry requirements (relative to UCAS predicted grades)	20th	Lower mean entry requirements (relative to UCAS predicted grades)	-0.76	2.76
	80th	Higher mean entry requirements (relative to UCAS predicted grades)	0.40	2.47
Mean deprivation	20th	Lower mean deprivation	7.64	2.56
	80th	Higher mean deprivation	19.28	2.76

18 In this context, lower and higher deprivation correspond to the first quintile cut-off and fourth quintile cut-off values of IDACI scores across all English LSOAs in 2019, which were 5.6% and 25.6% respectively. This means that 'lower' deprivation was equivalent to only 5.6% of families with children aged under 16 living in income deprivation (corresponding to the 20th percentile across all LSOAs in England) and 'higher' was equivalent to 25.6% living in income deprivation (the 80th percentile).

High school prior attainment was associated with achievement closer to UCAS predicted grades

There was a strong negative relationship between Mean best 8 mean and the dependent variable. The higher a school cohort's prior attainment, the closer their applicants achieved to predicted grades.

Specifically, a one grade increase in school prior attainment (from mean GCSE grade 6.15 to 7.15) was associated with achievement 0.88 points closer to UCAS predicted grades. This is equivalent to 9 in 10 applicants from a school with lower prior attainment (mean GCSE grade 6.15) achieving one grade further below UCAS predicted grades compared to a school with higher prior attainment (mean GCSE grade 7.15). This effect is beyond that of the applicant's own GCSE performance, which also had a strong negative relationship with the predicted-achieved gap.

The relationship between school prior attainment and the predicted-achieved gap may reflect unmeasured factors that affect the capacity for students to achieve their potential. This might include the classroom environment, or support received from teachers and peers to achieve their 'positive circumstances' predicted grades.

Attending a school where students, on average, hold firm choices with higher entry requirements (relative to UCAS predicted grades) was associated with achievement closer to UCAS predicted grades

Applicants in schools with higher average firm choice entry requirements relative to predictions achieved closer to their UCAS predicted grades.

This can be illustrated with an example. Consider:

- 'Higher entry requirement' School A where, on average, applicants' firm choice entry requirements were 0.4 grades above predictions (the 80th percentile for this variable); and
- 'Lower entry requirement' School B where on average firm choice entry requirements were 0.76 grades below predictions (the 20th percentile).

On average, around 3 in 10 applicants in school B would achieve one grade further below predictions compared to those in school A. This effect is beyond all other factors, including the applicant's own HE entry requirements (relative to predicted grades), school prior attainment and school type.

Higher entry requirements relative to predicted grades at applicant level, included as a control, was also strongly associated with achievement closer to predicted grades.

Applicants in schools with higher mean deprivation achieved further below UCAS predicted grades

Our model estimates that around 1 in 5 applicants from a 'higher deprivation' school (a school in the 80th percentile of mean deprivation) would achieve one grade further below predictions compared to similar applicants from a 'lower deprivation' school (a school in the 20th percentile).

Of all school types, those in sixth form colleges achieved closest to UCAS predicted grades

Applicants in sixth form colleges achieved closest to predicted grades, compared with other school types.

This finding aligns with a survey of teachers and advisers from around the same time as this research[19], in which:

- 41% of respondents indicated that overall, the predicted grades submitted to UCAS by their centre were 'stretching' or 'highly aspirational'. This proportion was substantially lower for sixth form colleges at 28%.[20]
- Nearly three quarters of respondents indicated that students' first choice course entry requirements were important in grade prediction. However, only 61% of those in sixth form colleges revealed that it was important.[21]

19 Evidence from a survey sent at the end of the 2018 cycle. Proportions in this report cover responses from teachers and advisers from England-based centres. In total, there were 565 respondents from centres based in England. Responses are unweighted. The question asked was 'Overall, the predicted grades submitted to UCAS by your centre are:'. Possible responses were 'Highly aspirational', 'Stretching', 'Achievable' and 'Very safe'.

20 The question asked was 'Overall, the predicted grades submitted to UCAS by your centre are:'. Possible responses were 'Highly aspirational', 'Stretching', 'Achievable' and 'Very safe'. Figures for sixth form colleges are based on 55 survey responses from teachers and advisers in sixth form colleges in England.

21 The question asked was 'How important are these factors in predicting grades for your students' applications?'. Proportion of respondents choosing 'Very important' or 'Quite important' is shown for the factor 'Entry requirements of first choice'.

In terms of quantifying effects, compared with applicants in sixth form colleges, model estimates were equivalent to around:

- 1 in 2 applicants attending a grammar school achieving one grade further below predictions.
- 1 in 3 applicants attending an independent school achieving one grade further below predictions.
- 1 in 4 applicants attending an academy achieving one grade further below predictions.
- 1 in 5 applicants attending a state school achieving one grade further below predictions.

The only school type that did not differ significantly from sixth form colleges was FE colleges.[22]

Leckie and Maragkou (2024) also report a smaller predicted-achieved gap in sixth form colleges than other school types, with statistical adjustment for other factors. They also note a smaller gap in state schools compared with independent schools, with statistical adjustment for other factors.

There were some regional differences

Applicants from the East Midlands achieved closest to UCAS predicted grades and those from the North West and the North East achieved the further below. Differences were equivalent to over 1 in 4 applicants from the North West and the North East achieving one grade further below predictions than those from the East Midlands.

School level ethnic group effects were non significant or small

Table 5 above shows the effect of the percentage in each ethnic group, other than White, on the predicted-achieved gap. Some were statistically significant.

However, these effects were small, especially given the relatively low variation in the proportion of applicants in each ethnic group across schools.

Relative importance of fixed effects

Effect size assesses the relative importance of each fixed effect. We calculated effect sizes using the effectsize package (v0.6.0.1; Ben-Shachar et al., 2020). The most important factors, both with a moderate effect size, were school and applicant level prior attainment. Higher prior attainment, at both school and applicant level, was associated with achievement closer to predicted grades.

Nontrivial school differences remained after adjustment for fixed effects

The final model VPC was 0.079. This means that 7.9% of the variation in the difference between UCAS predicted grades and achieved grades lies between schools and is not accounted for by fixed effects included in the model.

Inspection of the difference between schools at the 20th and 80th percentile for school random effects showed a 0.71 grade difference in the predicted-achieved gap. This is equivalent to around 7 in 10 applicants from a school in the 80th percentile quintile achieving one grade further below predictions compared with those from a school in the 20th percentile, all else equal. This difference is larger than any of the continuous school fixed effects described above (which also compare 20th and 80th percentiles across schools), other than school prior attainment. It may relate to unmodelled school factors, or student factors that vary across schools.

Ceiling effects

Ceiling effects are inherent in the relationship between UCAS predicted grades and achieved grades. For example, higher predicted grades are limited in the extent to which they can be exceeded. Similarly, the highest ability applicants cannot be predicted above A*A*A*.

Floor effects also apply. For example, an applicant predicted DDD or equivalent (6 points) cannot achieve more than 6 points below predictions. However, ceiling effects may be of particular concern, since most achieve below predictions, and some groups identified as achieving closer to predicted grades are also typically higher attaining.

Consequently, we took the following steps:

- Included UCAS predicted grades in the model as a control variable. This accounted for the extent to which an applicant could achieve above or below predictions.
- Included prior attainment at GCSE in the model, as a measure of applicant academic ability. This included

22 Based on pairwise comparisons between all school types, with correction for multiple comparisons.

a polynomial to model non-linear relationships. While GCSE is the most recent examined ability measure preceding UCAS grade prediction, there are limitations to its use for this purpose. It is typically assessed in Year 11, and the GCSE measure used is not specific to A level subjects. Additionally, as with all assessments – examined or otherwise – it is subject to measurement error.

- Examined data partitioned models (partitioned by prior attainment) to assess whether conclusions might be impacted by ability-related ceiling effects.

On the last point, all the high-level conclusions specified in the Key points at the beginning of the report remained broadly consistent across models built on lower, medium, and higher academic ability applicants separately, with some differences in the sizes of effects. However, in the medium and higher attaining models, males in mixed schools had a more similar predicted-achieved gap to males in single sex schools. They were not statistically different in these two models. This analysis does not provide evidence for ceiling effects being a 'cause' of this report's overall conclusions.

Conclusions were broadly consistent with various model respecifications

Modelling 2018 cycle applicants produced broadly consistent results.

The model described in the Analysis section was also built separately for 2018 applicants, to check consistency of relationships in a different cycle. Results were consistent directionally with the high level conclusions described in the Key points at the beginning of this report.

Similar relationships were found when modelling without prior attainment.

A model without prior attainment related terms (which had the strongest relationship with the dependent variable) was also built. Most of the applicant level modelling relationships reported in the Key points at the start of this report – other than those relating to GCSE performance - were directionally the same, although the sizes of some effects differed. The exception was some differences in relationships between gender and whether the school was single sex, and the dependent variable.

The lower marginal R^2 of this model (0.111) emphasises the importance of prior attainment in explaining the relationship between UCAS predicted grades and achieved grades.

Modelling without choice-related variables resulted in broadly consistent findings.

The effects of applicant characteristics were broadly similar whether choice-related variables were included in the model or not. All the high-level relationships described in the Key points at the beginning of this report were directionally the same when choice-related variables were removed.

ACKNOWLEDGEMENT

This report benefited from expert peer review by George Leckie, Professor of Social Statistics and Co-Director of the Centre for Multilevel Modelling (CMM) at the School of Education, University of Bristol, UK.

REFERENCES

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1-48. https://doi.org/10.18637/jss.v067.i01

Ben-Shachar, M.S., Lüdecke, D., & Makowski, D. (2020). effectsize: Estimation of Effect Size Indices and standardized Parameters. Journal of Open Source Software, 5(56), 2815. https://doi.org/10.21105/joss.02815

HESA. (n.d.). JACS 3.0: Principal subject codes. https://www.hesa.ac.uk/support/documentation/jacs/jacs3-principal

Leckie, G., & Maragkou, K. (2024). Student sociodemographic and school type differences in teacher-predicted vs. achieved grades for university admission. Higher Education, 1-27. https://link.springer.com/article/10.1007/s10734-024-01217-x

Lenth, R. (2022). emmeans: Estimated marginal means, aka least-squares means. R package version 1.7. 2.

Lüdecke, D. (2021). sjPlot: Data Visualization for Statistics in Social Science. Comprehensive R Archive Network. https://CRAN.R-project.org/package=sjPlot

Lüdecke, D., Ben-Shachar, M.S., Patil, I., Waggoner, P., & Makowski, D. (2021). performance: An R Package for Assessment, Comparison and Testing of Statistical Models. Journal of Open Source Software, 6(60), 3139. https://doi.org/10.21105/joss.03139

Milborrow, S. (2021). earth: Multivariate Adaptive Regression Splines. Derived from mda:mars by T. Hastie and R. Tibshirani. Uses Alan Miller's Fortran utilities with Thomas Lumley's leaps wrapper. Comprehensive R Archive Network. https://CRAN.R-project.org/package=earth

Ministry of Housing, Communities and Local Government. (2019). The English Indices of Deprivation 2019 (IoD2019). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/835115/IoD2019_Statistical_Release.pdf

Nakagawa, S., Johnson, P. C. D., & Schielzeth, H. (2017). The coefficient of determination R2 and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded. Journal of The Royal Society Interface, 14(134), Article 20170213. https://doi.org/10.1098/rsif.2017.0213

R Core Team. (2021). R: A language and environment for statistical computing. R

Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

Raudenbush, S. W., & Bryk, A. S. (2002). Hierarchical linear models. Newbury Park, CA: Sage.

CM-00326