British Educational Research Journal
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cber20

The White British-Black Caribbean achievement gap: tests, tiers and teacher expectations

Steve Strand [a]
[a] University of Warwick, UK

Available online: 01 Jun 2011

To cite this article: Steve Strand (2012): The White British-Black Caribbean achievement gap: tests, tiers and teacher expectations, British Educational Research Journal, 38:1, 75-101

To link to this article: http://dx.doi.org/10.1080/01411926.2010.526702

British Educational Research Journal
Vol. 38, No. 1, February 2012, pp. 75–101

The White British–Black Caribbean achievement gap: tests, tiers and teacher expectations

Steve Strand*
University of Warwick, UK

A recent analysis of the Longitudinal Study of Young People in England (LSYPE) indicates a White British–Black Caribbean achievement gap at age 14 which cannot be accounted for by socio-economic variables or a wide range of contextual factors. This article uses the LSYPE to analyse patterns of entry to the different tiers of national mathematics and science tests at age 14. Each tier gives access to a limited range of outcomes with the highest test outcomes achievable only if students are entered by their teachers to the higher tiers. The results indicate that Black Caribbean students are systematically under-represented in entry to the higher tiers relative to their White British peers. This gap persists after controls for prior attainment, socio-economic variables and a wide range of pupil, family, school and neighbourhood factors. Differential entry to test tiers provides a window on teacher expectation effects which may contribute to the achievement gap.

Introduction

There has been long-standing concern about the educational attainment of minority ethnic pupils in England. Early work was summarised in the Swann report (Department of Education and Science [DES], 1985), which drew on public examination results at age 16 from a number of local authorities with high proportions of ethnic minority students and concluded that 'West Indian children as a group are underachieving in our education system' (DES, 1985, p. 3). Other research in the 1980s from a range of local authorities also indicated significant differences between ethnic groups in educational attainment at primary school (e.g. Scarr *et al.*, 1983; Mortimore *et al.*, 1988) and this continued into the 1990s (Sammons, 1995; Gillborn & Gipps, 1996; Strand, 1997, 1999). Consistent data at a national level across the statutory school age range came in 2002 with the inclusion of ethnicity in the

*Institute of Education, University of Warwick, Coventry, CV4 7AL, UK. Email: steve.strand@warwick.ac.uk

ISSN 0141-1926 (print)/ISSN 1469-3518 (online)/12/010075-27

http://dx.doi.org/10.1080/01411926.2010.526702

pupil-level data collected in the school census. A recent topic paper from the Department for Education and Skills (DfES) has reviewed ethnic attainment gaps using the national test data at age 7, age 11 and age 14 and public examinations at age 16. While the pattern of ethnic gaps differs somewhat across age groups, and some gaps have narrowed over time, broadly speaking the attainment of Black Caribbean, Black African, Black Other, Pakistani and Bangladeshi groups is below that of their White British peers, while Chinese, Indian and Irish pupils score higher than White British (DfES, 2006, p. 39).

Why do these ethnic achievement gaps exist? Perhaps the most frequently cited explanation relates to the substantial differences in socio-economic status (SES) between Black and White groups. The Labour Force Survey 2004/05 defined 20% of White British households as being in income poverty compared to 25% of Indian, 30% of Black Caribbean, 45% of Black African, 55% of Pakistani and 65% of Bangladeshi households (Kenway & Palmer, 2007). An indicator of economic disadvantage collected directly for individual pupils in the school census is entitlement to free school meals. Combined primary and secondary school data from 2005 indicate that levels of entitlement range from 11% for Chinese, 12% for Indian, and 14% for White British pupils, up to 30% for Black Caribbean, 34% for Pakistani, 44% Black African and 47% for Bangladeshi pupils (Strand & Lindsay, 2009). Ethnic gaps in parental occupation and socio-economic class are also pronounced, with the last UK census in 2001 revealing that Pakistani, Bangladeshi and Black Caribbean workers are among the least likely to be employed in managerial and professional jobs (Simpson *et al.*, 2006, p. 48). Socio-economic disadvantage may have a direct influence on children's development, for example, through limited material resources and an increased risk of a range of health and developmental problems, and an indirect influence through parental education, expectations and aspirations (e.g. McLoyd, 1998).

However, large-scale empirical studies have had mixed success in accounting for the Black–White test score gap with SES measures. Most studies report that controls for socio-economic status typically reduce the Black–White gap by no more than one-third, and often by less, and that substantial gaps remain (e.g. Kao *et al.*, 1996; Hedges & Nowell, 1998, Phillips *et al.*, 1998; Demack *et al.*, 2000). For example Hedges & Nowell (1998) report that in the National Educational Longitudinal Study (NELS) the Black–White gap at age 18 only reduced from –0.82 SD to –0.65 SD after control for parental education and income. Similarly, Phillips *et al.* (1998) report that socio-economic status, including racial disparities in family income, wealth, parental education and school resources, explain only about a third of the Black–White test score gap for six-year-olds, and conclude that 'reducing economic inequality between black and white parents would probably not reduce the black–white gap much' (p. 138). In a recent analysis of the Longitudinal Study of Young People in England (LSYPE), a large and nationally representative sample of over 15,000 14-year-olds, Strand (2010a) reports that socio-economic variables (the social class of the home, maternal educational qualifications, gender, entitlement to a free school meal, home ownership and single-parent households) could account for the

Bangladeshi gap, and reduced the Pakistani gap by over 80% and the Black African gap by two-thirds, relative to their White British peers. However, the White British–Black Caribbean gap was not reduced and their mean age 14 score remained –0.37 SD below the mean for comparable White British students, equivalent to around a whole year of progress in terms of England's National Curriculum levels. Some recent studies with very young children have reported relatively greater success. For example Fryer and Levitt's (2004) analysis of 20,000 US children born in the mid 1990s and surveyed through the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) reports that controls for SES (parental occupation, education and income) reduced the Black–White gap in attainment on entry to kindergarten by 40% in mathematics and by two-thirds in reading. However, even here significant gaps remained.

In addition to SES, factors such as parenting practices and home learning environment are strong predictors of educational attainment and progress, particularly in the early years (e.g. Phillips *et al.*, 1998; Sylva *et al.*, 2004), although with older students factors such as parents' involvement with school and their educational aspirations for the young person become more prominent (e.g. Yan & Lin, 2005; Strand & Winston, 2008). However, Strand (2010a) reports that additional controls for parents' educational aspirations for their child, provision of educational resources, involvement in school, and the quality of the parent–child relationship—as well as a wide range of student factors such as attitude to school, academic self-concept, frequency of completing homework, school context and neighbourhood deprivation—were equally unable to account for low achievement of the Black Caribbean group. Neither were these factors able to explain why Black Caribbean students were the only minority ethnic group to make less *progress* than White British students during the first three years of secondary school (age 11–14), falling even further behind their White British peers than they were at age 11.

This leads to a consideration of other factors that might explain the observed gap. In recent years the concept of indirect or 'institutional' racism has become prominent, moving beyond conscious racist intent on the part of individuals to encompass organisational arrangements that may have nothing to do with ethnicity directly, but nevertheless have a disproportionate negative impact on some ethnic groups (see Gillborn, 2008, pp. 27–28 and pp. 122–123 for a fuller discussion). In the school context, ability grouping/curriculum tracking is perhaps the most prominent structural aspect of schooling that researchers have studied,[1] with several US authors proposing that Black students are disproportionately placed in low-ability groups or tracks early in their educational careers, and that such placement leads to the development of negative attitudes and behaviours related to learning and ultimately to poorer attainment (e.g. Oakes, 1985; Braddock & Slavin, 1993; Hallinan, 1996, 2001). While evidence of the under-representation of Black students in higher ability groups or tracks is strong, the evidence is more mixed on whether ethnic differences in grouping remain once controls for prior attainment or measured ability are included, with some studies reporting a decreased but still significant effect (Wang & Goldschmidt, 2003; Southworth & Mickelson, 2007) but others reporting that ethnic group differences in track placement disappear after controls for prior attainment and

SES (e.g. Alexander & Cook, 1982; Hallinan, 1994; Ferguson, 1998; Lucas & Gamoran, 2002; Kelly, 2004). Similar arguments regarding the negative effects of ability grouping on Black Caribbean pupils have been made in England (e.g. Wright, 1987; Mac an Ghail, 1988; Gillborn, 1990). However, these have largely been small-scale ethnographic studies, leading other authors to conclude that 'the research fails to establish that discrimination against Black pupils occurs on any scale in the allocation of pupils to courses, or through the effects of this allocation' (Foster *et al.*, 1996, p. 105).

As the tracking literature has become more sophisticated, a sharper focus on enrolment on specific courses has emerged (e.g. algebra I, algebra II, trigonometry, etc). For example, if Black students are more likely to be enrolled in lower mathematics courses during grade 8 (age 14) they could have fewer opportunities to take more advanced classes at grade 10 (age 16) (Stevenson *et al.*, 1994). However, again the evidence is mixed, with a recent analysis of the US National Educational Longitudinal Study (NELS) by Lleras (2008) indicating that Black students are no less likely than White students to complete higher-level mathematics courses in grades 9 and 10, after control for grade 8 measures of prior attainment, engagement and mathematics class. In England a parallel with course-taking may be seen in the extensive use of differentiated test papers (commonly referred to as tiering) in national tests in science and mathematics at age 14 and in public examinations in a wide range of subjects at age 16. The national tests are presented in different tiers, each consisting of different papers that allow the award of a limited range of National Curriculum (NC) levels, and teacher judgement is used to assign students to the different test tiers. Importantly, the higher levels can only be achieved if the teacher has entered the student for the higher tier examination. This process is presumed to be more efficient, and to offer a more positive experience to students, since they are only tested on a range of items that are matched to their current level of performance, as judged by their teachers.[2] However, the element of teacher judgement introduces a social dimension to the process and there has been very little research on how this may impact on different ethnic or social class groups (Elwood & Murphy, 2002, p. 396). In a detailed study of two secondary schools, Gillborn and Youdell (2000) suggest that minority ethnic students are less likely to be entered by their teachers to the higher test tiers, and so are not able to achieve the highest test outcomes. Tikly *et al.* (2006) appear to replicate this finding across a larger sample of 18 secondary schools. However, the schools in their project were specifically selected because their African and Caribbean students were performing below the average for all pupils at age 14, and do not constitute a representative sample. Perhaps more importantly, the study includes no control for students' prior attainment and so cannot refute suggestions that any under-representation in higher tier entry at age 14 simply reflects pre-existing attainment differences at age 11, i.e. the study is not able to establish bias[3] in secondary school practices in tier allocation.

To summarise, track placement, course taking and tiered entry have been hypothesised as school organisational arrangements that impact negatively on the attainment and progress of Black students. However, the evidence on whether Black students are

differentially represented in tracks, courses or tiers, net of causally preceding variables such as prior attainment, is mixed. In relation to tiering there has been no study using a large and nationally representative sample to determine whether different ethnic groups are disproportionately entered to different test tiers, and, if they are, whether these differences can be accounted for by a range of student, family, school and neighbourhood variables. This article presents such an analysis. The following specific research questions are addressed:

- Are all ethnic groups equally likely to be entered for the higher tier papers of the national tests in mathematics and science at age 14?
- If differential patterns of entry by ethnicity exist, can they be explained by the students' prior attainment (do entry patterns simply reflect 'real' differences in attainment between groups?)
- Can any differential patterns be explained by other student, family, school and neighbourhood factors, e.g. do differential patterns of entry reflect differences in home background such as social class, or differences in students' attitudes, aspirations or motivation?
- To the extent that the above analyses indicate bias in entry to the higher test tiers, what factors might account for this bias?

Methodology

Sample

The data set used here is wave 1 of the Longitudinal Study of Young People in England (LSYPE). Wave 1 occurred in summer 2004, and the target population was young people attending Year 9 (age 14) in all schools in England. LSYPE used a two-stage sampling procedure. At the first stage a sample of schools was drawn with probability proportionate to size from a stratified frame by school deprivation status, region and by school admission policy (comprehensive, selective and secondary modern), and at the second stage a sample of students in Year 9 was drawn from the schools. The survey was specifically designed to support analyses in relation to ethnic group through sample boosts for the six largest minority ethnic groups: Black African; Black Caribbean; Bangladeshi; Indian; Pakistani; and students of Mixed heritage. These boosts provided representative samples of the relevant sub-populations as a whole, rather than drawing disproportionately from areas or schools with high numbers of minority ethnic students. After excluding students who had no age 14 test scores, who did not give their ethnicity or those whose main parent was not interviewed, the eligible sample was 14,503 students drawn from 629 schools, with an average number of students per school of 22.7 (range 1 to 45, SD 5.3). In the analyses to follow the data have been weighted to compensate for differential selection chances in the sample design and to remove non-response biases. Analyses were completed using the SPSS Complex Samples module V15.0.

LSYPE data collection was based on face-to-face interviews with the young person and with both parents/carers (where present). The data were linked to the school

census and to the students' national test results at age 11 in 2001 and age 14 in 2004. An initial analysis of the LSYPE data set created a set of 28 variables that were both associated with educational attainment at age 14 and exhibited significant variation across different ethnic groups. Appendix 1 gives a summary of the variables. A full description and cross-tabulations of these variables by ethnic group are given in Strand (2010).

Tiering structure in national tests at age 14

All students in England complete national tests in English, mathematics and science at the end of Year 9 (age 14). These award pupils a National Curriculum (NC) level which is age related, with a level assumed to represent roughly two years of educational progress (DES, 1988). The typical student at age 11 is expected to achieve level 4, and at age 14 to achieve level 5 or level 6. The highest level that can be awarded in the English and science tests at age 14 is level 7, although a level 8 can be awarded in the mathematics test.

There are no tiering arrangements for national tests in English at age 14 and all students sit the same test papers. However, the science test is available in two tiers, a lower tier (3–6) and a higher tier (5–7), where each tier has different papers targeted at a restricted set of levels. The principal target levels for the 3–6 tier are levels 4 and 5, and for the 5–7 tier the principal target level is level 6. The highest possible outcome (level 7) can only be achieved if the student is entered by their teacher for the higher tier. However, there are negative consequences to entering a student for the higher tier should they not achieve the expected level. If a student entered for the higher tier fails to achieve level 5, there is only a very narrow range of marks that can lead to a compensatory level 4, otherwise the student is not awarded a level and is graded unclassified (U). The tiering system is shown in Table 1. Which tier a student is entered for is a matter for the professional judgement of the teacher, which will be influenced by the teacher's perceptions of how students will cope with the demands made on them by the content and structure of the tests.

Table 1 also shows the tiering arrangements for the mathematics test, which are more complex, with tests available in four tiers (tiers 3–5, 4–6, 5–7 and 6–8). The

Table 1. Tiering structure for age 14 national tests in science and mathematics

Subject	Tier	Awardable NC levels						
Science	Lower tier (3–6)	U	3	**4**	**5**	6		
	Higher tier (5–7)	U			5	**6**	7	
Mathematics	Tier 3–5	U	**3**	4	5			
	Tier 4–6	U	3	**4**	5	6		
	Tier 5–7	U		4	**5**	6	7	
	Tier 6–8	U			5	**6**	7	8

Notes: The numbers indicate National Curriculum (NC) levels that can be achieved through the relevant tier. The shaded areas indicate the level/s at which the tier is targeted (see text). U = unclassified result.

principal target level for the 3–5 tier is level 4; for the 4–6 tier it is level 5; for the 5–7 tier it is level 6; and for the 6–8 tier level 7. Again the tier a student is entered for is a matter for the professional judgement of the teacher, and an unclassified (U) grade can result if a student entered for a higher tier fails to achieve the expected level.

Analytic strategy

The pattern of entry to test tiers is analysed using logistic regression for the science test and ordinal regression for the mathematics test. These analyses identify the unique (net) contribution of particular factors to variations in tier of entry, while other background factors are controlled. This is important because differences in tier of entry would be expected to reflect prior attainment levels, and might also be influenced by other socio-economic factors (for example, the social class of the home) or student factors such as motivation and effort.

The first *base model* includes only ethnic group to determine whether significant differential patterns of entry to test tiers by ethnic group exist, and the size of such effects. Disproportionate entry to the higher test tier across ethnic groups does not per se indicate the existence of bias in entry since differential entry rates may reflect actual differences in attainment between ethnic groups. Therefore a second *prior attainment model* adds each student's attainment in national English, mathematics and science tests at age 11 as a control variable. A third *family background model* adds further controls for socio-economic factors, specifically the social class of the home, mother's highest educational qualification, entitlement to free school meals, gender, home ownership and single-parent households. In the final *full contextual model* all the variables listed in Appendix 1 were eligible for inclusion. All these variables have been shown to impact independently on attainment at age 14 (Strand, 2010) and include: parental attitudes and behaviours (parental involvement in school, parents' educational aspirations for the student, parental provision of material resources such as a home computer and private tuition, the quality of family relationships); student educational risk factors (identified special educational needs, whether the student has ever truanted from school, whether the student has ever been excluded from school, long-term absence from school, problems leading to the involvement of police, education welfare or social services); student motivational factors (the student's attitude to school, educational aspirations, frequency of completing homework, planning for the future, academic self-concept) and school and neighbourhood economic deprivation. All variables are initially included in the models before variables with a non-significant WALD test statistic are progressively removed to create parsimonious models.

Results

Science tiering

Descriptive statistics. Twelve per cent of White British students achieve the highest level (level 7) in the science test at age 14, compared to only 6% of Pakistani and

Table 2. Percentage of students entered for each science test tier and odds ratios from four logistic regression models by ethnic group

Ethnic group	% entered for:		Odds ratios			
	Tier 3–6	Tier 5–7	Base model	Prior attainment	Family background	Full contextual
White British	53.6	46.4	—	—	—	—
Mixed heritage	56.4	43.6	0.89	0.90	0.94	0.92
Indian	51.0	49.0	1.11	1.30***	1.37***	1.00
Pakistani	71.6	28.4	*0.46****	0.88	1.09	*0.75**
Bangladeshi	62.5	37.5	*0.69****	1.20	1.65***	1.17
Black Caribbean	71.9	28.1	*0.45****	*0.66****	*0.69****	*0.64****
Black African	66.7	33.3	*0.58****	1.13	1.19	0.89
Any other group	52.7	47.3	1.04	1.57***	1.71***	1.35*
Nagelkerke R^2	—	—	0.01%	53.4%	54.4%	57.2%

Notes: *Base model*: controls for ethnic group only. *Prior attainment model*: controls for ethnic group and age 11 average test marks. *Family background model*: controls for ethnic group, age 11 average test marks, gender, social class of the home, maternal educational qualifications, entitlement to FSM, home ownership and single-parent households. *Full contextual model*: controls for all measured variables with a significant association with tier of entry. Variables with a non-significant WALD test statistic were removed to create a parsimonious model. The full regression model is included in Appendix 2.*$p < .05$;**$p < .01$;***$p < .001$. Figures in italic indicate significant under-representation in entry to higher tiers relative to White British students.

Black African students and 5% of Bangladeshi and Black Caribbean students. It will be remembered that students are only able to achieve level 7 if they are entered for the higher tier (5–7) papers. The first two columns of Table 2 present the proportion of students from each ethnic group entered for the lower and higher tiers. This shows that 46% of White British students are entered to the higher tier, compared to only 38% of Bangladeshi, 33% of Black African, 28% of Pakistani and 28% of Black Caribbean students.

Logistic regression analyses

Base model. The percentage differences in tier entry rates between different ethnic groups can also be expressed as odds ratios (ORs), as shown in the third column of Table 2. The OR indicates the odds of being entered for the higher tier for students from each ethnic group relative to the odds for White British students. This shows that Pakistani and Black Caribbean students are only around half as likely to be entered for the higher tier as White British students (0.45:1 and 0.46:1 respectively). Black African and Bangladeshi students are also significantly under-represented, though to a lesser extent (0.58:1 and 0.69:1 respectively).

Prior attainment model. The fourth column of Table 2 presents the ORs after prior attainment as indicated by age 11 average test marks is included in the model.[4] Prior

attainment accounts for a substantial proportion of the variation in tier entry, giving a Nagelkerke pseudo R^2 of 53.4%. The ORs for Pakistani, Bangladeshi and Black African students are no longer significantly different from White British students, suggesting the tier entry decisions are broadly in line with students' prior attainment. However the OR for Black Caribbean students only rises to 0.66:1 and Black Caribbean students are still significantly less likely to be entered for the higher tier than White British students *of the same prior attainment*. This indicates that for every three White British students entered for the higher tier only two Black Caribbean students of the same prior attainment are entered.

Family background model. The fifth column of Table 2 presents the ORs for each ethnic group after adding further controls for family background, including gender, social class of the home, mother's highest educational qualification, entitlement to FSM, home ownership and single-parent status. Even after inclusion of these variables Black Caribbean students still continue to be under-represented to the same extent (0.69:1).

Full contextual model. The final model includes all variables that were significantly associated with tier of entry,[5] and the full model is shown in Appendix 2. Several variables were associated with differential entry to the higher tier, over and above the effect of prior attainment and controlling for the simultaneous influence of all variables in the model. Boys were more likely to be entered to the higher tier than girls in the ratio 1.25:1. Students with mothers with a degree were more likely to be entered in the ratio 1.44:1 compared with those with mothers with no educational qualifications. Students from higher and lower managerial and professional homes were 1.48:1 and 1.40:1 respectively more likely to be entered than those from homes where the head of household was long-term unemployed. Also more likely to be entered (see Appendix 2 for specific ORs) were students whose parents were actively involved with the school, monitored their child's whereabouts and had high educational aspirations for their child (wanted them to continue in full-time education after age 16). In terms of student variables, entry to the higher tier was more likely where the student had high educational aspirations, completed homework five evenings a week and had high academic self-concept, and less likely where the student had truanted, been involved with the police, excluded from school or lived in a high deprivation neighbourhood.

While statistically significant, these variables explained relatively little additional variance over that explained by prior attainment alone, adding only around 4% to the Nagelkerke pseudo R^2. The final column of Table 2 shows the impact of these additional controls on the resulting ORs for each ethnic group. The additional variables are still unable to account for the under-representation of Black Caribbean students in entry to the higher test tier. All other things being equal, for every three White British students entered for the higher tier only two comparable Black Caribbean students are entered (OR = 0.64:1, $p < .001$). It is notable than in this final model Pakistani

students also appear to be under-represented, although to a less marked extent (OR = 0.75:1, $p < .05$).

Mathematics tiering

Descriptive statistics. Black Caribbean students are the lowest attaining ethnic group in mathematics at age 14, and only one-third (33%) attain level 6 or above compared to over half (55%) of White British students. Pakistani, Black African and Bangladeshi students also have significantly lower proportions of students achieving level 6 or above at 38%, 39% and 40% respectively (see Strand, 2010a, for further detail). Table 3 presents the proportion of students from each ethnic group entered for each mathematics test tier. Black Caribbean students are substantially under-represented relative to White British students in the upper two tiers (6% vs. 17% for tier 6–8 and 19% vs. 29% for tier 5–7 respectively) and conversely over-represented in the lower tiers (e.g. 35% vs. 21% in tier 3–5). Pakistani, Bangladeshi and Black African students are also under-represented relative to White British students in the higher tiers, but the degree of under-representation for Black Caribbean students is more extreme than for any other ethnic group.

Ordinal regression analyses. Ordinal regression analyses were completed to determine whether the odds of entry to higher test tiers differ significantly for different ethnic groups. Table 4 summarises the results. The odds are expressed as a single cumulative odds ratio[6] for each ethnic group, indicating the extent to which each ethnic group is under (or over) represented relative to the White British group.

Base model. The results confirm that Black Caribbean students are the most under-represented ethnic group, being less than half as likely to be entered for the higher tiers compared to White British students (0.44:1). Pakistani, Black African

Table 3. Percentage of students entered for each mathematics test tier by ethnic group

Ethnic group	Unweighted count	Percentage in each mathematics test tier			
		3–5	4–6	5–7	6–8
White British	9162	21.1	32.8	28.8	17.3
Mixed heritage	736	21.4	36.0	25.8	16.8
Indian	956	14.8	33.4	29.9	21.9
Pakistani	901	33.8	33.1	23.4	9.7
Bangladeshi	685	30.0	35.4	23.8	10.8
Black Caribbean	545	35.0	40.5	19.0	5.5
Black African	569	29.8	36.5	22.1	11.5
Any other ethnic group	574	23.3	30.2	23.9	22.5
Total	14128	21.8	33.0	28.2	17.1

Notes: Tier of entry could not be determined for 375 students, who were excluded from the analysis.

Table 4. Cumulative odds ratios for ethnic group in four ordinal regression models for mathematics tier of entry

Ethnic group	Base model	Prior attainment	Family background	Full contextual
Mixed heritage	0.92	1.14	1.24*	1.22*
Indian	1.34***	1.59***	1.83***	1.42***
Pakistani	*0.55***	1.19	1.50***	1.12
Bangladeshi	*0.62***	1.08	1.63***	1.22
Black Caribbean	*0.44***	*0.68***	*0.72***	*0.65***
Black African	*0.62***	1.50***	1.67***	1.19
Any other ethnic group	1.01	1.62***	1.92***	1.50***
Nagelkerke R^2	0.9%	70.8%	72.3%	75.0%

Notes: *Base model*: controls for ethnic group only. *Prior attainment model*: controls for ethnic group and age 11 maths test marks. *Family background model*: controls for ethnic group, age 11 maths test marks, gender, social class of the home, maternal educational qualifications, entitlement to FSM, home ownership and single-parent households. *Full contextual model*: controls for all measured variables with a significant association with tier of entry. Variables with a non-significant WALD test statistic were removed to create a parsimonious model. The full regression model is included in Appendix 3. *$p < .05$; **$p < .01$; ***$p < .001$. Figures in italics indicate significant under-representation in entry to higher tiers relative to White British students.

and Bangladeshi students are also under-represented relative to White British students by around 0.6:1. Indian students are over-represented in the higher tiers relative to White British students by 1.34:1.

Prior attainment model. Age 11 mathematics test marks[7] were very strongly correlated with tier of entry, giving a Nagelkerke pseudo R^2 of 71%. Prior attainment accounted for the lower proportion of Pakistani and Bangladeshi students entered for the higher tiers as these ORs are no longer significantly different from White British students. Black African students are actually over-represented in the higher tiers given their prior attainment, as are Indian students. However, Black Caribbean students are the only ethnic group to remain under-represented and are only two-thirds (0.68:1) as likely to be entered for higher tiers as White British students with the same age 11 mathematics test score.

Family background model. As well as prior attainment, this model also includes gender, social class of the home, maternal education, entitlement to FSM, home ownership and single-parent households as explanatory variables. The results show that Pakistani and Bangladeshi groups join the Black African and Indian groups in being over-represented in the higher tiers, after accounting for their high level of socio-economic disadvantage. However, Black Caribbean students remain the only group to be substantially under-represented in the higher tiers, even taking into account their prior attainment and family background, by a ratio of 0.72:1.

Full contextual model. The final model includes all variables that were significantly associated with tier of entry. The full results are given in Appendix 3. The results reveal that boys were 1.21 times more likely to be entered for the higher tiers than girls. Students from the higher four social classes were 1.6–1.4 times more likely to be entered than those from the lowest social class group. Students with mothers with any level of educational qualification were more likely to be entered than those with no qualifications, ranging from 1.72 for students with mothers with degrees to 1.18 for students with mothers with General Certificate of Secondary Education (GCSE) level qualifications. High parental educational aspirations, greater parental supervision, the provision of a home computer and private tuition were also positively related to tier of entry (see Appendix 3 for specific ORs). In terms of student factors there were increased odds of entry to higher tiers for students with high educational aspirations (intended to continue in full-time education after age 16), high academic self-concept and completing homework on four or more evenings a week. Negative factors included identified special educational needs, extended absence from school, one or more instances of exclusion from school, contact with the police because of student behaviour, and attending high deprivation schools or living in high deprivation neighbourhoods. These factors were all statistically significant although their impact was small relative to prior attainment, explaining only an additional 4.5% of the variance in tier of entry. Even after control for this wide set of variables there remain statistically significant and large differences in entry to test tiers for two ethnic groups, as shown in the last column of Table 4. Black Caribbean students are under-represented in entry to the higher tiers relative to their White British peers in the ratio 0.65:1, while Indian students are over-represented in entry to the higher tiers relative to their White British peers in the ratio 1.42:1.

Discussion

The starting point for this article is the analysis of the LSYPE by Strand (2010a) which reports that socio-economic variables, as well as a wide range of parental attitudes and behaviour, student risk and motivation factors and school and neighbourhood context variables, were unable to account for the low attainment at age 14 of Black Caribbean students relative to their White British peers. Neither were these variables able to explain why Black Caribbean students were the only ethnic group to make less progress than White British students between the age of 11 and 14, falling even further behind their White British peers. The analysis presented in this article for the same nationally representative sample shows that Black Caribbean students are the only ethnic group to be consistently under-represented relative to White British students in entry to the higher mathematics and science test tiers. This under-representation is not simply a reflection of their lower prior attainment; Black Caribbean students are under-represented relative to White British students with the same prior age 11 test scores. Neither is it explained by differences in gender, social class of the home, maternal education, entitlement to FSM, home ownership or

single-parent households. Other student factors were also controlled. For example, Black Caribbean students were the ethnic group most likely to be excluded from school during the year prior to the age 14 tests, to have the highest level of identified SEN, and were the most likely to have truanted at some time during the first three years of secondary school (Strand, 2010a). But including these and all other student, family, school and neighbourhood factors did not alter the under-representation, and for both the mathematics and science tests Black Caribbean students remain under-represented in the higher tier/s in the ratio 0.66:1. All other things being equal, for every three White British students entered for the higher tier only two Black Caribbean students are entered. The evidence points to systematic under-representation of Black Caribbean students in entry to the higher tier examinations at age 14. It is also notable that the White British–Black Caribbean achievement gap is most pronounced for the tiered mathematics (–.54 SD) and science (–.52 SD) tests, but substantially smaller for the English test, which is not tiered (–.30 SD).

It is important to be clear how the results for Black African, Pakistani and Bangladeshi groups should be interpreted. These groups are under-represented in entry to the higher tiers in the base models but not in the prior attainment (or subsequent) models. We should remember that significant ethnic achievement gaps already exist at age 11 nationally and for the LSYPE students (see Strand, 2010a, Table 3). For Black African, Pakistani and Bangladeshi groups the gaps relative to White British students do not widen any further between age 11 and age 14, so we must look at processes occurring in the *primary phase* to understand the origin of these achievement gaps. The fact that patterns of tier-entry are consistent with prior attainment indicates no evidence of bias in *secondary school* teachers' allocation of students to tiers for these ethnic groups.[8] However, this is not the case for Black Caribbean students where the achievement gap widens further during the first three years of secondary school and the evidence suggests bias in secondary school teachers' allocation of students to tiers relative to prior attainment (and all other controlled variables).

Has bias been established?

It may be suggested that while the results establish differential entry rates to higher tiers for Black Caribbean students (that are unexplained by other measured factors) they do not of themselves demonstrate bias in tier entry decisions. It might be suggested that to demonstrate bias in some teachers' tier entry decisions, the test marks for Black Caribbean students entered for any tier should on average be *higher* than those of the White British students entered to the same tier. The logic of this argument is that if more able Black Caribbean students are held back only by entry to an inappropriate tier, then their greater ability should be reflected in higher marks within the tier they were entered for. However, this argument is misconceived at two levels.

First, tier of entry is not the only variable affecting performance. Even within a tier, test marks are substantially impacted by prior attainment, social class of the home, maternal education and so on. Given the significant variation between ethnic groups

in these contextual factors, it is unlikely that Black Caribbean students would have a higher mean test mark than White British students within a tier.[9] Furthermore, even if the mean mark for the Black Caribbean group is lower than the mean mark for the White British group within a particular tier, which is largely what is found, the same (unknown) factors that explain the poorer than expected progress of Black Caribbean students from age 11 to 14 may also explain why they achieve on average lower marks than White British students within the same tier.

Second, and more fundamentally, tier of entry is not simply a decision made on the day of the test that might restrict some more able Black Caribbean students from achieving the highest test levels. There is a more complex relationship between teacher expectation and tiering. Tiering decisions are required at least six months[10] before the tests and may often be made substantially in advance of this. In many schools students are placed into ability groups/sets on entry to secondary school and sometimes particular sets are prepared for specific tiers, so students may have studied different material to different depths over the whole three years of secondary school in preparation for a particular tier (Gillborn & Youdell, 2000). The point about the social consequences of tiering is that it makes explicit what the teacher expects of the student, and this is typically revealed well in advance of the test. The lower test marks for Black Caribbean students within tiers could be a response to the tiering decision, for example, to become demotivated and to try less hard. The important issue raised by the tiering results is not so much that differential entry rates are the *cause* of the low attainment and poor progress of Black Caribbean students (although they may contribute somewhat to the underachievement of the most able students) but that they might illustrate wider teacher expectation effects. Tiering decisions therefore need to be seen as more than a technical issue about accurate measurement at the point of assessment; they need to be set within the wider context of teachers' perceptions and the social consequences of assessment.

A concurrent measure of performance at age 14 that was independent of the national tests, such as a reasoning test score, would in some regards be a better control than test marks taken three years previously. However, age 11 test marks are very highly correlated with attainment at age 14 ($r = 0.89$) which is as high as can feasibly be expected of any concurrent reasoning test. The fact that Black Caribbean students are under-represented to such a significant degree in the higher tiers, even relative to White British students with the same age 11 scores, at the very least raises questions about why the tiering gap is so big, even if one holds to the view that the entry decisions are a fair reflection of Black Caribbean students' current attainment at age 14. The fact that this under-representation in the higher tiers is specific to one ethnic group and persists even after taking account of extensive additional explanatory variables suggests a significant cause for concern.

What might account for the differential entry to test tiers?

The data require consideration of other explanations for the under-representation of this (specific) minority ethnic group. The bias may relate to two other educational

outcomes identified in national data also distinctive to Black Caribbean (and Mixed White and Black Caribbean) students. First, Black Caribbean, and Mixed White and Black Caribbean, students are 2.0 to 2.5 times more likely to be permanently excluded from school than White British students (Parsons *et al.*, 2005). Second, Black Caribbean students are 2.3 times more likely than White British students, and Mixed White and Black Caribbean students twice as likely as White British students, to be at School Action Plus (SAP) or have a statement of SEN for behavioural, emotional and social difficulties (BESD) (Strand & Lindsay, 2009, Table 5). Even after student-level controls for age, gender, entitlement to FSM and neighbourhood deprivation, both groups remain 1.5 times more likely to be identified with BESD than White British students (Strand & Lindsay, 2009, Table 6). While only a relatively small proportion of Black Caribbean students are directly included in these groups, the results may be symptomatic of wider issues related to behaviour.

Research suggests that teachers' judgements of students' academic potential can be distorted by affective factors such as perceptions of their behaviour (e.g. Mortimore *et al.*, 1988, p. 157; Bennett *et al.*, 1993; Thomas *et al.*, 1998). Thus, Bennett *et al.* (1993) reported that teachers' perceptions of students' behaviour constituted a significant component of their academic judgements. In other words, students who were perceived as exhibiting bad behaviour were judged to be poorer academically than those who behaved satisfactorily, even after controlling for test score and gender. Black Caribbean students may be disproportionately allocated to lower test tiers, not as a result of direct or conscious discrimination, but because teachers' judgements of their academic potential are distorted by perceptions of their behaviour. If the behaviour of Black Caribbean students is more challenging, or even if it is simply that teachers *perceive* their behaviour as more problematic, there may be a tendency to underestimate their academic ability. These findings are certainly congruent with ethnographic studies in English secondary schools arguing that behavioural criteria and not purely cognitive measures were used in the allocation of pupils to examination sets and streams, and that this practice disadvantaged African-Caribbean pupils in particular (Wright, 1987; Mac an Ghail, 1988; Gillborn, 1990; Gillborn & Youdell, 2000; Rollock, 2007). Such perceptions may have particularly powerful consequences when combined with a tiering system that includes high penalties if students are inappropriately entered to the higher tiers (the award of an Unclassified grade). Gillborn and Youdell's (2000) detailed secondary school case study suggests that teachers were extremely cautious and risk averse with regard to entry to the higher tiers, reflecting a desire to protect students from failure. This may impact negatively on Black Caribbean students, even if their ability is not underestimated, if they are seen as more likely to be disaffected or less motivated, and at greater perceived risk of falling through the tier floor.

There is general agreement that Black Caribbean students have the most conflict in relations with teachers (e.g. Foster *et al.*, 1996; Modood, 2003; Rollock, 2007), but there are fundamental disagreements over the causes of the behaviour. Some authors give primacy to out-of-school cultural factors, arguing that Black Caribbean students experience considerable pressure by their peers to adopt the norms of an 'urban' or

'street' subculture where more prestige is given to unruly behaviour with teachers than to high achievement or effort to succeed (e.g. Foster *et al.*, 1996; Sewell, 1997). Fordham and Ogbu (1986) further argue that notions of 'acting white' or 'acting black' become identified in opposition to one another. Hence, because acting white includes doing well at school, acting black necessarily implies not doing well in school. Other explanations give primacy to school processes, with greater surveillance of Black male students and pre-emptive disciplining by teachers resulting in greater staff–pupil conflict (Gillborn & Youdell, 2000; Rollock, 2007), leading some Caribbean students towards a distinct subculture to resist their differential treatment by schools and teachers (e.g. Gillborn, 1990). However, cultural explanations do not preclude the existence of institutional processes that may exacerbate group differences in achievement, and the reverse is also true. Indeed, it is likely that both sets of factors are involved and feed off each other in a vicious cycle of amplification (Pilkington, 1999, p. 414).

Conclusion

It is widely recognised that teacher grades are multidimensional assessments, measuring not only students' academic knowledge but also teachers' judgements of their effort, participation, attendance and behaviour (e.g. Bowers, 2009), as well as other factors such as the extent of parental involvement with the school (e.g. Desimone, 1999). Test scores are generally less influenced than are grades by such judgements but the current results indicate that, at least in England, test results cannot be assumed to be independent of such influences. The current study demonstrates quite unambiguously that Black Caribbean students are systematically under-represented in entry to the higher tiers of national science and mathematics tests at age 14 relative to their White British peers, and these differential entry rates cannot be explained by prior attainment, socio-economic status, maternal education, family composition, gender, poverty, a wide range of measures of aspirations, motivation, and effort and school and neighbourhood deprivation. While the LSYPE does not contain data on the teaching groups experienced by the students, differential entry to test tiers at age 14 may be the culmination of ability grouping and the studying of different syllabuses earlier in secondary school (Gillborn & Youdell, 2000). These results, from a nationally representative sample, lend support to research emphasising the role of course taking in understanding the Black–White achievement gap (Wang & Goldschmidt, 2003; Southworth & Mickelson, 2007; Lleras, 2008). This chimes with a recent analysis of school effects on equity gaps in national test scores at age 11 which concludes that within-school rather than between-school factors are most likely to account for the White British–Black Caribbean achievement gap (Strand, 2010b). Finally, the results also have implications for national assessment policy in England. The Government has recently piloted 'single level' tests which are even more extreme than tiering since they provide different test papers for *each National Curriculum level*. This will give even greater emphasis to teachers' judgements than tiering; since the tests will only be able to confirm the level at which the teacher has entered the student, there

will be no possibility for the tests to indicate that the student is functioning at a higher level. In the light of the current results these proposals need careful and detailed evaluation.

Acknowledgements

This research was funded by the Department for Children, Schools and Families (DCSF) (Project Reference EOR/SBU/2006/031).

Notes

1. In the USA many high schools place students in different 'tracks' that offer academic classes to higher achieving students and general or vocational tracks to lower achieving students. Setting or ability grouping in the UK is similar, except that in theory a student might be placed in a top set in one subject but a lower set in another subject, although in practice students tend to be placed in similar sets across different subjects (e.g. Hallam, 2002).
2. For a discussion of the benefits of tiering see Burghes *et al.* (2001).
3. Some authors consider any evidence of disproportionate representation in ability groups or tiers as *prima facie* evidence of bias, which Ferguson (1998) has defined as unconditional bias. In contrast, this study adopts a definition of bias as disproportionate representation in ability groups or tiers after control for legitimate objective measures of performance such as past attainment or grades, which Ferguson has defined as conditional bias. In common with Ferguson (1998, p. 280), I believe the latter is more appropriate if seeking evidence of bias in allocating students to tiers.
4. An initial analysis used age 11 science test marks as the measure of prior attainment. However, a significantly better correlation was achieved with average age 11 test mark (r = 0.63) than with age 11 science mark alone (r = 0.56). The total test marks obtained by each student across all age 11 tests were summed (range 0–280) and subject to a normal score transformation so the mean age 11 test score is represented by zero with a standard deviation of 1.
5. All variables described in Appendix 1 were included in the analysis but variables that were not significantly associated with entry tier (non-significant WALD test) were removed through a process of backwards elimination. This was important in order to produce a parsimonious model because including a large number of redundant variables led to complete or quasi-complete separation in the data.
6. This single odds ratio makes the assumption that the regression parameters are equal for all cumulative responses (tiers). For each model the WALD statistic was computed to test this null hypothesis against a model with variable parameters. The assumption of constant parameters held for the full contextual model but was not met for some of the simpler models. In these cases multinomial regressions which do not assume constant parameters were run and showed consistent direction of effects associated with ethnic group, so for simplicity of presentation the cumulative OR is reported here.
7. Age 11 mathematics test marks and age 11 average test marks were equally strong predictors of age 14 mathematics tier of entry (both r = .81). Given this functional equivalence in terms of prediction, age 11 mathematics test marks were used as the control because the test content was more closely related to the age 14 mathematics tests. Age 11 mathematics test marks (range 0–100) were normal transformed to have a mean of 0 and SD of 1.
8. This point has been misinterpreted in Gillborn (2010), primarily because he adopts an unconditional rather than conditional definition of bias (see footnote 3).
9. Using statistical methods to control for contextual variables *within* a tier is problematic because of the substantial drop in sample size.

10. While the order for test papers in November/December does not commit schools to entering any individual student for a particular tier, they are told that 'schools' orders should be as accurate as possible, as there is very limited time for processing and fulfilling late orders and correcting any shortfalls in ordering' (Qualificationa and Curriculum Authority, 2004, p. 32).

References

Alexander, K. & Cook, M. (1982) Curricula and coursework: a surprise ending to a familiar story, *American Sociological Review,* 47, 926–640.

Bennett. R. E., Gottesman, R.L., Rock, D. A. & Cerullo, F. (1993) Influence of behaviour perceptions and gender on teachers' judgements of students' academic skill, *Journal of Educational Psychology,* 85, 347–356.

Bowers, A. (2009) Reconsidering grades as data for decision making: more than just academic knowledge, *Journal of Educational Administration,* 47(5), 609–629.

Braddock, J. & Slavin, R. (1993) Why ability grouping must end: achieving excellence and equity in American education, *Journal of Intergroup Relations,* 20(2), 51–64.

Burghes, D., Roddick, M. & Tapson, F. (2001) Tiering at GCSE: is there a fairer system? *Educational Research,* 43(2), 175–187.

Demack, S., Drew, D. & Grimsley, M. (2000) Minding the gap: ethnic, gender and social class differences in attainment at 16, 1988–95, *Race, Ethnicity and Education,* 3(2), 117–143.

Department for Education and Skills (DfES) (2006) *Ethnicity and education.* London: DfES. Available online at: http://publications.teachernet.gov.uk/eOrderingDownload/DFES-0208-2006.pdf (accessed 27 June 2007).

Department of Education and Science (DES) (1985) *Education for all: the report of the Committee of Enquiry into the Education of Children from Ethnic Minority Groups (The Swann report)* (London, HMSO).

Department of Education and Science (DES) (1988) *National Curriculum Task Group on Assessment and Testing: a report* (London, DES).

Desimone, L. (1999) Linking parent involvement with student achievement: do race and income matter? *Journal of Educational Research,* 93(1), 11–30.

Elwood, J. & Murphy, P. (2002) Tests, tiers and achievement: gender and performance at 16 and 14 in England, *European Journal of Education,* 37(4), 395–416.

Ferguson, R. (1998) Can schools narrow the Black–White test score gap? in: C. Jenks & M. Philips (Eds) *The Black–White test score gap* (Washington, DC, Brookings Institution Press).

Fordham, S. & Ogbu, J. (1986) Black students' school success: coping with the burden of 'acting White', *Urban Review,* 18(3), 176–206.

Foster, P., Gomm, R. & Hammersley, M. (1996) *Constructing educational inequality* (London, Falmer Press).

Fryer, R. G. & Levitt, S. D. (2004) Understanding the Black–White test score gap in the first two years of school, *Review of Economics and Statistics,* 86(2), 447–464.

Gillborn, D. (1990) *Race, ethnicity and education: teaching and learning in multi-cultural schools* (London, RoutledgeFalmer).

Gillborn, D. (2008) *Racism and education: coincidence or conspiracy?* (Abingdon, Taylor & Fancis).

Gillborn, D. (2010) The colour of numbers: surveys, statistics and deficit-thinking about race and class, *Journal of Education Policy,* 25(2), 253–276.

Gillborn, D. & Gipps, C. (1996) *Recent research on the achievements of ethnic minority pupils* (London, HMSO).

Gillborn, D. & Youdell, D. (2000) *Rationing education: policy, practice, reform and equity* (Buckingham, Open University Press).

Hallam, S. (2002) *Ability grouping in schools: a literature review* (London, Institute of Education, University of London).
Hallinan, M. (1994) School differences in tracking effects on achievement, *Social Forces,* 72(3), 799–820.
Hallinan, M. (1996) Race effects on student track mobility in high school, *Social Psychology of Education,* 1, 1–24.
Hallinan, M. (2001) Sociological perspectives on Black–White inequalities in American schooling, *Sociology of Education,* 74, 50–70.
Hedges, L. V. & Nowell, A. (1998) Black–White test score convergence since 1965, in: C. Jenks & M. Phillips (Eds) *The Black–White test score gap* (Washington, DC, Brooking Institution Press), 149–181.
Kao, G., Tienda, M. & Schneider, B. (1996) Racial and ethnic variation in academic performance, *Research in Sociology of Education and Socialization,* 11, 263–297.
Kelly, S. (2004) Do increased levels of parental involvement account for social class differences in track placement? *Social Science Research,* 33(4), 626–659.
Kenway, P. & Palmer, G. (2007) *Poverty among ethnic groups: how and why does it differ?* (York, Joseph Rowntree Foundation).
Lleras, C. (2008) Race, racial concentration, and the dynamics of educational inequality across urban and suburban schools, *American Educational Research Journal,* 45(4), 886–912.
Lucas, S. R. & Gamoran, A. (2002) Tracking and the achievement gap, in: J. E. Chubb & T. Loveless (Eds) *Bridging the achievement gap* (Washington, DC, Brookings Institution), 171–198.
Mac an Ghail, M. (1988) *Young, gifted and black* (Buckingham, Open University Press).
McLoyd, V. C. (1998) Socioeconomic disadvantage and child development, *American Psychologist,* 53(2), 185–203.
Modood, T. (2003) Ethnic differentials in educational performance, in: D. Mason (Ed.) *Explaining ethnic differences: changing patterns of disadvantage in Britain* (Bristol, Open Press).
Mortimore, P., Sammons, P., Stoll, L., Lewis, D. & Ecob, R. (1988) *School matters: the junior years* (Wells, Open Books).
Oakes, S. (1985) *Keeping track: how schools structure inequality* (New Haven, CT, Yale University Press).
Parsons, C., Godfrey, R., Annan, G., *et al.* (2005) *Minority ethnic exclusions and the Race Relations (Amendment) Act 2000.* DfES Research Report 616/2005 (London, Department for Education and Skills).
Phillips, M., Brooks-Gunn, J., Duncan, G., Klebanov, P. & Crane, J. (1998) Family background, parenting practices, and the Black–White test score gap, in: C. Jenks & M. Phillips (Eds) *The Black–White test score gap* (Washington, DC, Brookings Institution Press).
Pilkington, A. (1999) Racism in schools and ethnic differentials in educational achievement: a brief comment on a recent debate, *British Journal of Sociology of Education,* 20(3), 411–417.
Qualifications and Curriculum Authority (QCA) (2004) *KS3 assessment and reporting arrangement 2004* (London, QCA).
Rollock, N. (2007) Legitimising black academic failure: deconstructing staff discourses of academic success, appearance and behaviour, *International Studies in Sociology of Education,* 17(3), 275–287.
Sammons, P. (1995) Gender, ethnic and socio-economic differences in attainment and progress: a longitudinal analysis of student achievement over 9 years, *British Educational Research Journal,* 21(4), 465–483.
Scarr, S., Caparulo, B., Bernard, M., *et al.* (1983) Developmental status and school achievements of minority and non-minority children from birth to 18 years in a British Midlands town, *British Journal of Developmental Psychology,* 1, 31–48.
Sewell, T. (1997) *Black masculinity and schooling: how black boys survive modern schooling* (Stoke-on-Trent: Trentham Books).

Simpson, L., Purdham, K., Tajar, A., *et al.* (2006) *Ethnic minority populations and the labour market: an analysis of the 1991 and 2001 census.* Research Report No. 333 (Leeds, Department for Work and Pensions).

Southworth, S. & Mickelson, R. (2007) The interactive effects of race, gender and school composition on college track placement, *Social Forces,* 86(2), 497–524.

Stevenson, D. L., Schiller, K. S. & Schneider, B. (1994) Sequences of opportunities for learning, *Sociology of Education,* 67(3), 184–198.

Strand, S. (1997) Pupil progress during Key Stage 1: a value added analysis of school effects, *British Educational Research Journal,* 23(4), 471–487.

Strand, S. (1999) Ethnic group, sex and economic disadvantage: associations with pupils' educational progress from Baseline to the end of Key Stage 1, *British Educational Research Journal,* 25(2), 179–202.

Strand, S. (2010a) The limits of social class in explaining ethnic gaps in educational attainment, *British Educational Research Journal,* doi:10.1080/01411920903540664.

Strand, S. (2010b) Do some schools narrow the gap? Differential school effectiveness by ethnicity, gender, poverty and prior attainment, *School Effectiveness and School Improvement,* 21(3), 289–314.

Strand, S. & Lindsay, G. (2009) Evidence of ethnic disproportionality in special education in an English population, *Journal of Special Education,* 43(3), 174–190.

Strand, S. & Winston, J. (2008) Eucational aspirations in inner-city schools. *Educational Studies,* 34(4), 249–267.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I. & Taggart, B. (2004) *The effective provision of pre-school education (EPPE) project: final report* (London, Department for Education and Skills).

Thomas, S., Madaus, G., Raczek, A. & Smees, R. (1998) Comparing teacher assessment and standard task results in England: the relationship between student characteristics and attainment, *Assessment in Education,* 5, 213–246.

Tikly, L., Haynes, J., Caballero, C. & Hill, J. (2006) *Evaluating of aiming high: African Caribbean achievement project.* DfES Research Report 801/2006 (London, Department for Education and Skills). Available online at: http://www.dfes.gov.uk/research/data/uploadfiles/RR801.pdf

Wang, J. & Goldschmidt, P. (2003) Importance of middle school mathematics on high school students' mathematics achievement, *Journal of Educational Research,* 97(1), 3–19.

Wright, C. (1987) Black students—White teachers, in: B. Troyna (Ed.) *Racial inequality in education* (London, Tavistock).

Yan, W. & Lin, Q. (2005) Parent involvement and mathematics achievement: contrast across racial and ethnic groups, *Journal of Educational Research,* 99(2), 116–127.

Appendix 1. Definition of explanatory variables derived from LSYPE

Family background

Ethnic group: information on students' ethnic group was collected through self-identification from 16 ethnic categories (plus don't know/refused). The rationale for the LSYPE sampling strategy was to focus on the attainment of the six main minority ethnic groups and White British students, hence ethnic group was collapsed into seven categories plus a generic 'any other group'. The seven categories were White British, Mixed heritage, Indian, Pakistani, Bangladeshi, Black Caribbean and Black African, which together accounted for 96% of all students interviewed.

Socio-economic classification of the home (SEC): the SEC of the head of the household was coded by matching their occupation/size of organisation using the Office of National Statistics eight SEC analytic classes, ranging from higher managerial and professional occupations through to never worked or unemployed for the last six months or more.

Mothers' highest educational qualifications: the highest educational qualification of the student's mother was measured on a six-point scale ranging from degree or above through to no educational qualifications.

Entitlement to a free school meal (FSM): this is a widely used measure of family poverty since only students from families claiming state benefits are eligible for FSM.

Home ownership: a binary indicator of whether the family owned or rented their home. Home ownership provides a measure of socio-economic status in England where many families aspire to own their own home and there is relatively little local authority or social housing.

Family composition: students living in a household with a single adult were contrasted with those living in a household with more than one adult.

Parental attitudes and behaviours

Parents' educational aspirations for the young person: the main parent was asked what they would like their child to do when s/he reached school-leaving age 16. This variable identifies students whose parents wished them to remain in full-time education (FTE) beyond the official school-leaving age of 16 years.

Provision of educational resources: there were two measures: (a) whether the family provided a home computer for the student's use, and (b) whether the family paid for private lessons in subjects that are taught in school as part of the National Curriculum.

Parental involvement in school: the parent interview included questions on parents' involvement in education and school activities. Variables that offered little discrimination were ignored (e.g. 98.2% of parents talked to their children about their reports). Activities that required special knowledge or resources were also excluded

(e.g. help out with teacher assessment, host an exchange student, donations or financial support to the school, employed at school, help with special interest groups like sport or drama). Following this process seven binary outcomes were created (attended a parents' evening in the last 12 months; talked to teacher about the child in the last 12 months; helped out in class; helped elsewhere in the school, e.g. library; helped with fundraising activities,; involved in Parent Teacher Association and acted as school or parent governor. A summary variable was created which recorded parent involved in one, two or three or more activities, contrasted again none.

Parental supervision: a binary indicator of whether the main parent reported they 'always knew where the young person was when s/he was out' or not.

Family discord: the frequency with which parent reported quarrelling with the student, with 'most days' and 'more than once a week' contrasted against 'less than once a week'.

Student risk and protective factors

Special educational needs (SEN): this was a binary variable to identify students who were either at School Action Plus or had a statement for SEN, both of which require the involvement of an external agency, not just school-based identification, contrasted with those with no such identification.

Truancy: a binary indicator of whether the student had truanted at any time in the last 12 months.

Long-term absence: a binary indicator of whether the student had been absent from the school for one month or more in the past 12 months.

Service involvement: a binary indicator of whether the parents reported they had ever been contacted by Social Services or the Educational Welfare Service about the student's behaviour. Also a separate measure of *police involvement* where the parents had been contacted by the police because of something the student had done.

Exclusion from school: a binary indicator of whether the student had been either temporarily or permanently excluded in the last three years on one or more occasions.

Student's educational aspirations: a binary indicator of whether the student intended to remain in full-time education (FTE) after age 16 (the end of compulsory schooling) or not.

Planning for the future: students were asked three questions: 'I don't think much about what I will do in the future', 'I'll just wait and see where I end up' and 'having a job/career is important to me', each measured on a five-point Likert scale. A short scale was created which had low but acceptable internal consistency (Cronbach's alpha = .52). For the purpose of analysis four score bands were used.

Homework: the number of evenings a week on which the young person reported they usually completed homework, ranging from none through to five.

Academic self-concept: a scale measuring academic self-concept was created from seven items, each measured on a five-point Likert scale. The seven items were: I get good marks for my work; how good do you think you are at school work; how good do your teachers think you are at school work; and how good do you think you are at English, mathematics, science and ICT (information and communications technology) respectively. The scores were summed to create a short scale which had good internal consistency (Cronbach's alpha = .73). The scores were divided into four score bands.

Attitude to school: this was measured by nine questions relating to attitudes to school, teachers and lessons, each measured on a five-point Likert scale. Items included questions such as 'I am happy when I am at school', 'I work as hard as I can in school', 'the work I do in lessons is a waste of time'. The scores were summed to create a continuous scale which had good internal consistency (Cronbach's alpha =.84) and for the purpose of analysis coded into quartile bands and contrasted against the least positive band.

School and neighbourhood context

A wide range of school-level variables was tested but only the four variables listed below, plus neighbourhood deprivation, were significantly related to attainment.

Selective status: comprehensive schools do not select by ability and admit the whole ability range. Grammar schools select by ability, taking the higher scoring children from a geographical area based on their scores on a reasoning test at age 11. Secondary modern schools cater for the students in selective areas who are not selected by the grammar schools.

School type: Church schools and Foundation schools were contrasted with community (non-denominational) schools.

School sex: schools were coded as co-educational, single-sex boys or single-sex girls.

School deprivation: the percentage of students in the school entitled to FSM was used as an indicator of the relative deprivation of the school. Schools were placed into six bands ranging from the least deprived (< 5% entitled to FSM) to the most deprived (35% or more entitled to FSM). These bandings are those used by the DCSF in analysis of school performance.

Neighbourhood deprivation: the Income Deprivation Affecting Children Index (IDACI) is produced by central government and measures the proportion of children under the age of 16 in an area living in low-income households. The measure is focused on disadvantage and has a wide base, including families in receipt of income support, job seekers' allowance and working families' tax credit/disabled persons' tax credit (for those below 60% of national median income). The indicator is available

for very localised areas called super output areas (SOA) of which there are 32,000 in England, each containing approximately 1500 people and 200 children (SD = 70). Scores were normalised to a mean of zero and SD of 1 where higher scores indicated greater neighbourhood deprivation.

Appendix 2. Logistic regression model for science tier of entry (age 14)

Table A1. Logistic regression model for science tier of entry (age 14)

Variable	Value	B	SE	OR	
Intercept	Intercept	–2.00	.250		
Ethnic group (base = White British)	Mixed heritage	–.083	.122	.92	
	Indian	.001	.097	1.00	
	Pakistani	–.287	.118	.75	*
	Bangladeshi	.158	.140	1.17	
	Black Caribbean	–.442	.125	.64	***
	Black African	–.112	.125	.89	
	Any other ethnic group	.297	.118	1.35	*
Age 11 score	Age 11 average test marks (normalised)	1.94	.047	6.96	***
Gender	Boy vs. girl	.221	.048	1.25	***
Social class of the home (base = long-term unemployed)	Higher managerial & professional	.390	.129	1.48	**
	Lower managerial & professional	.334	.117	1.40	**
	Intermediate	.219	.130	1.25	
	Small employers & own account	.343	.122	1.41	**
	Lower supervisory & technical	.140	.128	1.15	
	Semi-routine occupations	.143	.121	1.15	
	Routine occupations	.318	.131	1.37	*
	Missing	.203	.117	1.23	
Mother's educational qualifications (base = none)	Degree or equivalent	.365	.096	1.44	***
	Higher ed. below degree level	.126	.079	1.14	
	GCE A level or equivalent	.018	.081	1.02	
	GCSE grades A–C or equivalent	.062	.064	1.06	
	Other qualifications	–.020	.086	.98	
	Missing	–.101	.101	.90	
Parental involvement in school	1–2 activities vs. none	.290	.137	1.34	*
	3+ activities vs. none	.495	.151	1.64	**
	Missing	1.015	.827	2.76	

Table A1. (*Continued*)

Variable	Value	B	SE	OR	
Parental aspiration	Want student to continue in FTE post 16	.170	.061	1.19	**
	Missing	–.906	.615	.40	
Parental supervision	Always knows where child is when out	.199	.059	1.22	**
	Missing	.337	.680	1.40	
Truancy	Truanted sometime in last 12 months	–.236	.063	.79	***
	Missing	–.031	.111	.97	
Police	Student behaviour led to police involvement	–.462	.106	.63	***
	Missing	–.452	.451	.64	
Exclusion	One or more exclusions from school	–.318	.089	.73	***
	Missing	.529	.464	1.70	
Student aspirations	Continue in FTE after age 16 (vs. leave)	.356	.060	1.43	***
Homework—evenings per week (base = none)	1 evening per week	–.036	.143	.97	
	2 evenings per week	.011	.143	1.01	
	3 evenings per week	.067	.141	1.07	
	4 evenings per week	.258	.151	1.30	
	5 evenings per week	.322	.152	1.38	*
	Missing	–.090	.160	.91	
Academic self-concept (base = very low)	Very high	1.017	.093	2.76	***
	High	.593	.084	1.81	***
	Low	.261	.078	1.30	**
	Missing	.334	.111	1.40	**
School deprivation (base = < 5%)	35%+ entitled FSM	–.259	.143	.77	
	21–35% entitled FSM	–.505	.164	.60	**
	13–21% entitled FSM	–.240	.156	.79	
	9–13% entitled FSM	–.193	.159	.83	
	5–9% entitled FSM	–.155	.140	.86	
Neighborhood deprivation	IDACI (normalised)	–.091	.032	.91	**

Notes: Nagelkerke pseudo R^2 = 57.2%.*$p < .05$;**$p < .01$;***$p < .001$. FTE = full-time equivalent; FSM = free school meals. For a full description of all the variables see Strand, 2010a.

Appendix 3. Proportional odds model for mathematics tier of entry (age 14)

Table A2. Proportional odds model for mathematics tier of entry (age 14)

Variable	Parameter	B	SE	OR	
Threshold	Tier 6–8	−1.45	0.18	–	
	Tier 5–7	2.08	0.18	–	
	Tier 4–6	5.32	0.19	–	
Ethnic group (base = White British)	Mixed heritage	0.20	0.10	1.22	*
	Indian	0.35	0.09	1.42	***
	Pakistani	0.12	0.10	1.12	
	Bangladeshi	0.20	0.11	1.22	
	Black Caribbean	−0.44	0.12	0.65	***
	Black African	0.18	0.11	1.19	
	Any other ethnic group	0.41	0.11	1.50	***
Age 11 test	Age 11 maths test score (normalised)	2.87	0.04	17.6	***
Gender	Boy vs. girl	0.19	0.04	1.21	***
Social class of the home (base = long-term unemployed)	Higher managerial & professional	0.47	0.11	1.60	***
	Lower managerial & professional	0.35	0.10	1.42	***
	Intermediate	0.30	0.11	1.35	**
	Small employers & own account	0.33	0.11	1.40	**
	Lower supervisory & technical	0.13	0.11	1.14	
	Semi-routine	0.21	0.11	1.23	
	Routine	−0.02	0.11	0.98	
	Missing	0.20	0.10	1.22	
Mother's educational qualifications (base = none)	Degree or equivalent	0.54	0.07	1.72	***
	HE below degree level	0.26	0.07	1.30	***
	GCE 'A' level or equivalent	0.25	0.07	1.28	***
	GCSE grades A-C or equivalent	0.17	0.05	1.18	**
	Other qualifications	0.21	0.07	1.23	**
	Missing	−0.02	0.08	0.98	
Parental aspirations	Want student to continue in FTE post 16	0.31	0.05	1.36	***
	Missing	−0.29	0.43	0.75	
Parental supervision	Always knows where child is when out	0.16	0.05	1.18	**
	Missing	0.83	0.47	2.29	
Computer	Household has home computer	0.22	0.06	1.24	***
	Missing	0.16	0.42	1.18	

Table A2. (*Continued*)

Variable	Parameter	B	SE	OR	
Private tuition	Yes (vs. no)	0.17	0.05	1.18	***
	Missing	0.54	0.41	1.71	
Special educational needs	SAP or statemented (vs. no)	–0.70	0.09	0.50	***
	Missing	–0.15	0.48	0.86	
Police	Behavior led to involvement of police	–0.37	0.07	0.69	***
	Missing	–0.14	0.27	0.87	
Exclusion	One or more exclusion from school (vs. none)	–0.38	0.07	0.69	***
	Missing	0.11	0.29	1.12	
Student's aspiration	Continue in FTE post 16 (vs. leave at 16)	0.22	0.05	1.24	***
Homework—evenings per week (base = none)	1 evening per week	–0.09	0.11	0.91	
	2 evenings per week	0.05	0.10	1.05	
	3 evenings per week	0.19	0.10	1.21	
	4 evenings per week	0.42	0.11	1.53	***
	5 evenings per week	0.38	0.11	1.47	***
	missing	–0.16	0.12	0.85	
Academic self-concept (base = very low)	ASC very high	1.18	0.07	3.26	***
	ASC high	0.72	0.07	2.06	***
	ASC low	0.35	0.06	1.41	***
	missing	0.37	0.09	1.45	***
School deprivation (base = less than 5%)	35%+ entitled FSM	–0.64	0.12	0.53	***
	21–35% entitled FSM	–0.65	0.12	0.52	***
	13–21% entitled FSM	–0.56	0.11	0.57	***
	9–13% entitled FSM	–0.47	0.11	0.62	***
	5–9% entitled FSM	–0.25	0.11	0.78	*
Neighborhood deprivation	IDACI (normalised)	–0.07	0.03	0.93	**

Notes: Nagelkerke pseudo R^2 = 75.0%.*$p < .05$;**$p < .01$;***$p < .001$.
HE = higher education; FTE = full-time equivalent; SAP = School Action Plus; FSM = free school meals; IDACI = Income Deprivation Affecting Children Index.
For a full description of all variables see Strand, 2010a.