A quasi-experiment study investigating the impact of Aimhigher summer school and mentoring programmes on disadvantaged pupils' HE knowledge, attitudes, expectations, academic confidence, motivations, and HE entry rates.

by

MATTHEW STEWART HORTON

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College of Social Sciences

University of Birmingham

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Abstract

Over the past two decades successive governments within England have made concerted efforts to reduce inequalities in higher education (HE) participation. This has been supported by HE widening participation (WP) programmes, targeted at disadvantaged pupils. Despite hundreds of millions of pounds (£) of investment, limited evidence on programme effectiveness has emerged, due to a lack of experimental design. This research aimed to address these limitations through the employment of a quasi-experimental design. The research investigated if Aimhigher mentoring, and summer schools improved disadvantaged pupils' AABs (HE knowledge, attitudes, expectations, and academic motivations); likelihood of entering HE; and if pupil AABs mediated HE entry behaviours.

The research compared outcomes of pupils (year groups 9-13) allocated to a treatment and non-treatment groups (n 4700). Pupil controls (attainment and SES) and outcomes (HE entry) were accessed via the national pupil database. Surveys were employed to measure changes in pupils' AABs (n 1,275). Both summer schools and higher levels of engagement in mentoring (above 10 sessions) significantly increased pupils' likelihood of entering HE by up to 115% and 54% respectively. Many pupils' benefited from the interventions, although pupils with SEND and those of a Black and Mixed ethnicity did not benefit in terms of their likelihood of entering HE. Higher levels of engagement (above 10 sessions) in mentoring significantly improved pupils' HE knowledge but had little impact on improving other AABs. Summer schools improved HE knowledge and attitudes for some pupils', although it is likely this analysis was underpowered. Few significant improvements were observed for HE expectations and none for academic motivations. HE knowledge, expectations, attitudes, and academic motivations were found to be stratified by pupil background and were strong mediators of pupils' HE entry behaviours. All survey measures were found to have test-retest reliability.

All results are indicative, as there were differences in the comparability of the treatment and non-treatment groups. However, dosage and heterogeneity effects provided more robust evidence of an Aimhigher effect. Findings have important practical and policy implications for the design, delivery, targeting, and evaluation of programmes. Aimhigher programme effectiveness can be supported through; a stronger focus on improving pupils' HE expectations, attitudes, and academic motivation; increasing engagement levels within mentoring (above 10 sessions), and ensuring all pupils benefit regardless of background. It would be fruitful for future research to investigate dosage effects and heterogeneity, as significant effects are unlikely to be visible without such analysis. Quasi-experiments are more suited (than RCTs) to measure the impact of pupils' engagement within multi-intervention programmes. WP experimental research could be improved via better access to the NPD (matched comparison groups). This would improve the comparability samples, provide a better understanding of 'what works' and support faster progress in reducing inequalities in HE participation.

Acknowledgements

Completing this PhD has been very familiar to me. I grew up in a poor household. I failed all the way through school, was placed in special classes, and truanted through most of my secondary education. When I did attend school, I was in trouble or suspended. I was not stupid. I was from a working-class background with working-class friends. We were not remotely interested in education. Looking back, we were just 'learning to labour'. However, at a key point in my life, just before my GCSEs I was thrown out of home at 15 (deservedly). This ended up being a blessing in disguise. I moved in with my grandparents Helen and George Horton. They instilled in me the importance of education and motivated me to better my life. My dad (Stuart) sat me down a few months before my final GCSE exams and posed a question to me 'are you going to do some revision and retake at college or spend the rest of your life stacking shelves'. I can still clearly remember this short conversation today (which is now 32 years ago). Thank you to my brother for persuading the school not to expel me before my final GCSE exams [I set fire to the art cupboard, but to be fair I had been locked in there]. I scraped through my GCSEs (fell asleep in a few) and obtained a 'C' and two 'D' grades to get into Redditch College of Knowledge [also known as the last chance saloon]. Thank you to my college lecturers that inspired me (Celia Brown and Aiden Kelly) and those that inspired me more by saying that I would end up as a bin man. Whilst at college my tutor suggested that I should take the Cambridge and Oxford entrance exams. I outwardly rejected this as a) I was not that intelligent, b) I was not paying £60 to take their entrance exam c) I would not pass the interview and d) I would not fit in. I have no regrets. I later progressed to Swansea University (where I met my wife), then the OU (M.A.), and finally here today at UoB completing this thesis. Thank you to my tutors whose wealth of expertise and knowledge have supported me through this process; Peter Davies, Tian Qiu, Tracy Whatmore, Claire Crawford, and Tom Perry. [I know that is a lot of tutors, but to be fair I started this thesis in 2012]. Thank you to my mom for teaching me not to be a sheep or follow the crowd. And finally, to my wife (Ellie) and children (Sky and Iona) for putting up with me opting out of so many things over the past few years [as I needed to complete my PhD]. Without these people in my life, the support and motivation they have provided I would not have ended up where I am today [3.00 a.m. sitting on the sofa, with a dent in it from completing this PhD]. They will be happy to know this is now complete as I add the last full stop.

Table of Contents

Chapter 4b: The Study

Chapter 5: Research Methodology 130

Chapter 6: Findings and Analysis

List of Tables

List of Figures

List of Appendices

Chapter 1: Introduction

1.1: Introduction

Over recent decades successive governments have attempted to reduce social inequalities with a particular emphasis on closing gaps in school attainment and Higher Education (HE) participation between advantaged and disadvantaged groups. Inequalities in HE participation are often addressed through university widening participation (WP) and access programmes. This study evaluates the impact of the Aimhigher West Midlands WP programme. The programme consists of summer schools and a mentoring scheme delivered to disadvantaged pupils in secondary schools. The programme aims to support the government's goals to close the gap in HE participation between disadvantaged young people and their more advantaged peers. To support this goal the programme aims to improve pupils' knowledge and understanding of HE pathways, expectations, and intentions to progress to HE, positive attitudes to HE, academic motivations, and confidence in their academic ability (AABs). The evidence of the effectiveness of WP interventions is limited. The introductory chapter provides an overview of educational inequalities, why they are important to address, what theory and research suggest are the causal mechanisms, and how government policies and funding within schools and HE have attempted to address these inequalities. This is followed by an overview of the study and how it aimed to address limitations and gaps within the evidence via the employment of a quasi-experimental design. The section ends with a positionality statement and an outline of the structure and content of the thesis.

1.1.1 Introduction to the Focus Area and Justification for the Research

The UK is ranked as one of the top ten largest economies in the world (International Monetary Fund, 2020). Despite this, with respect to income, it is the fifth most unequal European Country (The Institute for Public Policy Research, 2018). Furthermore, evidence suggests that economic and social inequalities are increasing with over twenty per cent of the UK population living in poverty (Joseph Rowntree Foundation, 2018). Within the field of sociology, social inequality refers to the unequal distribution of opportunities or outcomes within society. These are often stratified by ethnicity, gender, disability, and class status. The

Sociologist Max Weber (1946) linked such inequalities to the stratification of social classes, wealth, and status where the higher classes maintain their prestige and privileges. These inequalities can lead to differences in income, wealth, health and access to education, education outcomes and employment prospects.

Within the UK there are persistent class-based inequalities in educational qualifications obtained in compulsory and post-16 education, including HE (Department for Education, DfE, 2009-2020, University and College and Admissions Service, UCAS, 2019 Office for Students, OfS, 2020). Therefore, improving education outcomes in school and increasing participation within HE may help to eradicate these inequalities. Current HE policy within England (Department for Business, Innovation and Skills, DBIS, 2016) emphasises the economic value (human capital) and social justice benefits of participating in HE. This focus is based on the premise that a degree provides graduates with greater opportunities within the labour market, including a graduate premium in salaries obtained (Walker and Zhu, 2011; Tomlinson, 2018). A recent DfE (2022) analysis outlines that 86.7% of working-age graduates (aged 16-64 years) were in employment compared to 70.2% of working-age non-graduates. Graduates were much more likely to be in highly skilled employment with a median salary of £36,000 compared to £26,000 for non-graduates. Other evidence suggests that obtaining a degree can increase a person's net income by £120,000 over their lifetime (Price Waterhouse Coopers, 2007). (DBIS (2011) report that this is £108,000 once tuition fees costs and lost earnings are taken-into account. Increasing HE participation also provides other wider societal benefits by increasing human capital and the types of knowledge and skills for economic growth and a competitive global economy (Walker and Zhu, 2013; Bowl, McCaig and Hughes, 2018). The Sutton Trust (2010, p.25) provide evidence to suggest 'that improving the educational achievements of children from the most disadvantaged homes would contribute between £56 billion and £140 billion to the value of the UK economy each year by 2050, through … increased lifetime earnings and savings in the areas like health, crime and welfare.'

Since the early 1960s, there has been a significant increase in the proportions of the UK population entering HE from 6% of 18–30-year-olds to 50.2% of 17–30-year-olds in 2017/18 (Committee on Higher Education, 1963; DfE, 2019). However, the benefits of HE are not equally distributed as within England there are persistent differences in HE participation between different socio-economic and demographic groups (DfE, 2019; OfS, 2020; UCAS, 2019). Lower HE participation rates have been reported for pupils characterised by a special educational need (SEN), in care status, those eligible for free school meals (FSM), males, those who speak English as a first language or are from a White ethnic group (particularly those from a Gypsy, Roma or Traveller background), and those living within disadvantaged neighbourhoods (DfE, 2020 and UCAS, 2020).

These inequalities are magnified in HE entry rates into more prestigious universities such as those often referred to as Oxbridge (Cambridge and Oxford universities), research-intensive universities, selective universities, and the Russell Group universities (Harris, 2010). Such institutions recruit pupils with higher Key stage 4 (GSCE or equivalent) and Key stage 5 (A level or equivalent) grade tariffs. Disadvantaged young people are just over four times less likely to enter HE than their more advantaged peers, and twelve times less likely to attend a selective university, although this gap has closed over the past 14 years (UCAS, 2020). The lower participation of low-income students in selective institutions leads to wasted talent, lower earnings (Britton, Dearden, Shepard *et al*., 2019) and in turn hinders social mobility (Sutton Trust, 2004). This is because degrees from selective universities are valued more by employers. Evidence also suggests there are wage differentials in terms of the subject studied (Walker and Zhu, 2011, 2013; Chowdry *et al*., 2013). Britton *et al*., (2019) analysis of tax and student loans data found that graduates from higher-income families on average earned 20% more than those from lower-income families. They also found that earnings varied by institution (prominent London universities) and subject studied (medicine, economics, law, business, engineering, technology, and computer science).

Adnett (2016) argues that as the benefits of HE seems to be based on the status of the institution attended, there is a need to increase fair access to the most prestigious HE providers. However, other evidence suggests that a higher graduate wage premium may also be associated to that more advantaged graduates have better cognitive skills (Kassenboehmer, Leungand Schurer, 2018), are less likely to drop out of their studies and graduate with higher grades (Crawford *et al*., 2016). Private schooling may also increase their social capital and networks to secure higher-paid employment (see Britton *et al*., 2019). The evidence presented suggests that the benefits of HE are not solely determined by participating or not participating, but more so by the course studied and institution attended.

This has profound implications for the widening participation agenda and in supporting students to make an informed choice.

Over the past few decades, improved HE participation rates (across all forms of HE) for most disadvantaged groups may have been due to several government policies. These include 'Pupil Premium' (DfE, 2022), raising the progression age (DfE, 2013) and an increased drive, funding and targets set by the regulator (the OfS and its predecessors), for HE providers to widen access and participation. However, Harris (2010, p.14) points out that 'despite the very significant progress that has been made, there is still much more to be done in making access to HE more equitable for all groups in society'. The recent Covid-19 Pandemic may have had a negative impact on disadvantaged pupils' attainment due to school closures (Education Endowment Foundation, 2020: Education Policy Institute, 2020) which may lead to fewer pupils' obtaining the required grades to progress to HE.

1.1.2 Introduction to Inequalities in HE Participation

A wealth of evidence suggests that attainment is the main determinant for socio-economic inequalities in HE participation and that improving attainment is the best way to reduce or even eradicate these inequalities (Gorard, See and Davies, 2012). As participation in HE is predicated on a relatively good level of attainment at Key Stage 4 (KS4) and level 3 (KS5, A-level or equivalent), certain groups within the UK are more likely to be underrepresented in HE. Inequalities in attainment at age 16 tend to be replicated in the patterns of HE progression rates (Haveman and Wolfe, 1995; Gayle, Berridge and Davies, 2002; Carneiro and Heckman, 2002 and 2003; Blanden and Gregg, 2004; Meghir and Palme, 2005; DfE, 2009/2020; Goodman and Gregg, 2010; Gorard 2012; Chowdry 2013; Bowes *et al.,* 2015).

It has been suggested that other underlying factors may also play an important role in shaping advantaged and disadvantaged pupils' educational trajectories. These inequalities are often described by sociological theories as being caused by several factors including cultural (Bourdieu, 1984), social (Coleman, 1988), economic and human capital (Becker, 1964) leading to disparities in levels of scholastic achievement between more and less affluent groups within society. Class and family-based inequalities may be persistently reproduced from one generation to another, limiting social mobility (Bourdieu, 1984). Other sociological theories suggest that social identity may lead to disparities in educational outcomes between the classes (Tajfel and Turner, 1979). Psychological theory outlines that self-efficacy may also play an important role (Bandura, 1977). Research within the field of education has operationalised these theoretical concepts as relating to pupil and parent attitudes, expectations, and behaviours (often referred to as AABs, see Gorard, See and Davies, 2012). Evidence suggests that such factors are associated with school achievement, participation in HE and are stratified by socio-economic and demographic characteristics (DCSF, 2009; Goodman *et al.*, 2010; Dumais and Ward, 2010). More recently research has outlined the importance of knowledge of HE in informing decisions on whether to apply (Davies and Qiu, 2012).

1.1.3 Policies and Initiatives Aiming to Address Inequalities

As educational outcomes are linked to social mobility, addressing potential inequalities should create a more equitable and fairer society. It is suggested that addressing such factors (outlined above) through intervention could help to close the gap between the social classes in terms of attainment and HE participation (Jencks, 1979; Bowles and Gintis, 2002; Farkas, 2003; Heckman, Jora, and Sergio, 2006; Lleras, 2008; Davies and Qiu, 2012). Over the past few decades, successive UK governments have attempted to address inequalities through policies, funding, and initiatives focusing on improving educational outcomes for disadvantaged young people. Government policies and regulations set by the OfS have attempted to close the gap in HE participation rates between young people from disadvantaged and advantaged backgrounds. This has also been supported by school-based policies such as 'Pupil Premium' and raising the progression age; HE student finance arrangements; and university responses, such as contextual admissions, scholarships, bursaries, fee waivers and fair access and WP programmes. The later are underpinned by statutory obligations (Access and Participation Plans) regulated by the OfS.

Widening participation programmes are primarily delivered through HE outreach teams and third sector providers. These programmes vary in terms of scale and scope but encompass activities targeted towards pupils, including summer schools, mentoring programmes, information, advice and guidance, campus visits, subject-specific masterclasses and in some cases, attainment-raising interventions. Programmes tend to focus on raising pupils' knowledge of HE, improving attitudes, addressing misconceptions of HE and raising expectations / aspirations to progress to HE (McCaig, Stevens and Bowers-Brown, 2006). Programmes can also involve engagement with school staff and in some cases support for parents / carers.

Despite significant amounts of funding (£887.7 million in 2016/17, OfS, 2018) allocated to these programmes, there is a notable lack of robust causal experimental evidence in terms of 'what works.' In particular, there is little evidence of the effectiveness of high-cost and resource-intensive activities, such as summer school and mentoring programmes, which are delivered widely across the sector. The evaluation evidence that has been published is often criticised for lacking rigour due to poor methodology, sampling bias, a lack of controls and comparison groups that include non-participants (Gorard and Smith, 2007; Gorard *et al.,* 2006; Younger *et al.,* 2011; Gorard, See and Davies, 2012; Education Policy Institute, 2020; Robinson and Salvestrini, 2020).

More recently there has been a significant drive by the OfS (2019) to improve the standards and strength of evidence for WP programmes. This drive is supported by the OfS and the Centre for Transforming Access and Student Outcomes in Higher Education (TASO) both of which have supported HEIs to improve evaluation practice with a focus on the employment of experimental methods. It is of paramount importance that the sector improves this evidence base, to establish which interventions are most effective in reducing gaps in HE participation. A review of research evidence into the effectiveness of WP interventions is critiqued in Chapter 3.

The research undertaken evaluates the impact of the Aimhigher West Midlands programme on improving pupils' AABs and HE entry outcomes. Pupils were tracked via the National Pupil Database (NPD) to obtain data on their background characteristics and whether or not they entered HE. Baseline and follow-up surveys were completed with a sub-sample of pupils to measure changes in AABs. The research presented in this thesis aims to address many of the limitations of previous research via the employment of a quasi-experiment approach, a comparison group and controls for important factors that influence pupils' educational trajectories.

The research undertaken provides a significant contribution to the literature by investigating issues that remain largely unexplored for the cohorts targeted by WP programmes (pupils with good attainment). This included investigating whether a) frequency of engagement in mentoring was associated with pupil outcomes, b) whether there was heterogeneity in their treatment (e.g., did some pupils' benefit more from treatment than others) and most importantly c) were AABs valid predictors of pupils' likelihood of entering HE d) and how reliable were Aimhigher AAB survey measures. Further, the study focused on the impact of Aimhigher interventions on pupils in year groups 9-13. Many previous studies have focussed on students completing level 3 courses (A level or equivalent), where there are only small differences in HE participation between disadvantaged and advantaged SES groups (Gorard, 2018). The research presented in this thesis has important implications for WP policy, practice, and future research. The research undertaken primarily focuses on widening participation, rather than fair access initiatives. The rationale for this focus is that the Aimhigher programme objective is to widen pupils' participation into all types of HE and not just selective institutions.

1.1.4 Positionality Statement

Within this section, I consider my positionality and how my ontological and epistemological assumptions have influenced the research process. Positionality refers to an individual's view of the world and the political and social standpoint adopted in the research (Savin-Baden and Major, 2013). Schraw (2012) outlines that ontological (the nature of reality and being) and epistemological (the origin and of knowledge) beliefs are influenced by a researcher's values and beliefs (e.g., political, religious, gender, ethnicity, race, social class, time, and place). Smith (1999) outlines that the positionality of research influences the research process in terms of research questions, data collection and interpretation of findings of their own and others' research. My positionality has influenced my understanding, acceptance, and critique of the validity of published research and my research design. The review of existing literature and research focused on the impact of educational interventions, highlighted the most apt, valid, and reliable measure of impact being via experimental approaches and the collection and analysis of quantitative data.

Weiner and Sarab (2012) outlined the researcher's position and background in terms of whether they are insider or outsider to the culture being studied, which influences the research process. Within my research, this has taken two dimensions relating to social class and work context which have changed over time. Firstly, I come from a working-class household, struggled at school, and eventually managed to attend university. Therefore, I have a first-hand understanding of the culture and lived experiences of disadvantaged young people and the barriers that impact their educational trajectories. However, over time I have become an outsider as my professional roles have meant my lifestyle has become middle-class. The other insider and outsider dimension that is of relevance to the research presented in this thesis is my work situation. I was employed by the Aimhigher programme for 10 years as the Research Manager. Therefore, this thesis is based on the interventions coordinated and delivered by the colleagues I worked with. This approach could be criticised for lack of independence and potential bias, as colleagues were required to demonstrate that the interventions they delivered were effective and impactful. However, I have upheld my academic integrity by avoiding conscious bias in the interpretation of findings. I have taken a pragmatic and neutral approach to the research process as lessons can only be learned in terms of programme effectiveness and improvements if objective research is conducted. My objective position is reflected in the analysis, discussion, and conclusion chapters, which provide a critical consideration of findings in terms of missing data and the comparability of samples. More recently I have left the Aimhigher programme and now work at another university not associated with the programme. This has shifted my lens to an outsider. However, as Carr (2010) argues social or educational research is never value-free.

1.1.5 Structure of the Thesis

The thesis has been structured into the following chapters as outlined in the table below.

Table 1a: Chapter Structure and Content Summary

Chapter 2: Background and Context: Widening Participation in HE
The second chapter outlines changes to government policies, initiatives, and funding within secondary schools, HE and their impact on WP. This was followed by a discussion of how policies may have impacted on inequalities in educational outcomes between advantaged and disadvantaged pupils.

Chapter 3: Literature Review

This chapter outlines the key sociological and psychological explanations of class-based inequalities in educational outcomes. The chapter considers other factors that may also lead to SES educational inequalities (beyond pupil characteristics and attainment), with a focus on cognitive and non-cognitive factors such as parent education, parent/child HE aspirations/expectations, HE attitudes, HE knowledge, confidence in academic ability and academic motivations (AABs). The chapter reviews evidence to understand if these factors can provide a plausible explanation for inequalities in educational outcomes. The last section of this chapter provides a review of WP programmes and how they have conceptualised theoretical concepts within programme design, in an attempt to improve pupil attainment, AABs and HE participation outcomes. The chapter concludes with a review of WP evaluation and research findings. This includes a consideration of the strengths, limitations, and gaps in published evidence in terms of improving pupil outcomes.

Chapter 4a: **A Review of National Datasets and Indicators: Inequalities in School Attainment and HE Progression**

This chapter provides a review of administrative datasets (such as DfE, NPD, HESA and UCAS) to understand how inequalities in school attainment and HE participation in England and the UK are stratified by pupil characteristics (demographic, socio-economic and family background) and the types of school attended. This includes a review of the validity and reliability of various indicators of disadvantage employed widely across schools and WP programmes.

Chapter 4b: The Study

This chapter provides an overview of the Aimhigher West Midlands programme, the focus of the research in this thesis. This includes an outline of the objectives of the programme, interventions delivered and how pupils were targeted. This is followed by an overview of how both theory and research from the literature informed the study design and conceptual framework underpinned by a Theory of Change. The chapter concludes with an overview of the study's aims, the gaps in evidence addressed and how it intended to contribute to WP policy and practice.

Chapter 5: Research Methodology

This chapter provides an outline of the study's quasi-experimental design that involved tracking pupil outcomes (HE) via the NPD and baseline and follow-up surveys to measure pupil AABs. The chapter considers how the design of the research undertaken improved on previous WP research, through the employment of a comparison group, important controls (pupil attainment, SES, and school characteristics), mediators (AABs) and an analysis that considered both dosage effect and heterogeneity. The key research questions are outlined which focused on whether Aimhigher interventions improved pupils' AABs, likelihood of entering HE and if AABs played an important mediating role in terms of pupils' HE trajectories. This chapter also outlines the ethical considerations of the study, how the control and outcomes variables were operationalised, measured, and coded. The reminder of the chapter reviews how schools were recruited to the study and their characteristics, and the sample recruited. The methods chapter closes with an overview of the analysis plan in terms of how data was prepared, and the descriptive and inferential statistics employed including both logistic and linear regression.

Chapter 6: Findings and Analysis

The seven research questions are organised into three analysis sections within the chapter. The three analyses investigated if pupils' engagement within Aimhigher was associated with an increased likelihood of entering HE (analysis 1); improved AABs (analysis 3); and if improved AABs played a mediating role in increasing pupils' likelihood of entering HE (analysis 2). The latter analysis also investigates the validity and reliability of Aimhigher AAB survey measures. Each analysis investigates the extent of missing data and how well matched the treatment and non-treatment groups were in terms of pupil characteristics. This is followed by a regression analysis consisting of a raw model (treatment types and outcome), a controlled model (treatment types and pupil controls, including AABs for analyses 2 and 3) and an analysis investigating treatment effect heterogeneity (analyses 1 and 3). Analysis 2 investigates how well ABBs could explain differences in HE participation when compared to commonly employed controls (e.g., pupil attainment and SES). Each analysis considers how findings relate to previous research and the practical and policy implications for the Aimhigher programme and wider sector.

Chapter 7: Discussion

This chapter provides a detailed discussion of the results in terms of the extent to which engagement within the programme was significantly associated with improvements in pupil outcomes. This includes a discussion in terms of which interventions were most effective if frequency (dosage) of engagement made a difference and which pupils benefited the most or least. This chapter carefully considers the reliability and validity of reported findings and whether they either substantiate or challenge previous research and theory. The chapter considers the contributions of the research undertaken in terms of the practical and policy implications for the Aimhigher programme and the wider WP sector. This includes the implications of findings in terms of programme design, targeting and future research.

Chapter 8: Summary and Conclusions

The final chapter summarises the wider implications of the findings on local and national policy and practical aspects of the programme delivery (design and targeting) and evaluation of WP programmes. The conclusion reviews the extent to which the study design was robust, its limitations and strengths and the extent to which the experimental approach could be more widely applied across the WP sector. The chapter outlines how the research approach in this thesis has been disseminated across the WP sector and improved evaluation practice. Finally, the chapter closes with a consideration of the gaps within the study and how future research could address these.

Chapter 2: Background and Context: Widening Participation in HE

2.1 Introduction

This chapter provides an overview of how government, school and HE policies have attempted to address inequalities in attainment, and HE participation between advantaged and disadvantaged pupils. This is followed by a consideration of how recent changes to secondary school and HE policy in England and the UK may have impacted on educational inequalities.

2.1.1 Higher Education Policy and Funding

From the 1980s universities experienced significant reductions in government funding per student (Deem, Hillyard and Reed, 2008), whilst the number of students entering HE increased. Up until the late 1990s HE undergraduates in the UK paid no tuition fees. The Dearing Report (1997) proposed changes in funding arrangements to support the sustainability of universities to allow for continued expansion and improvement. In 1997, the New Labour administration came into power in the UK and began to shift the costs of university undergraduate courses from the taxpayer to students. In 1998 tuition fees were introduced in England (Commons Library Briefing, 2018) and have increased up to the present day. In 1998 the government introduced means-tested tuition fees of £1,000 per academic year, which were paid upfront by all students with the exception of those from low-income households (Commons Library Briefing, 2018). In 1999, the labour Government set a target for HE participation to increase from 39% to 50% of 18–30-year-olds by 2010 (DfES, 2003). Further, developments in the Higher Education Act (2004) lead to tuition fees increasing to a maximum of £3,000 per year in 2006/2007. In 2010 the government commissioned the Independent Review of Higher Education Funding and Student Finance chaired by John Browne (the 'Browne Review'). This led to further reforms to HE for English students outlined within the government White Paper 'Students at the Heart of the System' (DBIS, 2011). The reforms led to a significant increase in tuition fees from £3000 in 2006 to £9,000 in 2012 (House of Commons, 2018) and to £9,250 per year from 2017 to 2022 (House of

Commons, 2021). Financial safeguards were put in place where no upfront costs were charged to students (Browne Review, 2010). These included tuition fee loans, non-repayable maintenance grants for accommodation and living costs for low-income households and maintenance loans for full-time undergraduates, which were higher for low-income households (Browne Review, 2010). Since 2007 tuition fees were no longer means tested and repayments could be made after graduation once a minimum income threshold was met (£25,000 in 2017). The financial safeguards and funding for WP and access programmes were put in place to help to ensure that students from lower-income backgrounds were not discouraged from entering HE. Income contingent loans are important as disadvantaged students are more likely to face capital market constraints. In 2013, the government announced that the cap on students' numbers would be dropped, allowing universities to expand their international and national recruitment markets (Higher Education Policy Institute, 2014). This opened-up universities to new cohorts of pupils' including those from more disadvantaged backgrounds who may have previously struggled to access HE, due to their lower grades. The Governments response to the Augar review (2018) should provide further recommendations for post-18 education, including tuition fee rates and obligations in terms of WP.

2.1.2 Widening Participation and Fair Access

Widening participation and fair access programmes have been developed in response to the introduction of increased tuition fees and statutory HE regulations. Over the past three decades, a number of organisations have regulated this work including the OfS, the Office for Fair Access (OFFA) and the Higher Education Funding Council (HEFCE). Widening participation and fair access initiatives are delivered by HE outreach teams and third sector providers in collaboration with schools and colleges.

Within England, HEIs are differentiated in terms of selective research institutions (e.g., pre-1992; the Russel Group) and non-selective (post-1992) institutions. McCaig (2015) outlines that selective elite institutions are perceived as providing value, quality, and prestige (vertical differentiation). This is evident with league tables (QS World University Ranking and the Times Higher Education – THE ranking) and places selective universities at the top and lower tariff universities at the bottom. Whereas horizontal differentiation refers to the different types of HE discipline; by learning mode (full-time and part-time) and relevance to labour markets (McCaig 2015). Within the English HE system Government policy (DBIS 2015 and DBIS, 2016) and increased marketisation since the early 1990s have led to differing approaches to widening participation and fair access to HE (McCaig and Adnett, 2010; McCaig 2018). Research-intensive elite universities tend to support fair access by selecting the highest qualified applicants, which tends to exclude most disadvantaged students. As outlined in chapter 1, it is widely reported that disadvantaged young people are even more under-represented in selective/Russell group universities (Harris, 2010; Boliver, 2013). Non-selective institutions focus more on widening participation into HE via local recruitment often with lower entry requirements with courses that attract under-represented groups (McCaig and Adnett, 2010).

HEFCE (2008) outline that WP programmes aim to address 'the large discrepancies in the take-up of HE opportunities between different social groups … by delivering activities and programmes that focus on raising aspirations, knowledge of HE and addressing other factors that may serve as barriers (e.g. misconceptions of HE costs and benefits) and often to a lesser extent educational attainment (although this is often the focus of fair access programmes) among people from under-represented communities to prepare them for higher education'. It is suggested that addressing such factors through intervention could help to close the gap between advantaged and disadvantaged groups in terms of attainment and HE entry (Jencks, 1979; Bowles and Gintis, 2002; Farkas, 2003; Heckman, Jora and Sergio, 2006; Lleras, 2008; Davies, Qiu and Davies, 2014). The following section provides an understanding of the regulation and policy that has moulded WP and fair access over the past two decades.

In 2004, the Office for Fair Access (OFFA) was established and by 2006 HE providers charging higher tuition fee rates were required to submit Access Agreements. The plans outlined how HE providers would improve access and success of disadvantaged students through outreach activity, financial support and more widely in terms of student success whilst at university. Alongside these Access Agreements, from 2009 institutions were also required to submit to HEFCE a Widening Participation Strategic Assessment (WPSA) and annual reports on their WP activity and expenditure. In 2010, the Browne Review recommended that sustaining or raising tuition fees should be dependent on measurable improvements to the quality, access and student experience. The recommendations were adopted and made policy by the Coalition government.

From 2012, the OfS (formerly OFFA) set out statutory obligations requiring universities charging above the basic full-time fee level (£6,000 per year) to develop an Access Agreement, consisting of locally set milestones and targets across access (success and progression) to ensure that disadvantaged students were not deterred from entering HE due to the new fees' regime. In 2016, the government set out new social mobility goals, to double the proportion of young people from underrepresented groups entering HE by 2020 (compared to 2009 entry rates) and to increase the number of Black minority (by 20%) and White working-class boys entering HE (CFE Research and the Behavioural Insights Team, 2019). In 2019, Access Agreements were replaced by Access and Participation Plans (APPs), which provided a greater focus on accountability through improving equality of opportunity for under-represented groups.

The APPs and statutory reporting obligations provided a focus on measuring and improving outcomes across the student lifecycle. The OfS published data dashboards to support this process to show which groups were least and most under-represented in HE. The statutory obligations set by OFFA and the OfS, shifted the emphasis from the government providing funding for some aspects of institutional WP to investment from HE providers charging the higher tuition fee rate. Due to this increase in accountability and statutory obligations, the funding allocated by HEIs to WP and fair access significantly increased, from £38 million in 2003/4 to £887.7 million in 2016/17 (OfS, 2018). In addition to the institutional funding, various initiatives provided additional funding for national WP programmes to encourage partnership working between HEIs, Further Education Colleges and schools. This included Excellence Challenge (2001-2004, see HEFCE 2002) partnerships for progression (£255 million for 2003/04, see HEFCE 2002), the national Aimhigher Programme from 2004/2011 (£332 million in 2006/07), in 2014/2016 the National Networks for Collaborative Outreach (NNCO, - £11 million per year, see HEFCE 2015), and more recently the National Collaborative Outreach Programme (renamed the Uni Connect Programme in 2020), funded initially from 2016 to 2021 (30 million in 2016/17 and then 60 million per year from 2017/18 to 2020/21, see HEFCE 2016) and then extended to 2023 (with 30 million in funding per year, see How Uni Connect works - Office for Students).

2.1.3 Which Disadvantaged Pupils are HE Providers Targeting

Within Access and Participation Plans (APPs) targeting and prioritisation of disadvantaged cohorts varies by provider. Approaches are informed by local context, needs and gaps in access and are further driven by obligations set by the OfS. In particular, a major focus across the sector is to eliminate the HE entry gap between young people (aged 18-30 years of age) living in areas of low and high participation by 2038/39. This is measured via HE Participation of Local Areas (POLAR) and more detail is provided within the method section. The OfS set a goal for these gaps in young (18-19 years olds') HE participation between low (quintile 1) and high (quintile 5) participation areas to reduce from a ratio of 5:1 to 3:1 by 2024/25 (see, Office for Students: universities must eliminate equality gaps, 2018. These priorities were set by the OfS and supported by sector-wide APP key performance measures (KPMs) to widen participation across the HE sector more generally and with a particular focus on raising access to more selective universities. A recent OfS (2020) analysis of all (171) access and participation plans approved in 2019 (covering the period 2020-21 to 2024-25) provided an overview of the targets set out within these plans in terms of improving access for under-represented groups. In order of prominence, 128 targets focused on low participation neighbourhoods (POLAR), 91 ethnicity, 57 socio-economic status, 33 care leavers, 30 disabled, 29 multiple measures, 26 mature students, 11 White economically disadvantaged men, 8 attainment raising, 3 state schools and 2 low-income backgrounds. Within APP guidance the OfS outlined a number of highly underrepresented groups that HEIs should consider targeting within their plans. The groups included care leavers, people estranged from their families, young people from military families, and those from Gypsy, Roma and Traveller communities. However, with the exception of care leavers, none of the APP access targets developed by HEIs mentioned any of these groups.

2.1.4 Impact of Changes in School and HE Policy on Widening Participation and Fair Access

Within England, all students can obtain tuition fee loans and maintenance loans to support living costs. The maintenance loans are means tested, where students from low-income households are provided with more financial support. There are also many bursaries, scholarships, fee waivers and hardship funds that can be accessed by some eligible students.

Further, many HE providers support WP and fair access through contextual admissions processes where greater consideration is given to disadvantaged students when providing offers (e.g., sometimes through a reduced grade tariff for pupils regarded as disadvantaged) and alternative routes to HE, including foundation degree programmes.

The introduction of tuition fees has led to increased market pressures on HEIs. It was expected that tuition fees (see section 2.1.1) would vary based on student demand, choice (e.g., quality, tuition fee and provision type) and match the entry requirements (UCAS points) of selective and non-selective institutions (McCaig, 2018). However, such variation failed to materialise (Brown, 2015). Current policy expects (DBIS, 2015 and DBIS, 2016) poor providers to be replaced by new HEI providers who will compete on price. More recent changes in policy outlined with the Teaching Excellence Framework (OfS, 2022) provide the OfS powers to sanction HEIs with poor student outcomes that are below minimum requirements for quality and standards (for student experience and student outcomes relating to continuation, completion, degree, and progression). Providers who perform poorly on these metrics can lose their HE status or can be sanctioned to lower their tuition fees to the minimum amount of £6,000 for full-time students. Further, McCaig (2015) outlines that shifts in policy (see White Paper Students at the Heart of the System, DBIS, 2011) led to changing demands within access agreements with encouragement for selective HE to improve fair access to the most-brightest pupils' and a move from raising aspirations within non-selective HEIs to improving student retention and success rates. McCaig (2015) argues that recent Government policies threaten social justice and the existence of non-selective institutions as market pressures such as higher tuition fees may discourage disadvantaged students. Threats include new providers increasing price competition, league table pressure to raise entry requirements and a decline in specific cohorts entering HE (e.g., mature students and part-time). It is also possible that these policies may lead to WP students enrolling onto lower-cost and less prestigious institutions, thus reducing social mobility (McCaig, 2018).

Due to the scope and nature of the Aimhigher programme and the research undertaken, this review focuses on WP outreach interventions and not the effectiveness of other policies outlined above in terms of their impact on WP. However, perceptions about the costs of HE are very pertinent to the research in terms of students' knowledge, attitudes, and aspirations.

Disadvantaged pupils are less likely to understand the benefits of going to university in terms of the graduate premium and employment prospects (Davies, Qiu and Davies, 2014). Evidence suggests that increases in tuition fees may have decreased the proportions of pupils' intending on continuing into sixth form and HE (see chapter 3, Cullinane and Montacute, 2017; Horton and Thompson., 2018; Ipsos MORI, 2019). If these decreased intentions to participate in HE wase to be reflected in actual behaviours, then this would lead to a significant reduction in the proportions of disadvantaged students entering HE. It is possible that a delayed effect has emerged. HESA POLAR3 entry data (Q1) showed that following the first year of the new fee arrangements, the proportions of disadvantaged pupils' entering HE increased in some years at a slower rate, in other years flatlined and at one point decreased (see chapter 4a). However, over recent years HE participation rates have begun to increase for most disadvantaged groups. These issues are discussed in detail within chapter 3, where young people and their parent's attitudes are considered in terms of their influence on HE decision-making. It is possible that these decreases in HE intentions/expectations and a flatlining in HE application and entry rates could have been much worse and may have been mitigated against by both government policies that have been discussed and demographic changes with fewer 18 to 19-year-olds in the UK population and how HE institutions have responded to these changes (a drop in entry grades to ensure HEIs meet their recruitment targets).

There are a number of other important government secondary school policies and funding decisions that may have impacted on the HE participation rates of disadvantaged students. Over recent years there have been concerted attempts to close the gap in attainment between advantaged and disadvantaged groups via 'Pupil Premium'. From 2011, schools were provided with extra funding for pupils eligible for free school meals, those in the care system and from armed service families (DfE, 2022). Other policy developments include raising the participation age (RPA) in 2013, (DfE, 2013) from at which point 16-year-old students were required to either attend a full-time course at a school sixth form or college or start an apprenticeship or traineeship or spend 20 or more hours a week volunteering, while in part-time education or training. From 2015, young people were expected to be on an RPA pathway until the age of 18. This policy may go some way to encourage more disadvantaged pupils' to continue into post-16 education pathways and consider HE as an option.

Despite these policies, many commentators have raised concerns that these inequalities may increase due to other changes in educational policy and funding cuts. Prior to 2011 low-income pupils', continuing in post-16 education up to the age of 16-19 in the UK were eligible to claim Education Maintenance Allowance (EMA, see DfE, 2011). Payments were provided to encourage low-income pupils to continue in education past the compulsory legal age of 16. Dearden *et al.*, (2009) estimated that EMA increased post-16 education / training continuation by 4.5 percentage points for year 12 learners. However, in 2010 the coalition government scrapped EMA (costing £564 million in 2010/11) and this was replaced by the 16-18 bursary fund which had a much lower budget £180 million (Britton and Dearden, 2015). Concerns were raised that the scrapping of EMA would discourage disadvantaged learners continuing into post-16 education and training. Aimhigher (Horton and Thompson, 2011) conducted research whilst these policy changes were under consultation to explore the impact of funding changes on pupils (sample over 1000) intentions/expectations to progress to post-16 and HE progression pathways. Findings suggested that if EMA did not continue, 12% of pupils from disadvantaged areas (IMD) planned not to continue into post-16 education, apprenticeships or training compared to only 2% of pupils from advantaged areas. The Institute of Fiscal Studies (2011) obtained similar findings, as 12% of pupils in receipt of EMA (post-16 learners) reported they would drop out of their course if funding did not continue. In terms of HE (Horton and Thompson, 2011) found that higher proportions of pupils' eligible for EMA (30.4%) than those not eligible (15.3%) had decided not to go into HE on the grounds of perceived affordability.

Other concerns have been raised in terms of more recent changes to the school curriculum leading to the narrowing of GCSE qualifications (Ofsted, 2018) and the eradication of qualification types more often taken by disadvantaged pupils' (e.g., vocational courses) and the relinquishment in statutory requirements for local authorities to provide careers guidance[1], although this has recently been addressed to some extent. The government policies, funding increases and cuts discussed could have both positive and negative consequences on disadvantaged students' scholastic achievement and likelihood of participating in HE.

[1] More recently the DfE have increased emphasis on careers guidance within schools, including a requirement of the provision of a careers leader and guidance to meet legal requirements through the Gatsby Benchmarks and Ofsted inspections that will continue to review the provision of careers guidance.

Chapter 3: Literature Review

3.1 Introduction

This chapter provides an overview of key theoretical and empirical explanations of inequalities in both school attainment and HE participation. The chapter begins with a summary of explanations for these inequalities informed by the social sciences including sociological, psychological, and economic theory. This is followed by a review of research studies which investigate the importance of these theoretical concepts in explaining disparities in educational attainment and HE participation. This includes a consideration of prior attainment and other non-cognitive factors that have been shown to be stratified by SES such as pupil and parent knowledge of educational pathways, attitudes to school and post-16 learning pathways, confidence in academic ability, academic motivation and aspirations and expectations towards HE.

The review considers whether these non-cognitive factors influence or are influenced by prior attainment. It is important to establish if such a sequence of causality exists, as if this is not apparent and supported by robust evidence, then perhaps school and WP interventions are focusing on factors that are unimportant or at least factors which have not been adequately researched. Such questions have important policy implications considering that in 2016/17 over £887.7 million was spent on WP activities and financial support by HE providers within their access agreements (OfS, 2018). This review is followed by a discussion of how these key concepts have been operationalised within WP programmes. This is followed by a review of research and evaluation studies examining the impact of WP programmes on pupil attainment, AABs and HE entry.

3.1.1 Theoretical Explanations of Educational Inequalities

The stratification of educational inequalities has received considerable attention within the fields of sociological, psychological, and economic theory. It has been suggested that important factors associated with such inequalities include human (economic) capital (Becker, 1964), social capital (Coleman, 1988), cultural capital (Bourdieu, 1984, 1986, 1988; Bourdieu and Passeron 1990), self-efficacy (Bandura, 1977), confidence in academic ability (Crawford *et al*., 2010) locus of control (Goodman and Gregg, 2010), self-identity and self-concept (Tajfel and Turner, 1979). Both government WP policy and HE WP programmes tend to be based on the premise that educational inequalities between affluent and less affluent families are influenced by differences in these forms of capital and associated factors. The following section outlines how these theories have provided explanations for such educational inequalities.

3.1.2 Cultural Capital Theory and Other Forms of Capital

In the 1970s, sociologist Pierre Bourdieu developed the theory of Cultural Capital. The theory postulates that social inequalities between the classes are caused by unequal academic achievement and formed by cultures within the school and home environments. Bourdieu (1973; 1984) suggested that the higher classes hold an advantage within society, as their cultural capital is more valued, and they are more able to exchange this into educational success and economic capital.

Bourdieu (1973; 1984) argued that scholastic achievement develops in the early years and is supported by being able to internalise the skills and knowledge required for understanding the transmission of messages within the classroom. Children from the upper classes gain and maintain a head start, by acquiring cultural capital through the process of socialisation and the acquisition of class habitus (e.g., habits, mannerisms, tastes, moral beliefs, skills, attitudes and how we perceive the world). Such tastes are formed through family background and upbringing. Coleman (1988) also outlines the importance of social capital obtained from membership of social networks, connections, and recognition. In turn, cultural and social capital can help more advantaged students succeed in school and progress into the most prestigious schools and universities and gain the knowledge and educational capital in the form of qualifications (Bourdieu, 1973; 1984; Coleman, 1988). Further evidence suggests that parents of disadvantaged children are more likely to have lower qualifications, and this has been found to be associated with lower levels of attainment in their children (Morris and Rutt, 2006; Goodman and Gregg, 2010; Chowdry, Crawford, and Goodman, 2010; Dearden and Sylva, 2011). The family environment, socialisation practices and resources obtained through economic capital (e.g., employment, income, wealth, and property, see Becker, 1964) may disadvantage them due to a lack of parental support with schoolwork (Chowdry, Crawford, and Goodman, 2011) and also a lack of paid for tuition or private schooling limits their chances of obtaining good grades at school to allow them to enter HE.

Several criticisms have been levelled towards Bourdieu's theory of cultural capital. This includes the deterministic nature of the theory in that cultural capital and class are viewed as static with little chance of social mobility (Goldthorpe, 2007). In turn, it could be argued that the theory is unable to explain the significant growth of disadvantaged groups entering HE in the UK over recent decades (see chapter 4a). However, the evidence presented earlier (see chapter 2, section 2.1.2) suggested that HE participation at selective universities is still highly stratified in favour of more advantaged students and prior attainment does not account for all of these differences (Sutton Trust, 2011). Others have outlined that the concept of cultural capital is difficult to empirically measure (Cardona, Diewald, and Kaiser, 2015)

Alternative theories within the field of economics stress the importance of human capital and motivation (Bowman *et al.*, 2018). Whether or not a person decides to go to HE is dependent on their academic qualifications and the extent to which they perceive the economic value of a degree outweighing the costs (Becker, 1993). Long and Riley (2007) suggest that barriers to accessing HE are impacted by constraints that can be financial, informational/behavioural, and academic. Therefore, economically disadvantaged families are less likely to understand the economic returns of going to university and are more likely to perceive 'university as too expensive' or is not for 'people like me' (Reay, Crozier, and Clayton, 2009). Even when children from disadvantaged backgrounds achieve the required grades to enter HE, parent-child interactions may be less likely to be supportive of their aspirations, understanding of how to apply to university and the economic returns, in turn reducing their likelihood of them progressing to HE (Perreira, Harris and Lee, 2006; Zimdars, Sullivan and Heath, 2009). This may be due to either informed choice (e.g., concerns about debt) or parents, peers and other social networks having less experience of applying to HE and being unable to provide resources and support to enable them to make an informed decision (Maguire, Ball and Macrae, 2000; Moschetti and Hudley 2008).

More recently St John, Hu, and Fisher's (2010) Academic Capital Formation (ACF) theory has incorporated the different capital constructs to explain the barriers that students face in accessing HE (college) in the U.S. and how intervention programmes can be made more effective. In particular, St John (2013) outlines that peer graduate mentoring programmes are more effective in increasing access to HE if they develop disadvantaged students' social capital. Mentoring was found to be more effective when support was provided to improve disadvantaged students' knowledge of how to apply and the costs of HE. Further, programmes were also found to be more effective when students could access networks providing trusted information about HE.

3.1.3 Self-Identity and Self–Concept

An important aspect of Bourdieu's (1973; 1984) theory of cultural capital explains how group membership, schools, peer groups and the home environment and the development of habitus may help children from upper and lower SES groups form different self-identities or self-concepts in terms of how they view themselves. Identity is often used to refer to an individual's or group's beliefs, looks, values and traits. In the field of psychology, the focus is on self-identity and self-esteem and what makes us unique. Whilst, in the field of sociology the focus is more on how social identity is formed through group membership and cultural norms. Identities are also formed based on ethnicity, race, gender, occupation, socio-economic status, where we live (Bécares and Priest, 2015) and the type of school we attend (Eccles and Roeser, 2011). Identity is important to the study of social inequalities as it may have an impact on motivation to do well in education, subsequent attainment, help to mould attitudes and aspirations and future educational and employment opportunities.

Evidence also suggests that peer groups can help to reinforce university aspirations and enrolment (DeGiorgi, Pellizzari and Redaelli, 2010). Tajfel and Turner's (1979) Social Identity Theory suggests that group membership helps to develop an individual's self-concept, where members of their 'in group' are perceived favourably. Maras *et al.,* (2007, p. 379) suggest that 'an individual may reject HE if it is perceived as being part of an out-group's identity rather than a part of their own'. In turn, working-class students may be less likely to go to university as this may lead to a loss of their class identity (Reay, Crozier, and Clayton, 2009). Disadvantaged students may also feel pressure from their parents to obtain employment to support their family financially (Saenz *et al*., 2007).

Archer and Yamashita (2003) suggest that identity and structural inequalities are associated with lower education progression rates of pupils from disadvantaged inner-city areas, working class and some ethnic minority groups. They claim that such groups hold a negative self-image in the belief that they are not good enough for post-16 education.

Chowdry, Crawford, and Goodman (2011) provide evidence that there are SES differences in children's confidence in their academic ability. However, they found that once prior attainment was considered at age 11, children from lower SES groups were more likely to think they were doing better at school than children from higher SES groups. Gorard, See and Davies (2012) cite studies that have found evidence for a link between a pupil's academic self-concept and academic achievement (Shavelson and Bolus, 1982; Zimmerman, 1995; Cervantes, 2005; Peetsma *et al.*, 2005). However, other studies have found a weak or no link (Bachman and O'Malley, 1977; Baumeister, Campbell and Krueger, 2003; Scott, 2004). Gorard, See and Davies (2012) conclude that the evidence is mixed and at best supports an association between self-esteem or self-concept and attainment, although studies that include more explanatory variables tend to find no association.

3.1.4 Self-Efficacy and Locus of Control

It has been suggested an individual's self-efficacy may influence pupil attainment (Bandura, 1977). This is a topic of interest within the field of Psychology and social cognitive theory. Albert Bandura (1977) coined the term self-efficacy which refers to an individual's belief in their innate ability to succeed in specific situations. This influences how goals are set, approached and whether or not they are achieved. The theory suggests that an individual's attitudes, cognitive processes and social behaviours exhibited in most situations are heavily influenced by the actions observed in others. Evidence suggests that self-efficacy begins in the early years through experiences and continues to develop in adulthood. If an individual has low expectations of their self-efficacy, they will tend to avoid challenging tasks/setting goals as they will not have confidence in their ability, will not sustain effort when tasks are difficult and tend to focus on past failures (Bandura, 1997). In consequence, such individuals tend to have low levels of commitment and perseverance, increasing the likelihood of failure. Bandura (1977) suggested that self-efficacy can be strengthened through mastery experiences: by successfully performing tasks; social modelling or peer modelling by observing similar people to yourself successfully completing a task. This can increase the observers' belief that they have the capability to also master similar activities successfully.

Van Dinther, Dochy and Segers (2011) suggest that self-efficacy may be supported through family, school, and peer environments.

Bandura's (1977) concept of self-efficacy compliments cultural capital theory as it suggests that parents who perceive their child as having good academic capabilities and aspirations will be reflected in the beliefs and attitudes of the child and subsequent behaviours, supporting educational success. As socio-economically disadvantaged parents are more likely to have lower qualifications (Crawford, Goodman, and Joyce, 2010) they may find it more difficult to support peer modelling on academic tasks (e.g., homework), leading to their children having lower levels of self-efficacy (Mazur, Malkowska-Szkutnik and Tabak, 2014). Wiederkehr *et al.,* (2015) found self-efficacy to be stratified by SES and suggest this may in part explain disadvantaged students' lower attainment levels. Chowdry, Crawford, and Goodman (2010) cite a number of studies that provide support for cultural capital theory, and the importance of self-efficacy as an individual's probability of participating in HE is significantly determined by their parents' characteristics, such as education level and/or socio-economic status.

3.1.5 The Influence of Cognitive and Non-Cognitive Factors on Inequalities in Educational Outcomes

Administrative data (see chapter 4a) shows that attainment is highly stratified by SES factors from the early years to adolescence and that similar patterns of stratification persist into HE (DCSF, 2009, The Sutton Trust, 2010, DfE, 2016-2020, UCAS 2019, OfS, 2020). This is not surprising as HE entry is predicated on a good level of attainment at Key Stages 4 and 5 (Haveman and Wolfe, 1995; Gorard, Rees and Fevre, 1999; Gayle, Berridge and Davies, 2002; Carneiro and Heckman, 2002 and 2003; Blanden and Gregg, 2004; Meghir and Palme, 2005; Goodman and Gregg, 2010; Harris, 2010; Gorard 2012; Chowdry, Crawford, and Goodman, 2010; Chowdry *et al.,* 2012; 2013; Bowes *et al.,* 2015). Two recent analyses of the NPD have found that inequalities in HE participation can be largely explained by differences in young peoples' GSCE attainment and background characteristics (SES). Crawford and Greaves (2015) found that such variables accounted for 85% of the differences and similarly more recently Gorard (2018) reports they account for 80% of the differences in HE participation.

Administrative datasets presented later (see chapter 4a) can tell us about how attainment and HE participation is stratified by a pupil's SES characteristics but provide no insight into how other cognitive and non-cognitive factors may also play an important role. The importance of such factors has been extended through theory and empirical evidence. As outlined sociological, psychological, and economic theories have attempted to explain the causes of these educational inequalities, and how they seem to be linked to social and economic status and both cognitive and non-cognitive factors (Chowdry *et al.,* 2013). Evidence suggests a pupil's educational attainment is influenced by factors such as their parents' education and attainment (Goodman and Gregg, 2010; Dearden, Sibieta and Sylva, 2011), child / parent aspirations and expectations (Goodman and Gregg, 2010; Chowdry, Crawford and Goodman, 2011), and child / parent attitudes (Morris and Rutt, 2005; 2006; Goodman and Gregg, 2010; Chowdry, Crawford and Goodman, 2011). These and other factors have also been shown to be associated with a pupil's likelihood of applying or entering HE, including child /parent attitudes (DCSF study, 2009; Dumais and Ward 2010; Goodman and Gregg, 2010; Chowdry, Crawford, and Goodman, 2010), aspirations / expectations and (St Clair, Kintrea and Houston, 2013; Croll and Attwood, 2013; Archer, DeWitt and Wong, 2014; Baker *et al.,* 2014; Green *et al.,* 2018; Häs *et al.,* 2021) knowledge of HE (Dumais and Ward, 2010; Davies and Qiu, 2012).

A number of large-scale empirical cohort studies have provided evidence that such factors may mediate educational outcomes. From an analysis of the NPD, Chowdry, Crawford and Goodman (2010) found that advantaged pupils' were 9-11 percentage points more likely to participate in HE, than disadvantaged students with similar GCSE scores. A HEFCE (2016) analysis also found that in certain neighbourhoods, lower proportions of pupils' with good KS4 attainment scores progressed to HE than would be expected. Such findings suggest that other factors may also be shaping pupils' educational trajectories. Several UK large-scale research studies (presented below) support this claim, with large cohorts of children tracked through the early years to the end of secondary school. An advantage of these studies (compared to those just employing administrative datasets) is that they investigate the importance of other factors such as pupil and parent attitudes, aspirations, motivations, SES, and attainment. Dearden, Sibieta, and Sylva's (2011) analysis of LYPSE found that differences in cognitive development between rich and poor children at age 3 years could be accounted for by parent education (18%), health and well-being (17%), family background demographics (16%), family interactions (14%) and home learning environment (9%).

Chowdry, Crawford, and Goodman (2011) present findings from an analysis of LYSPE and other tracking data for children aged 13 to 14 years in English secondary schools. The study linked pupil and parent background SES and NPD data (academic results) with survey results to examine their experiences, attitudes, aspirations, and motivations. Findings suggested that at age 11 attainment accounts for 40% of the SES attainment gap at age 16. Child and parent attitudes and behaviours accounted for 27% of the gap in KS4 test scores between children from lower and higher SES families. Chowdry, Crawford, and Goodman (2010, p.72) also found that 'just under one-third (19% of the overall gap) was accounted for by the direct effects of family background (3%) and secondary school characteristics (16%), leaving around one fifth (13% of the overall gap) unexplained'.

Goodman and Gregg (2010) and Chowdry Crawford and Goodman (2010) analysed data from four UK-based cohort studies (Millennium Cohort Study, Avon Longitudinal Study of Parents and Children, Longitudinal Study of Young People in England, and the British Cohort Study) which included over 32,000 pupils'. They found that prior educational attainment accounted for 60% of the variance in KS4 attainment final exam scores between 16-year-olds of high and low SES. Findings suggested that the remainder of the known variance was accounted for by parent/child attitudes and behaviours (23%) and by family background and parental education (6%).

Goodman and Gregg (2010) outline that changes in attitudes and behaviours are more likely to happen in the teenage years. They conclude that whilst raising attainment of pre-secondary children from lower SES backgrounds may prove most fruitful, policies and interventions that set out to reduce differences in attitudes and behaviours between teenagers from the lowest and highest SES backgrounds may help to close or even prevent the attainment gap. Chowdry *et al.,* (2013) suggest that pupils' non-cognitive skills could be the key determinant of their likelihood of going to university. It is important to note that all of these studies provide evidence of an association and not causality.

Bourdieu (1973; 1984) views cultural capital as learned through acquisition. Further, Bandura (1977) suggests that the psychological concept of self-efficacy can be strengthened through various mechanisms. Therefore, it is possible that these factors can be developed via school-based and WP programmes targeted at pupils, parents, and school staff. The next section reviews evidence to understand whether a) pupil and parents' knowledge of HE, attitudes, aspirations, and expectations to education are stratified by SES, and b) how important these factors are in influencing both attainment and HE participation outcomes. It is important to establish if such associations exist, as evidence has important policy and practical implications for WP programmes that aim to address such factors. In particular, it is important to review this evidence as the research presented in this thesis is interested in the impact of Aimhigher interventions on improving pupils' AABs and whether such improvements increase pupils' likelihood of entering HE.

3.1.6 The Importance of Pupil and Parent Knowledge on Educational Pathways

The review of theoretical models suggested knowledge about HE may be regarded as an element of a learner's cultural and social capital. Both are seen to be unequally distributed across the classes, in part due to differential support mechanisms, socialisation practices and home environments (Bourdieu, 1973; 1984). If disadvantaged pupils' have limited knowledge about the types of courses, entry requirements how to apply, costs, financial support, student life and the benefits of going to university, then they will be less able to make an informed decision about whether to go or not. Other barriers may also persist in lower SES families, as both parents and social networks often discourage intentions to go to university (Perreira, Harris and Lee, 2006; Zimdars, Sullivan and Heath, 2009).

Widening participation programmes often provide information, advice, and guidance (McCaig, Stevens and Bowers-Brown, 2006) with the purpose of improving young people's knowledge of HE pathways. Within such programmes it is often assumed that improving knowledge of HE pathways is important to engender positive attitudes and address misconceptions about HE, leading to improved aspirations to participate. Despite both theory and WP programmes placing significant importance on the view that inequalities in HE participation may in part be due to differences in cultural capital (operationalised as knowledge of HE), there is little robust research examining the importance of this factor. This section reviews the available evidence to determine the extent to whether there is a causal link, or at least an association between pupil and parent SES, and their knowledge of HE. It is important to establish if such links exist and the extent to which they are predictors of HE participation behaviours.

3.1.7 Can Differences in Child / Parent Knowledge of HE Account for SES inequalities HE Participation?

A number of studies suggest that knowledge of HE is stratified by SES. Connor *et al.*, (2001) research found that a lack of information about HE was associated with families from lower SES and no history of HE. Dumais and Ward (2010) found that students were more likely to apply to HE, if they had higher levels of cultural knowledge and parental support / guidance. Further, Bowman *et al.,* (2018, p.401) cite a number of studies that demonstrate the 'quantity and quality of college information varies substantially by SES, race and ethnicity' (Plank and Jordan, 2001; Rosa, 2006; Grodsky and Jones, 2007; Bell, Rowan-Kenyon, and Perna, 2009). Within England, Wales, Northern Ireland, and the US, those who enter HE are required to pay tuition fees for their university course, either after graduating (via income contingent loans) or upfront respectively. Human capital theory outlined earlier (section 3.1.2) suggested that pupil and parental knowledge of the costs and benefits of attending university (in terms of better employment prospects and pay) can influence pupils' perceptions and attitudes, and in turn, whether or not they participate (Dumais and Ward, 2010; Davies, Qiu, and Davies, 2014). The theoretical explanation of such decision-making was discussed in section 3.1.2. Ross and Lloyd's (2013) analysis of the LYPSE study found that pupils' who did not receive information from a teacher about university, felt less informed about the financial support available and were more concerned about the costs of HE. Bowman *et al.,* (2018) outline that the provision of information, advice and guidance about university plays a major role in improving students' knowledge of university costs and the benefits of obtaining a degree. However, Forsyth and Furlong (2003) found that working-class pupils' were discouraged from going to HE by their peers, teachers, and careers advisors, with more encouragement for them to seek employment. Evidence from the US suggests that better-informed students from high-income households slightly overestimated the price of a college degree by 5%, compared to a 200% overestimation by less well-informed students from low-income households (Grodsky and Jones 2007). The financial benefits of attending HE may also influence decisions. Davies, Qiu, and Davies (2014) expanded the concept of cultural capital to include cultural knowledge. They found that advantaged pupils' who had more knowledge of HE made better judgements about the graduate premium and were more likely to intend to go to HE. How pupils consider the wider benefits of HE in their decision-making is discussed in more detail later (section 3.1.10) when HE attitudes are discussed.

3.1.8 The Importance of Pupil and Parent Attitudes Towards Education

The formation of negative or positive perceptions, and feelings towards compulsory schooling and HE, may be a key determinant of educational success. As outlined within section 3.1.2, working-class cultures tend to place less value on the importance of HE (Raven, 2008). A lack of role models and family support may lead to negative misconceptions about HE and a decreased likelihood of participating (Reay, Crozier, and Clayton, 2009). This section reviews evidence to understand the extent to which there is a causal link, or at least an association between attitudes to HE with SES, attainment, and participation in HE. Since WP programmes are often based on the premise that disadvantaged young people often hold negative attitudes and misconceptions towards HE, it is important to establish if such links exist, and the extent they are predictors of attainment and HE outcomes.

3.1.9 Can Differences in Child / Parent Attitudes Towards Education Account for SES Inequalities in KS4 Attainment?

Large-scale studies have demonstrated that differences in child and parent attitudes may account for some of the SES inequalities in attainment. Goodman and Gregg's (2010) analysis of the four large cohort studies found that (see section 3.1.5), after prior attainment, the next most important factor associated with KS4 exam scores was accounted for by parent/child attitudes and behaviours (23%). Similar findings are reported by Chowdry, Crawford, and Goodman (2011).

Morris and Rutt (2005; 2006) evaluated the national Aimhigher Excellence Challenge Programme which aimed to increase HE participation rates of disadvantaged students in England. Findings suggested that pupil attitudes to education were stratified across several pupil and family background factors. Young people who held positive attitudes to education and stayed on post-16, and who had good school behaviour, were significantly more likely to obtain better GCSE grades. Further, they found that pupil variables were much more significant than the type of school they attended. After controlling for prior attainment, positive attitudes in terms of intentions to stay on in post-16 education and HE was associated with pupils' who were female, Indian, Pakistani, Bangladeshi, Black African and Black Caribbean non-SEN, and pupils' whose first language was other than English and other family factors.

Within educational research, other attitudinal factors have been suggested to influence pupil attainment and progression to HE. As discussed, (see sections 3.1 to 3.14) the construction of social identities and self-concept (Tajfel and Turner, 1979; Reay, Crozier, and Clayton, 2009), self-confidence (Chevalier, 2009; Baker *et al.,* 2014), locus of control (Goodman *et al.,* 2010) and self-efficacy (Bandura, 1977) are suggested to be associated with differential levels of academic achievement. These factors are often not directly evaluated within WP programmes but are seen to be associated to the formation of attitudes, aspirations / expectations, and future educational trajectories (Shavelson and Bolus, 1982; Zimmerman, 1995; Archer and Yamashita, 2003; Cervantes, 2005; Peetsma *et al.,* 2005 and Wiederkehr *et al.,* 2015).

3.1.10 Can Differences in Child / Parent Attitudes to Education Account for SES Inequalities HE Participation?

Evidence suggests that affluent pupils' are more likely to succeed at school and enter HE as they and their parents often have more positive attitudes to education (DCSF, 2009, Goodman *et al.,* 2010, Chowdry, Crawford, and Goodman, (2010). Maras *et al*., (2007) study involving 2731 students aged 13-16 years found pupils' perceptions of their family views about them attending university were associated with their attitudes towards HE. Attitudes to post-compulsory schooling and HE have been found to be associated with family SES and pupil characteristics (Morris and Rutt, 2005; 2006). Morris and Rutt (2006) suggested that teacher attitudes are also important in influencing pupils' future aspirations. As previously outlined (section 3.1.7) evidence suggests that working-class students are often discouraged from going to HE by their peers, teachers, and careers advisors (Forsyth and Furlong, 2003)

Another area of debate surrounding participation in HE, is the extent to which financial constraints lead to SES differences in attitudes and HE participation. Within England, tuition fees have risen to a maximum of £9,250 per year in 2022. The government in England has provided tuition fee loans to ensure that students, regardless of their background, are not discouraged from entering HE (see chapter 2, section 2.1.2). However, concerns have been raised about the extent to whether this policy has been effective (Horton and Thompson, 2018; Ipsos MORI, 2019). The costs of living and attending a university are likely to exceed the financial support provided. Parents of students from low-income households are unlikely to be able to provide the financial support that is more readily available to wealthy students. Chapter 4a outlines that for some socio-economically disadvantaged groups, HE participation rates have begun to flatline in recent years. It is possible that this may be due to the impact of the higher university costs.

Misconceptions and negative perceptions such as fear of student debt may be more salient to disadvantaged groups, as less attention is paid to financial support packages available (Avery and Kane, 2004; Gabaix and Laibson, 2006; Callender and Mason, 2017). However, Ipsos MORI (2019, p.10) found that the fear of debt was not due to a misunderstanding of student loan repayments as 'the vast majority of the young people understood that future repayments were dependent on income' and delayed until the repayment threshold was met. Connor *et al.*, (2001) found that both social and financial concerns about HE was associated with a decreased likelihood of HE applications from young people in lower socio-economic families with no parental experience of HE. However, Callender and Jackson (2008) found that White pupils were more concerned about financial barriers to HE than debt compared to their peers. Similar findings are reported by the Sutton Trust (Cullinane and Montacute, 2017) which found that pupils' from lower SES backgrounds were more concerned about university costs (66%) compared to those from high SES backgrounds (46%). Ipsos MORI (2019) reported similar findings including that, females (44%) were more concerned about HE costs than males (36%).

Ross and Lloyd (2013) conducted research, the year after higher tuition fees were implemented in 2012 to a maximum of £9,000 per annum. Their analysis was based on data from the LYPSE study encompassing 15,500 young people who had achieved 5 or more GCSEs at grades A*-C. They found that 34% of students with good GCSE grades, and who were motivated to go to HE, were deterred due to the financial costs. They found an association between financial concerns, including those who were White (36%), Black Caribbean (41%) or had a Mixed-race background (33%). Further, young people whose parents were not degree educated and were from lower-income and occupation households showed higher levels of concern than their more advantaged peers. Thirty-six per cent of those concerned about the costs of university expressed they were not going to go to HE, compared to only 16% of pupils that did not express such concerns.

Another important factor that may influence young peoples' HE decision-making process, is their perceptions of the benefits and return on investment of HE. Such considerations include weighing up the costs of university and whether this will lead to better employment and future earnings. The wider benefits of participating in HE were discussed in chapter 1 (section 1.1.1) and chapter 3 (section 3.1.2) provided some theoretical understandings including that of human capital theory. Obtaining a university degree provides a graduate premium in terms higher lifetime earnings (see section 3.1.13, Davies, Qiu, and Davies, 2014). In particular, it has been suggested that disadvantaged pupils may hold various misconceptions in terms of the benefits of HE. Bowes *et al*., (2015) found that young people and their parents from disadvantaged SES backgrounds held the belief that going to university did not improve job opportunities, a view especially held by White working-class males. Davies, Qiu, and Davies (2014) shed further light on this issue and found that disadvantaged students make poorer judgements on the size of the graduate wage premium.

3.1.11 The Importance of Pupil and Parent Aspirations and Expectations Towards Education

Bourdieu (1984) suggested that higher education expectations and aspirations may be regarded as an element of learners' cultural and social capital and in turn, may be stratified by SES (see section 3.1.2). This discourse outlines that the lower classes lack expectations or aspirations to progress to HE. In part, this is seen as a consequence that their parents are less likely to have participated in HE and in turn have lower expectations for their children. Archer, DeWitt, and Wong (2014) argue that they are less able to provide enrichment support and guidance on how to apply to HE. Socialisation and upbringing practices within the home make it more difficult for them to succeed at school and progress to HE (Bourdieu, 1984).

Baker *et al*., (2014, p.1) outline that 'poverty of aspirations', reinforce inequality because disadvantaged parents fail to emphasise the worth of education and their children do not make 'ambitious' choices regarding university or aim to go into high status occupations.'

Government policy and WP programmes are often based on the premise that disadvantaged pupils' have lower aspirations, than their more advantaged peers. This is perceived as acting as significant barrier that inhibits their chances of progression to HE.

Over the past two decades government school and HE-based policies (DfES White paper, 2003; DfE Schools White Paper, 2010), and HE regulatory bodies such as the HEFCE, OFFA and the OfS have placed a significant emphasis on improving positive post-16 pathways, through raising aspirations of disadvantaged young people. However, over recent years this approach has been questioned as being misdirected. Harrison and Waller (2018) provide an important distinction between these concepts by outlining that, aspirations refer to a want or desire for the future, whilst expectations refer to a belief in terms of what is more likely or probable to happen. Harrison and Waller (2018) found little difference in the aspirations between different SES groups. Larger differences were more notable in terms of expectations. Harrison and Waller (2018, p.921) argue that 'the process of forming expectations must therefore be cognitively distinct from forming aspirations.' They advocated expectations may provide a more valid indicator of HE entry behaviours.

This section reviews evidence to determine the extent to whether there is a causal link, or at least an association between SES, attainment, participation in HE and pupil, parent, and teachers' expectations / aspirations. Since WP programmes are based on the premise that disadvantaged young people have low aspirations / expectations, it is important to establish if such links exist and if they provide valid predictors of school attainment and HE trajectories.

3.1.12 Can Differences in Child/Parent Aspirations and Expectations Account for SES Inequalities in KS4 Attainment?

Several studies have found that disadvantaged pupils' may be less likely to succeed at school and enter HE due to parental and their own educational aspirations (DCSF, 2009; Goodman *et al.*, 2010; Chowdry, Crawford, and Goodman (2010). Chowdry, Crawford, and Goodman's (2011) analysis of two large cohort studies (see section 3.1.5) found that differences in parent and child attitudes and expectations towards post-16 education and HE accounted for 27% of the variance in attainment at age 11. However, they found that the influence begins to reduce at the end of compulsory schooling, as they account for 16% of the variance at age 16.

Better KS4 grades were obtained by children (and their parents) who had higher aspirations to HE. Gorard and See (2013) outline that there is a wealth of robust evidence to support claims that parental expectations (especially for mothers) are linked to their children's academic achievement. Other significant adults within in children's lives include their teachers, whose expectations may help to mould their expectations for the future (Baker *et al.*, 2014; Bathmaker *et al.*, 2016).

Gorard, See and Davies (2012) point out that the difficulty for evaluations to isolate such factors as aspiration/expectation, from other related factors. Gorard, See and Davies (2012, p.41) suggest that 'aspirations can be both a predictor of educational achievement and an outcome of it, and might be influenced by self-esteem or self-efficacy, personal traits, experiences and mediating family factors (Gutman and Akerman, 2008; Strand and Winston 2008), or linked to beliefs about ability' (Phillipson and Phillipson, 2007). Gorard, See and Davies (2012) found that there is no causal evidence that interventions aiming to raise aspirations are effective in raising attainment.

3.1.13 Can Differences in Child / Parent Aspirations and Expectations Account for SES Inequalities in HE Participation?

Several studies have reported that the most affluent groups tend to have higher HE aspirations (Croll and Attwood, 2013; St Clair, Kintrea and Houston, 2013; Archer, DeWitt and Wong, 2014; Baker *et al.*, 2014; Green *et al.*, 2018; Häs *et al.*, 2021). Findings from an Ipsos MORI (2019) survey found that 77% of young people aspire to go to HE, although there were differences by SES. Sixty-seven per cent of students from lower affluence backgrounds thought they were likely to enter HE, compared to 87% of students from highly affluent backgrounds. Similar disparities in HE aspirations/expectations and SES were found by Goodman and Gregg (2010) and they also found that parents and children's aspirations/expectations seemed to be associated. Goodman and Gregg (2010, p.38) outlined that other important factors associated with aspirations/expectations included educational attainment, gender (parents of girls have higher expectations than boys) and ethnicity where 'all non-white ethnic groups, and those with English as an additional language were significantly more likely to think that HE was for them compared to White people, and those for whom English is their first language'.

Within their review, Goodman and Greg (2010, p.38) conclude that the key influence on these expectations was prior attainment of the young person at age 11 (Key Stage 2), and it appears that both parents and young people 'take academic ability into account in forming their HE expectations' which are also stratified by SES. Even when students from lower income backgrounds progress onto a KS5 course (A level or equivalent) and obtain the same UCAS points as students from higher income backgrounds, they still have lower aspirations and are less likely to apply to HE (Cabinet Office, 2009). Khattab (2015) found that pupils are more likely to apply to university if their parents have high expectations for them to do so, although a pupil's aspirations / expectations and attainment were more positively associated with this decision.

Several studies have found that increases in tuition fees may have discouraged some disadvantaged pupils' from going to HE. A longitudinal study conducted by Aimhigher West Midlands (Horton and Thompson, 2018) tracked over 14,000 disadvantaged pupils' (from 2008 to 2015) in terms of their stated intentions to progress to HE and concerns about student finance and debt, before and after the 2012 tuition fee increases. Following the rise in tuition fees disadvantaged[2] learners' intentions / expectations to progress to HE had decreased by 5.4 percentage points (85.8% in 2008/9 to 80.4% in 2014/15). Further, in 2014/15 learners' intentions to progress to HE, were at their lowest point at any time during the research. Ipsos MORI (2019) report similar findings where in 2019, 77% aspired to go to HE compared to 81% in 2013. The Aimhigher study also found that concerns about student debt had between those dates steadily increased year on year by two percentage points from 2012/13 to 2014/15 (16.2% to 18.2% respectively).

The perceived benefits and costs of obtaining a degree can influence pupils' decisions on whether to participate in HE. Section 3.1.7 outlined that obtaining a university degree provides a graduate premium in terms higher lifetime earnings. Davies, Qiu and Davies (2014) study found that young people's (15–16-year-olds from state and private secondary schools in England) intentions to participate in HE were positively associated with their cultural capital, judgements about the graduate wage premium, and their parents'

[2] Within the Aimhigher composite targeting model disadvantaged learners refers to meeting at least one criteria from basket A of the targeting model (FSM eligible or domiciled within a 40% most disadvantaged neighbourhood and at least one criteria from basket B (no parental HE background or are domiciled in a POLAR YPR quintile 1 or 2 neighbourhood) or have a disability or are / have been in the care system.

educational qualifications. Intentions to participate in HE were significantly associated with high graduate premium expectations and confidence in these expectations, which were also associated with their level of interaction with parents and school, after accounting for grade expectations, home background, ethnicity and school type. Male, White and students attending state schools were less likely to intend to go to university. Conversely, students from non-white backgrounds, with graduate parents were more likely to intend on going to HE. Evidence provided a weak association between intentions to participate in HE and SES, household income, eligibility for FSM or parental occupation once a student's attainment was taken into account. Davies Qiu and Davies (2014, p.19) conclude that these findings suggest 'an interaction between cultural capital and human capital explanations of going to college and that a possible transmission mechanism is that students with higher cultural capital have an increased awareness of information about HE and a greater ability to accurately interpret this information'.

Sampling bias and self-reporting may have impacted on the validity of these findings as the study was not representative in terms of school types. Forty per cent were private schools, all had sixth forms and higher than average attainment and HE entry rates. Including lower-attaining schools may have strengthened the association between SES/FSM with intentions to go to HE. Further, the control for attainment may lack accuracy as it was based on students' grade expectations which may differ from actual results.

A major limitation of many of the studies reviewed is that they do not validate these claims by investigating if aspirations/expectations are good predictors of actual HE entry behaviours. For example, the Ipsos MORI (2019) study showed that almost two-thirds of lower SES pupils aspired to go to HE. However, as outlined later (see chapter 4a) actual HE participation rates of all disadvantaged groups are much lower than this. Similar findings are reported by other studies (Goodman *et al*., 2011; Croll and Attwood, 2013). Both studies report the higher SES groups have higher HE aspirations or expectations than lower SES groups. Both groups overestimated their chances of going to HE when compared to their actual HE entry rates. Goodman, Gregg and Washbrook (2011) report that the poorest pupils were more likely to overestimate their chances of going to HE (expectation 49% vs actual HE participation 13%) than pupils from richer backgrounds (expectation 78% vs actual participation 52%).

Goodman, Gregg and Washbrook (2011) argue that disadvantaged students do not have an 'aspiration deficit' as more aspire to go to HE than actually enter HE and this is true across all SES groups, with the gap decreasing for the richer students. Several studies report that aspirations have only a small influence on differences in HE entry rates as these differences largely disappear when SES background and prior attainment is taken into account (Marjoribanks, 2005; Gorard, See and Davies, 2011). Siddiqui, Boliver and Gorard (2019) matched NPD data to the Next Steps survey and reported that attainment was the strongest predictor of HE entry, as it accounted for 73% of the variance. Aspirations were found to have weak predictive power and only accounted for 3% of the variance in HE entry. However, other studies, provide evidence to suggest that aspirations are associated with HE entry behaviours (Croll and Attwood, 2013). The findings from this study may be limited due to that only a few controls were employed. Chowdry, Crawford and Goodman (2011) and Gorard *et al.*, (2018) argue that improving disadvantaged pupils' aspirations and expectations may only have a limited impact on closing the inequalities in HE participation rates between high and low SES groups.

3.1.14: Section Summary

This section has summarised social sciences theoretical explanations and empirical studies that have set out to explain educational inequalities in school attainment and HE participation. The evidence overwhelmingly suggested that prior attainment and SES plays a key role in pupils' future school attainment and likelihood of participating in HE (Chowdry, Crawford and Goodman, 2010; Chowdry *et al.*, 2012; 2013; Bowes *et al.*, 2015; Crawford *et al.*, 2015 and Gorard, 2018). However, studies have also suggested that other mediating non-cognitive factors (AABs) may also be stratified by SES and associated with educational outcomes, including school attainment and likelihood of participating in HE (Chowdry, Crawford and Goodman 2009; 2010; Chowdry *et al.*, 2013; Dumais and ward, 2010; Davies and Qiu, 2012; Davies, Qiu and Davies 2014; Khattab, 2015). However, when more robust studies have been conducted via the NPD (Croll *et al.*, 2013 and Siddiqui *et al.*, 2019), evidence is more mixed in terms of the influence of AABs on pupils' HE actual entry behaviours. However, this evidence is limited to a focus on pupils' aspirations / expectations. It is important to understand the influence of other AABs on pupil attainment and HE trajectories as WP programmes spend a considerable amount of resources on interventions to improve these AABs. The next section outlines how WP programmes have operationalised AABs and then considers the effectiveness of these programmes in improving pupil AABs, attainment and participation in HE.

3.2: A Review of Evidence: Widening Participation Interventions and their Effectiveness

3.2.1 Introduction

The next section begins with providing an understanding of how WP programmes have operationalised theoretical concepts of cultural, social, human, and intellectual capital (see chapter 3) to inform programme design and content. This is followed by a discussion of developments in the standards of evaluation evidence across WP programmes. The chapter ends with a review of more robust experimental studies that have investigated the impact of various WP interventions on improving pupils' attainment, AABs and likelihood of entering HE. The AABs of interest include pupils' HE knowledge, HE attitudes, HE expectations/ aspirations, academic motivation and confidence in academic ability. Most of the published literature relates to the first three factors. This chapter reviews evidence from activities classified as information advice and guidance, summer schools, attainment raising and tutoring, mentoring, and counselling and multi-intervention programmes which combine a number of activities. The types of interventions are of relevance to the research in this thesis as they contain similar components to Aimhigher mentoring and summer school programmes. The review does not include all types of WP interventions such as campus visits or masterclasses unless they are part of a multi-intervention. Importantly the review focuses on evidence from interventions that target young people in secondary schools and FE colleges and excludes evidence of interventions targeted at parents and carers (unless this is part of a student-led multi-intervention programme), as this is out of the scope of the research.

3.2.2 How Have Theoretical Concepts Been Operationalised Within Widening Participation Intervention Programmes

The administrative data review (see chapter 4a) and the evidence presented within the previous sections has outlined how both school and HE inequalities are stratified by prior attainment, individual, family background characteristics and the type of school attended. Evidence suggests that prior attainment and SES accounts for most of the variance in HE participation (Crawford and Greaves, 2015; Gorard *et al.*, 2018). In turn, it is argued that to widen participation HE providers should focus resources on closing this attainment gap (Chowdry *et al.*, 2012; Gorard, See and Davies, 2012; Gorard *et al.*, 2018). Despite attainment being the main barrier to HE participation, there is a tendency for WP programmes to focus on targeting and engaging disadvantaged pupils' who have the academic potential to progress to HE. Potential is often defined as those pupils that are expected to obtain good KS4 or KS5 grades, required for entry to HE. Evidence presented earlier provides some justification for this approach, as smaller proportions of disadvantaged students with good KS4 grades tend to progress to HE than their more advantaged peers with similar grades (Chowdry, Crawford, and Goodman, 2010; HEFCE, 2016). The HEFCE (2016) analysis provided the rationale for the Uni Connect Programme (formerly known as the National Collaborative Outreach Programme). The evidence suggests that for some of the cohorts targeted by WP programmes there must be other barriers to their participation in HE that are not accounted for by attainment. The evidence contrasts with studies that focus on the NPD and national surveys which include pupils of all attainment levels. These studies found that aspirations play a small influence on HE entry, as this can be explained by attainment and SES (Marjoribanks, 2005; Gorard, See and Davies, 2011; Siddiqui, Boliver and Gorard, 2019). Both theory and research presented within previous chapters suggested that other cognitive and non-cognitive factors (AABs) may play an important role in both pupil attainment and participation in HE. The sociological and psychological theories and associated concepts described in chapter 3 provide a plausible framework for WP programmes in terms of the factors that may lead to the persistent inequalities in HE progression rates between different socio-economic groups. Government policies and HE providers aim to address these barriers often with a focus on interventions to address pupil and parent social (Coleman, 1988), cultural (Bourdieu, 1973; 1984) and human (economic[3]) capital (Becker, 1964). These barriers are often conceptualised as relating to a young person's (or parents) HE aspirations / expectations, HE attitudes, knowledge of HE, academic confidence, and motivations. As these barriers are perceived as being stratified by SES, it is then rationalised that addressing them through interventions will help close the participation gap between advantaged and disadvantaged students.

[3] Economic barriers in the UK are supported through financial support packages via scholarships, bursaries, HE student tuition fee loans and means-tested maintenance grants. As the latter are means-tested, they provide more financial support to students from lower -ncome backgrounds.

WP interventions tend to include campus visits, summer school residentials at universities, mentoring support from peer undergraduates, information, advice, and guidance (IAG) activities and multi-intervention programmes combining various elements of these activities over a longer period of time. It is perceived that such interventions will enable pupils to make better-informed decisions and increase the likelihood that they will apply to HE. Widening participation interventions are predominately targeted at pupils and in some cases their parents and school staff. Both school and parent-based WP interventions provide another route to improve social capital across the school and family environment by fostering and widening networks of support that are more often available to advantaged children (Bourdieu and Wacquant, 1992; St John, Hu and Fisher, 2010). Chapter 4b (section 4.2.4) outlines how AABs and associated theoretical concepts have been operationalised within the Aimhigher programme.

3.2.3 Improving Standards of Evidence

Chapter 1 outlined how government policy and funding have attempted to address inequalities in HE participation. HE providers charging higher tuition fee rates have been tasked to improve access to HE underpinned by OfS, Access and Participation Plans (APPs). This has led to a significant rise in university spending to support disadvantaged groups through HEI (and third sector) WP outreach programmes centred around secondary schools and FE colleges. Alongside these APP commitments over recent years the OfS have encouraged HE providers to improve their standards of evidence by establishing what WP interventions are most effective.

Despite significant amounts of university funding (887.7 million in 2016/17, OfS, 2018) allocated to WP over the past two decades, robust evidence in terms of 'what works' remains extremely sparse. Previous reviews (Gorard *et al.*, 2006; Gorard, See and Davies, 2012) found little evidence of the causal impact of WP and school-based interventions (although some associations were found) on attainment, AABs and HE participation. The evidence base had only slightly improved over a decade later, as outlined in literature reviews conducted by Younger *et al.*, (2019) and Robinson and Salvestrini (2020). The reviews found weak evidence of impact, often due to a lack of experimental design, poor sampling and high attrition rates, a lack of or limited controls for confounding variables and little use of either comparison or control groups. However, over recent years there has been a slight improvement in the design of such evaluations with an increase in the use of quasi-experiment approaches and RCTs. Several RCTs have been published, whereas evidence from quasi-experimental approaches has been slower to emerge as it takes time to longitudinally track learners to the point of HE entry. The next section presents the more robust evidence from these reviews and more recent evidence that has been published since.

3.2.4 What Evidence is There That Widening Participation Interventions, can Improve Pupils' Attainment?

The evidence discussed within the literature review of national administrative datasets (see chapter 4a) outlines that the main reason that disadvantaged pupils' are under-represented in HE is due to their low prior attainment (Chowdry, Crawford, and Goodman, 2010; Goodman and Greg, 2010; Chowdry *et al.,* 2013; Gorard, 2018 and DfE 2020). Previous reviews of the literature have found no robust evidence in terms of the impact of WP programmes in improving pupil attainment (Gorard *et al.*, 2006; Gorard, See and Davies, 2012; Younger *et al.,* 2019; Robinson and Salvestrini, 2020). This section presents evidence from studies employing robust experimental designs to investigate the effectiveness of WP programmes in improving pupil attainment.

Multi-Intervention Programmes

Most WP interventions within the UK tend to be part of a multi-intervention programme and are suggested to be more effective than standalone isolated interventions (Younger *et al*, 2019; Robinson and Salvestrini, 2020). Chilosi *et al.,* (2010) evaluated the impact of an Aimhigher (national programme) multi-intervention programme on pupils' GCSE attainment, HE applications and entry. A 'difference-in-difference' approach was employed to compare improvements in outcomes with the previous cohorts within the schools/colleges. Engaging in Aimhigher activities was associated with a significant increase (by 3.8 percentage points) in the likelihood of achieving five or more GCSE grades A*–C. The study found that the attainment gap had closed between girls and boys. However, there were limitations to the study including small samples, inaccuracies in data and a limited number of controls (SES, gender, ethnicity, year group and school type) which may have confounded results. Some of these limitations were addressed within the Aimhigher Excellence Challenge programme evaluation. A number of studies were commissioned to track the outcomes of 24,000 pupils' (Emmerson *et al.*, 2005; Morris, Rutt, and Yeshanew, 2005; Morris and Golden, 2005; Morris and Rutt 2006). The programme aimed to increase the proportions of disadvantaged young people (aged 13-19 years) entering HE through targeted multi-interventions. Interventions also set out to improve pupil attainment, attitudes, and aspirations towards HE. Outcomes were compared between pupils attending schools who had and had not engaged in the programme. Interventions delivered within the programme included summer schools, campus visits, mentoring (via students and HE staff), masterclasses, study support and some pupils' were offered a HE bursary. This section presents findings from the Excellence Challenge programme that examine the impact of interventions on pupils' KS4 attainment. HE aspirations and attitude outcomes measured via surveys will be considered within the relevant sections of this chapter.

The research employed measures collected via the NPD to control for pupils' background characteristics (sex, ethnicity, special educational needs, in receipt of free school meals and first language) and attainment (prior attainment and end of Key Stage data or GCSEs). Findings indicated that once all background characteristics at school and pupil level had been controlled for, statistically significant associations were identified between programme engagement and improved pupil attainment leading to an additional 3.52 GCSE points (Emmerson *et al.*, 2005). The study found an association between improved attainment and university campus visits. Undergraduate mentoring programmes were also found to improve pupil attainment (Morris and Golden, 2005).

However, a US multi-intervention study obtained less-promising findings. Bergin, Cooks and Bergin's (2007) study focused on evaluating the impact of the EXCEL programme. The programme aimed to increase the likelihood of high-attaining disadvantaged ethnic minority students enrolling into HE. The programme consisted of enrichment interventions including a scholarship to the sponsoring university. A randomised controlled trial was employed where 83 high school students were randomly assigned to the programme intervention group or a control group. The intervention was found to have no impact on students' attainment. They point out that many different outreach intervention and scholarship programmes were being delivered during the time of the EXCEL programme and that these may have suppressed the observed impact of the programme on the intervention group.

Tutoring Interventions

Aimhigher West Midlands (2019) commissioned an online tutoring programme that targeted pupils domiciled within wards where there were low HE progression rates than expected based on their KS4 attainment. The study employed a quasi-experimental approach to measure the impact of the intervention on improving pupils' final KS4 GCSE Maths grades. The programme consisted of pupils' attending a number of 1-hour, online subject-specific tutoring sessions. Sessions were delivered by student peer tutors of a similar age that had expertise within the subject area. In total 21 schools and 258 pupils participated in the intervention. The evaluation compared pupil-level KS4 mock grades against KS4 final grades for an intervention group who engaged within the programme against a comparison group that did not engage. Data was only returned for 56 students from the intervention group (22% of those that engaged) and 54 students from the comparison group.

Findings suggested that there was a statistically significant association between engagement within the programme and improvements in students' final exam grades. Students who engaged in 8-13 tutoring sessions (n 34) were found to have a 0.5 grade improvement above the comparison group (n 54). However, two to seven tutoring sessions were not found to have any significant impact. Despite these results, there were possible biases in that pupils either self-selected to take part in the programme or were selected by their school. Therefore, unobserved variables may have led to sampling bias.

Le, Mariano and Faxon-Mills (2016) presented findings for a quasi-experiment evaluation of a US college readiness multi-intervention programme. Interventions included tutoring and counselling, financial support advice, workshops, and support to prepare for exams. The authors report that students who engaged in the intervention had higher levels of attainment and college enrolment rates, than those that did not engage from similarly disadvantaged backgrounds.

It is possible that disadvantaged students face a multitude of barriers to HE that cannot be addressed through attainment raising alone. Chowdry, Crawford, and Goodman (2011) provide evidence to suggest that the attainment gap at age 16 can be closed through interventions focusing on attitudes, expectations, aspirations, and behaviours. Addressing such factors may be more cost-effective than attempts to raise attainment for such students (Cunha and Heckman 2007; Cunha, Heckman and Schennach 2010) and could lead to improved HE entry rates for disadvantaged pupils. The remaining sections within this chapter review evidence from WP interventions to see how effective they have been in addressing such factors.

3.2.5 What Evidence is There That Widening Participation Interventions, can Improve Pupils' Knowledge of Higher Education?

This section reviews research and evaluation evidence from WP programmes that have investigated the extent to which interventions led to improvements in pupils' knowledge of HE. Earlier sections have outlined how this factor has been defined and operationalised within WP programmes and why it is considered important in determining HE participation outcomes.

Mentoring and Counselling Interventions

Robinson and Salvestrini's (2020) literature review of WP interventions, found that mentoring, counselling and role models can help to increase students' knowledge of HE (Kerrigan and Carpenter, 2009; Aimhigher West Midlands, 2019). O'Sullivan *et al.*, (2017) evaluated the impact of a school mentoring programme on low-income students. Pupils completed a pre and post-intervention survey. They found that when pupils regarded sessions as high-in quality and had a higher number of mentoring sessions, they experienced significant improvements in their knowledge of HE (how to apply and finance). Pupils self-reported on their engagement within the mentoring scheme which may lack accuracy. All of the studies presented above do not include a comparison group and in turn, it is not clear if pupils who engaged were more motivated to enter HE and may have done so without the intervention.

Experimental evidence from the US (Avery, 2013; Castleman & Goodman, 2014) found that counselling advice can improve college (university) enrolments when it included advice on applying to or completing college and financial applications. A UK trial of the Southern Universities Network Uni Connect Programme (SUN and Behavioural Insights Team, 2019) evaluated the impact of a 10-week online intensive mentoring project accessed by disadvantaged pupils (POLAR YPR, quintiles 1 and 2). The study compared outcomes between a control and treatment group of year 12 further education college learners. One hundred and eighty-six learners were randomly allocated to the treatment (n 93) and non-treatment groups (n 93). The RCT evaluated the impact of undergraduate student mentors providing information to increase students' knowledge about HE options to encourage them to apply. The trial consisted of goal setting and HE exploration over the first six weeks. Learners were provided with the choice of receiving more detailed IAG for the last 4 weeks of the trial (traditional university pathways, HE in FE or higher/degree apprenticeships). CfE (2019) reported that findings from pre and post-test surveys provided no evidence of a significant impact on students' self-reported knowledge about HE courses and where to find information about applying. This study may have suffered from sampling bias, as attrition rates were high (60%) within the treatment group.

Summer School Interventions

Another Uni Connect Programme RCT involved a collaborative evaluation of two high-intensity multi-day residential summer schools delivered to year 10 pupils across three partnerships (Go Higher West Yorkshire LiNCHigher and FORCE areas, 2018). Disadvantaged learners (POLAR YPR quintiles 1 and 2) were randomly allocated to the treatment (n 130) and control groups (n 50). The trial aimed to improve learners' knowledge of HE, motivation to attend and their belief that it was possible. CfE (2019) reported that post-event surveys showed no significant effect on learners' HE knowledge. The treatment group were slightly less likely (but not significantly) to express that they would apply to HE compared to the control group. Despite these findings, the trial lacked validity and reliability as attrition rates were extremely high and the authors report that there was lack of consistency in how survey data was collected. A further, point in relation to the validity of the findings is that only post-treatment surveys were employed. Pre and post-treatment surveys may have provided a more valid approach to measure shifts and improvements in outcomes.

Information, Advice and Guidance Interventions

A third Uni Connect randomised controlled trial involved light touch 'nudging' texts sent to year 11 (n 810) pupils' mobile phones (Network for East Anglian Collaborative Outreach Programme, 2019). Over a period of 3 months, weekly text messages were sent to year 11 pupils within a randomly assigned intervention group. These text messages aimed to improve pupils' understanding of post-16 pathways (e.g., video links to information and quizzes and post-16 options). Results for the year 11 trial found no significant difference between the intervention and control groups' perception about the different types of jobs available after their GCSEs and knowledge of pathways associated with their favourite subject. CfE (2019, p.52) report that 'The text messaging group had lower mean scores for their knowledge of different education and/or training options compared to the control group'. CfE (2019, p.52) suggest that a possible explanation for this finding was that the intervention may not have been effective due to high attrition rates within the follow-up survey and/or that learners may 'have had access to high-quality IAG through other channels.' Another explanation is that the light touch trials were ineffective.

3.2.6 What Evidence is There That Widening Participation Interventions, can Improve Pupils' Attitudes and Confidence Towards HE?

The following section reviews research and evaluation evidence from WP programmes that have investigated the extent to which interventions have led to improvements in pupils' attitudes to HE. Previous chapters have outlined how this factor has been defined and operationalised within WP programmes and why it is considered important to HE participation outcomes. Moore, Sanders, and Higham (2013) suggest that improved information, advice and guidance on the costs, financial support, and benefits of attending HE should be a key area addressed within WP programmes.

Mentoring and Counselling Interventions

Evidence suggests that mentoring, counselling and role models can help to improve disadvantaged students' attitudes to HE (Aimhigher West Midlands, 2019). However, this evidence does not provide causal evidence, as outcomes were only measured for the treatment group. A more robust study also within the UK, employed an RCT to investigate the impact of a short online mentoring programme on improving disadvantaged learners' attitudes to HE (SUN and BIT, 2019). Attitudes were measured via a questionnaire. CfE (2019, p.59) report that there was no significant impact of the intervention on improving learners' perception 'that university is for people like them and that it will broaden their horizons or improve their job prospects'. The trial did suffer from high attrition rates which may have biased findings.

Summer School Interventions

Recently another RCT of a residential summer school delivered by Go Higher West Yorkshire LiNCHigher and FORCE National Collaborative Outreach programmes (2019) again found no significant impact on improvements to students' attitudes in terms of increasing their perception that university is for people like them and in terms of broadening their horizons or perceptions of improved job prospects (CfE, 2019). However, again this RCT suffered from attrition rates which may have biased findings.

Multi-Intervention Programmes

Evidence from the Aimhigher Excellence Challenge Programme based in England (Morris, Rutt, and Yeshanew, 2005; Morris and Golden, 2005; Morris and Rutt, 2006) discussed earlier provided evidence of the effectiveness of a multi-intervention programme. Once all background characteristics at school and pupil level had been controlled for …. statistically significant associations were identified with improved attitudes towards HE and belonging to the target cohort of an intervention school. Young people who went on campus visits or had talked about university with an undergraduate, lecturer, family or friends were more likely to have positive attitudes towards HE, although school factors (positive teacher-child interactions) and parental factors (encouraging their child to complete homework and stay in education) had a larger impact on students' attitudes to learning. However, the authors outlined that these results were inconclusive and did not demonstrate a causal relationship as results may have been influenced by confounding variables not controlled for. For example, within comparison schools, pupils could have engaged in other WP interventions delivered by schools or HE providers that were not part of the programme. This could in turn suppress the impact of observed findings.

3.2.7 What Evidence is There That Widening Participation Interventions, can Improve Pupils' Expectations / Aspirations Towards HE?

This section reviews research and evaluation evidence from WP programmes that have investigated the extent to which interventions led to improvements in pupils' expectations or aspirations to progress to HE. Widening participation programmes are based on the premise that expectations / aspirations to HE are stratified by pupil characteristics. However, the evidence presented earlier suggests that the importance of such factors is debatable as they may only have a small influence on HE entry rates (Marjoribanks, 2005; Gorard, See and Davies, 2011; Siddiqui, Boliver and Gorard, 2019). Although as discussed, these studies tended to focus on analysis of the NPD or national surveys which include pupils' of all levels of attainment and not the cohorts targeted (good attainment) by WP interventions. For these cohorts, AABs may play a mediating role in their likelihood of participating in HE. Previous chapters have outlined how this factor has been defined and operationalised within WP programmes and why it is considered important to HE participation outcomes.

Summer School Interventions

Robinson and Salvestrini's (2020) literature review identified evaluations that found summer schools were associated with an increase in learners' confidence and aspirations to progress to HE (Hatt, Baxter and Tate., 2009; HEFCE, 2010; Bourdeau *et al.*, 2014; Aspire to HE, 2018; Lawson *et al*., 2019). However, none of the studies provided causal evidence of impact, due to limitations in methodology such as a lack of controls. Further samples may be biased, as pupils attending summer schools may have already had a higher likelihood of progressing to HE due to their attainment, motivations, and aspirations.

Mentoring and Counselling Interventions

Robinson and Salvestrini's (2020) literature review presents evidence to suggest that mentoring, counselling and role models increased students' motivation, confidence to succeed in HE and aspirations to progress to HE (Kerrigan and Carpenter, 2009; Aimhigher Birmingham and Solihull, 2010; O'Sullivan *et al*., 2017; Spath, Pearce, and Martyres, 2018; Lawson *et al.,* 2019; Aimhigher West Midlands, 2019). O'Sullivan *et al.,* (2017) outlined earlier that low-income students who reported attending a higher number of mentoring sessions which were high in quality (student self-reports) had significantly higher levels of HE aspirations (measured via surveys before and after the programme). Limitations of this study have been outlined earlier. Again, much of this evidence was limited and did not provide causal evidence due to a lack of experimental methods. One of the RCTs discussed previously that involved online mentoring (Go Higher West Yorkshire LiNCHigher and FORCE areas; CfE, 2018) found no significant effect on learners' self-reported likelihood to apply to HE.

Information, Advice and Guidance Interventions

A randomised controlled trial conducted in Canada (Oreopoulos and Dunn, 2013) found that students who were provided financial information about university (written and video) had higher HE aspirations and were less concerned about costs. However, lighter touch interventions in the UK evaluated via RCT's have proven to be less effective in improving learners' aspirations to progress to HE when information, advice and guidance on the costs, funding available and benefits of HE is in written format (Silva, Sanders, and Chonaire, 2016; McGuigan, McNally, and Wyness, 2019).

Multi-Intervention Programmes

Evidence from the Aimhigher Excellence Challenge Programme (Morris, Rutt, and Yeshanew, 2005; Morris and Rutt, 2005; 2006) discussed earlier (see section 3.2.6, multi-intervention programmes) suggested that once all background characteristics at school and pupil level had been controlled for statistically significant associations were identified with improved aspirations towards HE and belonging to the target cohort of an intervention school. Interventions seemed to have a more significant impact on changing young peoples' intentions if they were female, spoke English as a second language or had a large number of books in the household. However, although this study seems to demonstrate statistical associations between learners' engagement within Aimhigher activities and increases in aspirations to HE, it is unclear if this led to changes in actual HE entry behaviours.

3.2.8 What Evidence is There That Widening Participation Interventions can Improve Pupils' Progression to HE?

This section reviews research and evaluation evidence from WP programmes that have investigated the extent to which interventions led to improvements in pupils' participation in HE via either applications, acceptances, or entry. UK, German, and US studies (outlined below) have employed experimental designs to provide more robust evidence of the impact of summer schools, mentoring programmes, information, advice and guidance interventions and multi-interventions on disadvantaged learners' HE participation rates.

Mentoring and Counselling Interventions

Some US research provides causal evidence in terms of the impact of mentoring, counselling, and role models on increasing students' HE progression rates. Castleman, Arnold and Wartman (2012) conducted a US experimental study to reduce college drop-out rates over the summer. The study randomly assigned 162 disadvantaged students (from the same high schools) equally into an intervention or control group. The intervention group received counselling support to help them overcome any barriers to HE. Findings suggested that the programme had a positive effect on student enrolment. Improved enrolment rates with final-year US high school students have also been reported by other experimental studies (Moore *et al.*, 2015; Carrell and Sacerdote, 2017).

Summer School Interventions

Robinson and Salvestrini's (2020) review of WP evidence found that although summer school interventions showed an association with increases in both learners' confidence and aspirations, there was mixed evidence for interventions in terms of the increased likelihood of applying or being accepted to HE.

Information, Advice and Guidance Interventions

The Network for East Anglian Collaborative Outreach Programme (2019) RCT found no significant impact of a light touch 'nudging' texts (IAG intervention) on year 13 students HE application rates in the intervention group (61%) compared to the control group (59%).

Another large-scale RCT, not part of the Uni Connect programme was conducted by the Department for Education and the Behavioural Insights Team (Sanders, Chande and Selley, 2017). The trial employed a behavioural sciences approach to investigate if male and female undergraduate role models and small nudges (letters from undergraduates) could increase the likelihood of able year 12 students (n 11,004) to apply to university. The study focused on selective institutions. Able students were defined as those with a good level of attainment (367 GCSE points from their 8 best GCSEs or equivalent) and on track to attend a selective university but were on roll within schools where learners' attended local universities or did not go to HE at all (this was employed as a proxy for low aspirations).

Schools were randomly assigned to either a control condition (no treatment) or one of three treatment conditions consisting of a letter from an undergraduate (a) sent to students at their school; or (b) sent to their home or (c) both letters. All letters were consistent in terms of text and content other than the name of the undergraduate (e.g., male/female). Letters emphasised the different opportunities offered by universities, that employers look at what university you go to, and that often selective universities can be less expensive to attend for people from low-income backgrounds. The letters also stated that the undergraduate had suffered from similar misconceptions to those expected to be held by treatment group participants.

The authors reported that (2017, p.17) 'those who received both letters were 3.3 percentage points more likely to apply to a Russell Group university and 2.9 percentage points (11.4% accepted an offer) more likely to accept an offer from a Russell Group university than students in the control group (8.5% accepted an offer)'. They concluded that a letter from a role model of a similar background can significantly boost aspiration and increase the likelihood of under-represented students applying and accepting a place a Russell Group university. They estimated that the trial supported 322 additional students to progress to university for a very low cost (£45.00 each).

A limitation of the study was that the authors assumed that the mechanism that increased university acceptance rates was increases in aspiration, although no data was collected to validate this. Further, the study suggests that the undergraduate peers were from similar backgrounds to the students, but no further information is provided. This is important as the peer role models were called Rachel and Tom suggesting they were White British, and ethnic minority students may not identify these students as role models from similar backgrounds. Another limitation is that a 10% level is reported for the significance. This is quite high increasing the possibility of a Type 1 error (e.g., the null hypothesis may have been rejected when it should not have been).

Three of the four RCT's discussed found no significant impact of interventions upon the specific outcomes under investigation and the only significant trial conducted by the DfE and BIT had a large possibility of error. This is not surprising as a high proportion (80%) of clinical trials also obtain non-significant findings (Mateusz, Wasylewski and Strzebonska, 2020). It is possible that results may not have been significant across most of these studies as prior to the trial learners may have previously accessed other sources of information about HE and already had high HE expectations, knowledge, and positive attitudes to HE. This is an important issue which could suppress the impact of trials and is covered in more detail within the discussion. Two of the Uni Connect trials and the DFE/BIT trial included students in years 12 and / or 13. A number of academics (see Gorard, 2018) have argued that it is not worthwhile conducting WP interventions with post-16 learners completing A-level or equivalent courses, as there are only very small differences in HE entry rates between advantaged and disadvantaged students. For example, evidence suggests four-fifths of A-level students enter HE regardless of their social class (Robertson and Hillman 1997; Coleman and Bekhradnia 2011). This claim can be disputed to an extent as there are still some groups of students enrolled on level 3 courses that have lower progression rates than their advantaged peers (Chinese 77% vs Gypsy and Roma 30% and SEN 50% vs non-SEN 59%) as outlined later within chapter 4a.

In Germany, Peter, Spiess and Zambre (2018) conducted an RCT that provided evidence for the importance of IAG in improving HE enrolments. However, lighter touch interventions in both the US and UK evaluated via RCT's have proven to be less effective in improving enrolments when information advice and guidance was provided via leaflets or online websites (Carrell and Sacerdote, 2017; Phillips and Reber, 2018).

Multi-Intervention Programmes

Many of the studies discussed above have tended to measure the impact of isolated single intervention programmes delivered over a short period of time. Often these activities are part of a wider multi-intervention programme. Isolating and measuring the impact of a single intervention is an oversimplification and is unlikely to increase HE participation on its own as disadvantaged students often experience a multitude of barriers to HE. These barriers may be better addressed via multi-intervention programmes (Herbaut & Greven, 2019).

Research in both the UK and the US has provided evidence for the impact of such interventions on HE progression rates for students from disadvantaged backgrounds. Chilosi *et al.*, (2010, p.8) also found that engagement in the Aimhigher national programme was 'associated with a positive statistically significant … increase in the likelihood of applying for HE by 4.5 percentage points (1 per cent level), and of entering into HE by 4.1 percentage points.' Engagement within the programme was associated with an increase in low-socio economic status applicants, but this was not true for entrants. The authors outline that a possible explanation for this result is due to university selection processes. The study found no impact on ethnic minority HE application or entry rates. A similar but smaller impact is reported by the Morris, Rutt and Mehta (2009) UK study which found that the national Aimhigher programme contributed a 1 percentage point increase in the HE participation rates of disadvantaged students (with average attainment levels) across Excellence Challenge schools. However, an earlier study of this programme conducted by Emmerson *et al.*, (2006) found that when employing a difference in difference approach across local authorities, the programme did not have a significant impact on post-16 education progression rates either into further education or HE.

Several US studies have found that multi-intervention programmes can lead to improved college enrolment rates for disadvantaged students when interventions include scholarships and student support. Pharis-ciurej, Herting and Hirschman (2012) evaluated a US intervention programme that aimed to increase college enrolment rates of moderate and low-income students. The programme consisted of scholarships and mentoring support. Pre and post-intervention surveys were administered to students within intervention schools and a non-intervention comparison group. Several attainment, socio-economic, demographic and aspiration controls were applied. The study employed a difference in difference approach to compare enrolment outcomes at school-level. They found that the intervention had a significant impact on college enrolment rates in two of the three schools. However, it is possible that the sample was biased, as 25% of students did not complete the baseline survey.

These students were more likely to have lower attainment, behavioural issues, and low attendance.

Another US evaluation of a college readiness (multi-intervention) programme employing a quasi-experiment approach, was found to improve disadvantaged students' college enrolment rates, compared to a similar group of students who did not engage (Le, Mariano, and Faxon-Mills, 2016). Positive findings are also reported by Bowman *et al.*, (2018) who evaluated the impact of a US WP programme (GEAR UP) targeted at improving college access and success of circa 17,000 students from low-income backgrounds. Interventions included academic enrichment (e.g., tutoring), careers support, financial advice, scholarships (for 90% of the intervention cohort) and campus visits. The study employed a difference in difference approach to compare student-level outcomes between a matched group of intervention and non-intervention comparison schools. They found that the intervention improved college enrolments by 3-4 percentage points regardless of a student's background status.

Two other US studies have obtained less-positive findings. Bergin, Cooks and Bergin (2007) employed a randomised controlled trial to evaluate a programme consisting of a scholarship and other interventions which were found to have no significant impact on enrolments. Page *et al.*, (2019) employed a quasi-experiment and difference in difference approach to evaluate the US Dell Scholars Programme consisting of financial and other supporting activities. The study found that the programme had no significant impact on the college enrolment rates of low-income first-generation students but did help to improve college success rates.

A major limitation of many of the multi-programme evaluations and RCTs summarised within this review (and especially within the UK), is that they have not attempted to identify which activities within the programmes are most effective. A more recent study conducted in the UK by Aimhigher West Midlands (Uni Connect Programme) has shed some light on this issue. Burgess, Horton and Moores (2021) presented promising evidence from a multi-intervention programme that consisted of summer schools, peer mentoring, tutoring, campus visits, masterclasses and information advice and guidance interventions. Interventions were targeted at pupils' in year groups 9-13 on roll within West Midlands secondary schools and FE colleges. The study employed a quasi-experiment approach to compare HE acceptance outcomes between a treatment and a non-treatment group of learners. The study aimed to establish the types, sequences, and number (dosage) of interventions that were most effective.

Participants were drawn from a population of 2,706 learners completing full-time Level 3 qualifications on roll at sixth-form schools and colleges targeted by the programme. The sample consisted of 51% (n 1,386) of learners within target schools across two HE application cycles (2017/8 or 2018/9). Ninety-four per cent of these learners had only engaged in the programme in years 13 or their second year at college. Even though data was only obtained for 51% of learners in target schools they were largely representative of the larger cohort engaged in terms of ethnicity and gender. The study included controls for sex, ethnicity, school attended, rural vs. urban environment and where pupils lived (IMD and POLARYPR). Burgess, Horton and Moores (2021) report that learners who engaged within interventions (treatment group) were significantly more likely to be accepted to HE (58%) than the comparison group (39%). Those that engaged were almost 50% more likely to be accepted to HE. Any amount of engagement was effective in improving HE outcomes. However, five to six engagements were found to produce the optimal benefit and increased the probability of acceptance to HE from 39% (no engagement) to 64%. Only small increases in HE acceptance rates were observed beyond this point. The findings also showed that different types of interventions were more effective than others. Summer schools, campus visits and information and guidance were more strongly associated with HE acceptance. No significant association was observed for tutoring. Learners who engaged in a combination of activities were more likely to be accepted to HE. In particular, the most effective combinations were summer schools followed by information advice and guidance, campus visits and masterclass activities were strongly associated with HE acceptance.

Pupil characteristics were also found to be important in predicting HE acceptance. White males were significantly less likely to be accepted to HE than BAME (men and women) and White women. White pupils were only more likely to be accepted to HE than Mixed White and Black Caribbean pupils'. However, White pupils' were less likely to be accepted to HE than Asian and Black British-African pupils'. Learners living in more deprived neighbourhoods (IDACI) compared to affluent neighbourhoods were slightly more likely to be accepted to HE. No associations were found for POLAR, although this may be due to that most pupils were from lower quintiles. Further learners living in rural areas were found to have higher HE acceptance rates than those from urban areas. The school attended was found to be the best predictor of HE acceptance than any measure of programme engagement. Burgess, Horton and Moores (2021) report that the programme supported an additional 183 students into HE. A limitation of this study (and many other WP studies, see Robinson and Salvestrini, 2020) is that the participants were all studying for a level 3 qualification. Evidence suggests that there is little difference in HE participation rates for disadvantaged and advantaged students enrolled on such courses as these differences are mainly accounted for by differences in KS4 attainment (Crawford and Greaves, 2015; Gorard 2018).

Another limitation of this study was that participants were non-randomised. This could lead to unobserved variables biasing samples and results. Pupils that engaged may have had higher academic motivations and attainment, meaning that irrespective of the intervention they may have entered HE. Harrison and Waller (2015) describe this bias as 'deadweight'. This issue is prevalent across WP programmes and associated evaluations that do not employ an RCT design. However, similar problems can occur within RCTs, as attrition is usually higher within the treatment group as observed within the UK trials described earlier. However, quasi-experiment studies such as Burgess, Horton and Moores (2020) can be improved by employing controls for prior attainment and pupil AABs (via surveys) to identify how well-matched treatment and non-treatment groups are across a number of important characteristics. Related to this point, the study fails to provide an understanding of other important mechanisms that may have supported these improved HE acceptance rates, which may also be mediated by pupil AABs.

Despite these limitations, the study provides evidence of the efficacy of the programme, as there was an association between HE acceptance and the type of activity learners engaged in, the extent of their engagement (dose-response) and the combination of activities engaged in. Research would suggest that the solution to this issue of selection bias would be through the employment of randomised controlled trials (Gorard *et al.*, 2006; Gorard, 2012; Robinson and Salvestrini, 2020) which address issues of observed and unobserved differences in characteristics between the treatment and control groups, through randomisation. However, WP RCTs tend to focus on isolated interventions and are less able to account for whether engaging in multiple intervention programmes has a more significant impact on improving pupil outcomes. In part this is due to ethical concerns, as to conduct an RCT on a WP programme would mean that some pupils' (the control group) miss out on the intervention and any subsequent benefits that may be realised. These debates are considered in more detail within the method chapter.

3.2.9: Section Summary

This chapter has reviewed the evidence for the effectiveness of WP programmes in improving pupil attainment, AABs and HE entry. Previous reviews of the literature outlined that evidence of the effectiveness of WP interventions was lacking due to limited use of experimental designs (e.g., controls, poor sampling, comparison, and control groups). However, within England the OfS more recent attempts to improve the standards of evidence seems to have led to improvements in the use of experimental designs (RCT's and QED's), leading to some evidence of effectiveness. Despite these improvements, studies often still suffered from issues such as attrition, a lack of appropriate controls and matched comparison groups. In turn evidence for effectiveness has tended to infer an association rather than causality between interventions and pupil outcomes. The next chapter reviews national administrative datasets to provide a better understanding of disparities in school attainment and HE participation between pupils of different characteristics. This data is important as is often used to inform the targeting of WP interventions and also provides value in terms of the controls that should be employed within research.

Chapter 4a: A Review of National Datasets and Indicators: Inequalities in School Attainment and HE Progression

4.1 Introduction

The previous chapters have provided an understanding of; government HE and WP policy (chapter 2), theoretical concepts and empirical evidence for inequalities in attainment and HE participation (chapter 3) and a review of how effective WP programmes have been in addressing these inequalities. This chapter focuses on national administrative datasets to provide a better understanding of who is under-represented in HE. This is the main outcome measure of interest within the research presented in this thesis.

This chapter provides focuses on national administrative datasets (and some research) to provide an understanding of school attainment measures and performance across each key stage and HE participation rates in England and the UK. This is followed by a review of these administrative datasets to identify the extent to which school attainment (with a focus on KS4 and KS5) and HE participation are stratified by pupil characteristics. These indicators fall into three broad groups and relate to pupil individual/family characteristics, home postcode (neighbourhood statistics) and the school attended. The chapter critically reviews the validity and reliability of these indicators to provide a better understanding of who is underrepresented in HE. The inequalities are important to understand as WP programmes commonly employ these indicators to target disadvantaged pupils for interventions, in an attempt to close the gap in participation with their more advantaged peers. As the research undertaken and Aimhigher programme is primarily concerned with WP into any type of HE provider and not access to more selective universities, the review will focus on the former. The review that follows also informed the controls employed within the research.

4.1.1 National Administrative Datasets: Attainment and HE Participation

National administrative datasets reporting on pupil attainment across all key stages and HE participation is published on a regular basis by the government and charitable agencies. These agencies produce statistics that are useful to compare outcomes across the education lifecycle between various disadvantaged and advantaged groups. The data is used to drive government education policy, measure performance across schools and HE providers and inform the targeting of HE outreach programmes.

The Department for Education (DfE)[4] publish annual school attainment statistical releases and research on school attainment across all key stages (EYFSP, KS1, KS2, KS4 and KS5), post-16 destinations and estimates of HE progression rates of KS4[i] and KS5[ii] pupils'. The DfE examine differences in attainment of pupils with different socio-economic and demographic characteristics by eligibility for free school meals (FSM), gender, ethnicity, special educational need status, first language, looked-after status, school type, locality (HE Participation of Local Areas (POLAR) and Index of Multiple Deprivation (IMD) and intersectionality between measures. Higher education participation data is published by several organisations including:

1. The Universities and Colleges Admissions Service (UCAS) who are responsible for administrating and reporting annually on full-time undergraduate applications and acceptances for HE courses in the UK. Annual end-of-cycle reports provide data on UK HE progression for student characteristics by gender, FSM, ethnicity, POLAR, IMD, disability, school type and intersectionality of indicators (Multiple Equity Measure). Some UCAS data is provided for applicants and acceptances only, whilst other datasets are more valid by comparing the proportions of applicants / acceptances of a particular group against their population in England / UK.
2. The Higher Education Statistics Agency (HESA) provide annual data sets on key performance indicators (KPIs) to provide a measure of how the UK HE sector is performing. This includes indicators relating to WP of young (aged under 21) under-represented groups domiciled in the UK and England, enrolled for at least 50 days on a full or part-time undergraduate degree[iii]. These indicators include pupils from state schools, low participation neighbourhoods (POLAR Q1) and those in receipt of Disabled Students allowance (DSA). Data is also available for other indicators such as entry by

[4] The DfE has changed its name a number of times over recent years. When data and research are referenced, the following names may be used: In 1992 The Department of Education and Science (DES), became the Department for Education (DFE), then in 1995 changed to the Department of Education and Employment (DfEE), changed to Department for Education and Skills in 2001 (DfES), and in 2007 changed to the Department of Children Schools and Families (DCSF) and finally in 2010 changed to the Department for Education (DfE).

locality (IMD), sex and ethnicity. Some HESA datasets are provided for HE entrants only, whilst other datasets are more valid by comparing the HE entry rate of a particular group proportionally against their population in England / UK. Recently, HESA changed the way that these KPIs were measured meaning that comparisons to previous years are not valid.

3. The OfS have produced access and participation data dashboards displaying data across the student HE lifecycle. This includes data on HE entry rates for UK and England domiciled students. Dashboards support comparisons between undergraduate entry rates of different WP groups. This includes comparisons by POLAR4 quintiles, English index of multiple deprivation (IMD) quintiles, ethnicity, FSM, sex, age, disability, and new measures of intersectionality. Some of these datasets are based on the participation rates of entrants only. However, some datasets (POLAR, sex and ethnicity) support comparisons in HE entry rates between the proportion of 18-year-olds in the population holding a characteristic and the proportion entering HE with this characteristic.
4. The DfE Widening Participation in Higher Education (WPHE) publication provides estimates for 19-year-olds from English state-funded schools and special schools on full or part-time HE courses in the UK.[5] Another DfE publication, the Higher Education Initial Participation Rate (HEIPR) provides estimates on the likelihood of a young person participating in full / part-time HE including alternative providers by age 30. The DfE examine differences in attainment and HE progression for pupils of different socio-economic and demographic characteristics against their populations in the UK. Indicators include eligibility for FSM, gender, ethnicity, special educational need status, first language, looked-after status, school type, locality (POLAR and IMD) and intersectionality between measures.

4.1.2 Attainment a National Picture

The following section provides an overview of national administrative data for pupil attainment test scores across all key stages from compulsory schooling to post-16 education (level 3 qualifications). The data is published on a regular basis by the DfE. Progress measures

[5] HE/alternative providers and English Further Education Colleges.

include qualifications that count towards school performance tables at various key stages. Key stage assessments / exams measure how well a child is progressing against expected standards / targets set for children aged 3-18 years within the National Curriculum. Table 1b, provides a description of the KS2, KS4 and KS5 test measures.

Table 1b: School Attainment Across the Key Stages

Key Stage	Description
Key Stage 2 (ages 7-11)	By the age of 11 pupils' take SATs tests in reading, maths, grammar, punctuation, and spelling (GPS) and receive a teacher assessment (TA) in writing. To reach the expected standard a pupil must achieve a scaled score of 100 or more in reading and maths tests and an outcome of 'reaching the expected standard' or 'working at greater depth' in the writing TA. At the end of Key Stage 2 children are expected to be at level 4 or above.
Key Stage 4 (ages 14-16)	Pupil KS4 attainment measures include attainment 8 scores for GCSE and equivalent entries and achievements at the end of key stage 4[iv] across state-funded schools[6] (including academies and CTCs) in England. The DfE (2020) outline that attainment 8 measures the average achievement of pupils in up to 8 qualifications. This includes English (double weighted if both GCSEs in language and literature are taken); maths (double weighted); three further qualifications that count in the English Baccalaureate (EBacc); and three further qualifications that can be GCSE qualifications (including EBacc subjects) or any other non-GCSE qualifications on the DfE approved list.
Key stage 5 (ages 16-18)	The DfE provide data on the percentage of students achieving at least 2 substantial level 3 qualifications in England. Qualifications included are those that are at least the size of an A level (180 guided learning hours per year), such as a BTEC subsidiary diploma level 3. If a qualification is equal in size to 2 A levels it is counted as 2 substantial level 3 qualifications.

Table 1c presents data on the proportions of pupils making the expected levels of progress and / or performance for all key stages in compulsory and post-16 education across several academic years. Due to qualification reforms and significant changes in measurement, data for some years has been omitted, as it is not possible to make valid comparisons. The data shows that across the EYFSP, KS1, KS2 and KS5 there has been a general pattern of improvement in attainment scores. Conversely, KS4 average Attainment 8 scores have decreased across the time period from 48.4% to 46.7% (a 1.7 percentage point decrease). Since 2017/18 scores have started to slowly recover.

Table 1c: Percentage of pupils by key stage meeting expected levels of progress (England)

Level*		Age (years)	Measure	14/15	15/16	16/17	17/18	18/19
EYFSP		3-5	Achieving a good level of development	66.3%	69.3%	70.7%	71.5%	71.8%
KS1	Reading TA	5-7	Achieving expected standard		74%	76%	75%	75%
	Writing TA				65%	68%	70%	69%
	Maths TA				73%	75%	76%	76%
	Science TA				82%	83%	83%	82%
KS2		7-11	Achieving expected standards in reading, writing and maths		53%	61%	64%	65%
KS4		14-16	Attainment 8	48.4%	49.9%	46%	46.5%	46.7%
KS5		16-18	Achieving at least 2 substantial level 3 qualifications			85%	83.7%	87.7%

Data sourced from the DfE. Data for Key stages 1, 2 and 4 refer to state-funded schools including academies, free schools, city technology colleges, further education colleges with provision for 14 to 16-year-olds and state-funded special schools. They exclude independent schools, independent special schools, non-maintained special schools, hospital schools, pupil referral units and alternative provision (academy and free school alternative provision).

4.1.3 Destinations and HE Participation a National Picture

This section provides a summary of research and data that outlines how prior attainment is associated with educational trajectories in England and the UK. This includes a consideration of the importance of school attainment across key stages, the proportions of pupils' progressing from level 3 qualifications to HE and the proportions of young people participating in HE. The section ends with a consideration of the relative strengths and weaknesses of national HE administrative datasets.

4.1.4 Destinations of KS4 Students and Prior Attainment

Evidence suggests that the most significant predictor of attainment is prior attainment levels achieved early in life. The Department for Schools, Families and Children (DCSF, 2009) report that lower-attaining pupils at the end of the EYFSP continue to perform poorly at KS1 and KS4. Goodman and Gregg (2010) found that prior attainment accounts for 60% of the variance in KS4 test scores. Pupils require a good level of KS4 attainment to enable them to progress to a level 3 qualification, which is the usual prescribed route into HE. The DfE (2016-2019) provide data on the destinations of pupils from state-funded schools that progress to or remain in an education and/or employment destination[v] in the academic year after completing compulsory schooling (key stage 4) in England. Destinations of young people progressing to sixth-form schools and colleges remained static over the 3-year period from 2014/15 to 2016/17 (52%) and fell by 3 percentage points (49%) in 2017/18, although destinations (all forms of education) have increased by 4 percentage points 2010/11 (from 82% to 86%) (DfE, 2020). This rise in part may be attributed to the 2013/14 Raising the Participation Age (RPA) policy (see chapter 2).

The DfE (2020) provide an analysis of key stage 4 student destinations after taking prior attainment into account. Pupils' achievements both at the end of key stages 2 and 4, have a strong relationship with the likelihood of staying in education and employment. In 2017/18, 22% of pupils with low attainment progressed (from England state-funded mainstream schools) to either a school sixth form, sixth form college or other education destination[vi], compared to 39% of middle-attaining pupils and 70% of high attaining pupils. Low prior attainers were less likely to have any sustained destination (69%) and only 10% of them entered HE in the year after 16 to 18 study compared to 54% entering, HE from the high prior attainment group.

4.1.5 Destinations of Level 3 Students

Key stage 5 attainment is highly dependent on Key Stage 4 outcomes. Pupils are much more likely to achieve 2 or more A-Levels if they had met the Key Stage 4 threshold of 5 A*-C including English and Maths' (DCSF, 2009). The DfE (2016-2020) provide data on the sustained destinations of level 3[vii] students (aged 16-18 in state-funded mainstream schools and colleges) and their progression rates to HE[viii] (further education, apprenticeship, or training providers in England) at level 4 or higher. Recent data reports on students who completed 16 to 18 study in the 2015/16 academic year and identifies their education and/or apprenticeship destinations in the two years following their last attendance at a 16 to 18 institution. Of the students that completed level 3 qualifications in 2015/16, 62% progressed to a sustained HE or training destination within two years.

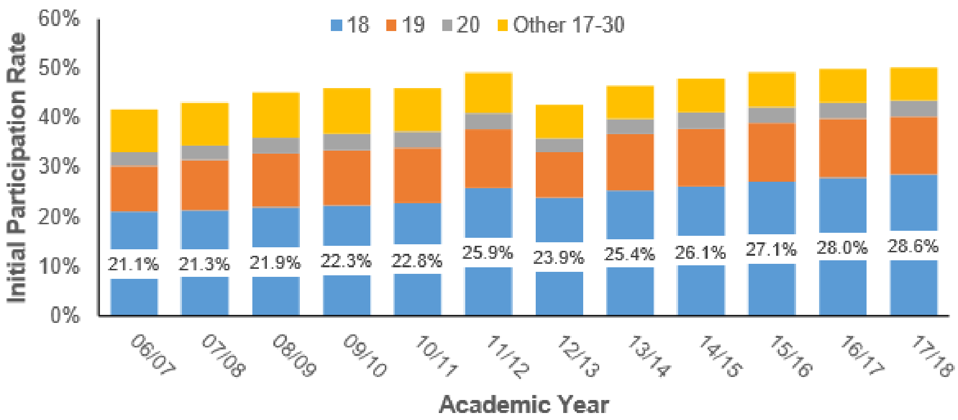
4.1.6 HE Acceptance Rates

UCAS data shows that in 2006, 24.8% of 18-year-olds from England were accepted to start an undergraduate course. Over most years from 2006 to 2019 acceptance rates have increased, with 2019 having the highest acceptance rate (35%). The exception to this is in 2012, when the new student fees regime was implemented, which saw just over a one percentage point fall on the previous year.

4.1.7 HE Entry Rates

The DfE (2019) provide data on the latest Higher Education Initial Participation Rate (HEIPR) estimates spanning from 2006/07 to 2017/18 (provisional). The HEIPR is an estimate of the likelihood of a young person (English-domiciled) participating for the first time in HE in the UK (HE Institutions, and at English, Welsh, and Scottish Further Education Providers) between the ages of 17-30. Population data is obtained from ONS estimates. Figure 1 shows that 28.6% of 18-year-olds participated in HE in 2017/18, a 0.6% increase from the previous year. In 2017/18 the participation rate for 17–30-year-olds had reached the highest level (50.2%). The participation rate of 17–30-year-olds has increased most years across the time series, with the exception of 2012/13 when the new tuition fees were implemented.

Figure 1: Higher Education Initial Participation Rate for 17- to 30-year-olds



Source: Department for Education (2019) Participation Rates in Higher Education

4.1.8 Limitations of Data

Within both national school attainment and HE progression datasets, there are several limitations concerning data coverage, missing data, and consistency of measures due to changes to definitions over time. These limitations are important to understand, as the next chapter reviews these datasets to determine how attainment and HE participation are stratified by pupil characteristics. This section provides a general overview of limitations and more specific issues will be dealt with later. It is important to note that UCAS data reports on application and acceptance rates which may differ from the actual numbers of HE entrants reported within DfE, OfS and HESA datasets. Other important limitations include:

Full and Part-time HE participation: UCAS analysis includes full-time HE acceptances only, whereas datasets from the OfS and HESA and the DfE provide HE participation rates for both full and part-time students. Part-time undergraduates make up 15% of the student-entrant population and evidence suggests this cohort is more likely to be from disadvantaged backgrounds (OfS, 2020).

School Type: DfE (level 3 destinations data), HESA, UCAS and OfS HE progression data is only provided for state-funded mainstream schools and colleges and excludes independent schools, special schools (although the DfE HEIPR measure includes special schools) and pupil referral units (PRUs). Further, DfE attainment statistics at all key stages excludes the performance of pupils within independent schools. Independent schools are excluded from these measures as they have no statutory requirement to follow the national curriculum nor provide pupil background data via the schools' census (PLASC). Pupils from both PRUs and special schools are less likely to progress to HE than pupils from most other school types. The OfS (2019) outline that on average only 1% of pupils from special schools, 74% of pupils from independent schools and just over 40% of pupils' from mainstream schools and colleges entered HE. These differences in characteristics between schools that are and are not included within various school attainment and HE progression measures provide an obvious source of bias.

Populations: there are further limitations in the coverage of HE progression datasets. Administrative datasets report on those who are underrepresented in HE in several ways. HESA data and some UCAS datasets are based on the composition of various socio-economic and demographic characteristics of HE student entrants and applicants, respectively. These data are limited in that they do not consider those with the same characteristics from the wider population not participating in HE. More valid datasets consider the HE participation rates between two groups based (e.g., males vs females) on the size of their population in the UK or England and are often based on DfE populations at key stage 4. When available the current review includes the latter metric.

Missing data and consistency of metrics: Other limitations affecting the comparisons of attainment levels and HE[7] participation rates include missing data for indicators of disadvantage leading to bias (this will be discussed in more detail later), differences in measurement between organisations and changes to measurements over time which make comparisons difficult. One major limitation of UCAS data is that they deal with most, but not all applications and acceptances to HE institutions. Most notably data excludes students studying at the Open University (OU) which has the largest number of undergraduates aged 17-25 in the UK. This omission is likely to create bias, as for most OU courses students' entry is not dependent on previous academic achievements, and they are the largest HE provider for students with disabilities (OU annual report 2010/2011). These limitations apply to many of the contextual measures that are reviewed in this chapter.

4.1.9 Contextual Measures: Inequalities in School Attainment and HE Progression

Evidence suggests that within the UK differences in educational achievement emerge early in life and continue throughout a pupil's compulsory education (DCSF, 2009, The Sutton Trust, 2010, DfE, 2016-2020). In consequence low attaining disadvantaged pupils' are less likely to continue into post-16 education and HE[8] than young people from more advantaged backgrounds (Gorard, Rees and Fevre, 1999, DfE, 2009, 2016-2020). Prior attainment through

[7] Higher education includes university and college institutions that offer courses of degree level or above.

all key stages is the primary factor that accounts for disadvantaged pupils' lower participation in HE (DCSF, 2009; Harris, 2010; Gorard, See and Davies, 2012; Chowdry, Crawford, and Goodman, 2010; Walker and Zhu, 2013; Davies, Qiu, and Davies, 2014; DfE, 2016-2020). This chapter summarises data from national administrative datasets (DfE, UCAS, HESA, OfS and HEFCE) to determine the extent to which patterns in school attainment and HE progression rates for young people are stratified by pupil and family characteristics. Measures of disadvantage are widely employed within national administrative datasets to monitor and report on inequalities and by WP outreach programmes to ensure programmes target those most under-represented in HE. Measures employed across the sector include individual pupil and family factors such as parental HE background, parental income (often measured via FSM), gender, ethnicity, disability / in care status; the type of school attended and neighbourhood measures of disadvantage. The following chapter reviews what these WP datasets can tell us about attainment (KS4 and KS5), post-16 destinations and HE participation rates of disadvantaged and advantaged groups. This includes an examination of the strengths and weaknesses of each indicator in terms of coverage, missing data, consistency of definitions and the time lag of data underpinning these indicators. The review where possible will focus on evidence in relation to participation rates of young people (aged below 20 years of age) in HE domiciled within England or the UK.

4.1.10 Individual Level and Family Data

Individual-level datasets sourced directly from families, pupils' and schools / colleges are often used within official statistics to compare attainment and HE participation outcomes of advantaged and disadvantaged groups. This chapter presents this data with reference to indicators of parental occupation, parental education, FSM status, ethnicity, gender / sex, disability status, first language and in-care status. Generally, these measures are seen as more robust (Gorard, 2018) than aggregate / proxy-based measures of disadvantage derived from the type of school attended and area-level statistics (e.g., IMD, and IDACI) which will be discussed later.

4.1.11 Social Class

Within the fields of economics, education, and sociology a number of indicators have been employed as proxy measures for social class. There is a lack of consensus on how social class should be defined and measured. Differences in definition occur dependent on whether class is viewed as a social process such as a person's cultural background ('cultural capital') or dependent on a person's occupation (Stevenson and Lang, 2010). Social class is often defined as how people in society are stratified (hierarchically or relative to one another). Throughout the 20th Century, the class system was often described of as consisting of lower, middle, and upper classes. However, evidence from the British Class Survey (Savage, 2016) suggests that as a result of increasing levels of inequality, there are now seven distinct social classes within Britain. The most widely recognised measure of social class is the National Statistics Socio-economic Classification (NS-SEC)[ix]. This is a relational occupation-based classification developed to categorise economically active adults and their dependents to provide an indication of socio-economic position. The classification comprises eight analytical groups, which are further divided into 17 operational categories. Occupations are assigned to a social economic group (SEG) which ranges from 1-8. Advantaged groups are often defined as classes 1-3 and disadvantaged 4-7. National NS-SEC data sets for England and Wales are collected every 10 years within the Census.

4.1.12 Limitations of Data

In the past NS-SEC was employed widely within HE outreach programmes to target disadvantaged pupils' and published within HESA widening participation KPIs (up to 2016), UCAS and DfE reports. However, this measure is no longer employed as a KPI, due to issues with validity and reliability. Issues include changes in measurement (via the 2001 and 2011 census), the accuracy of data provided on parental occupation, difficulties in coding occupations and missing data. NSEC data is missing for around 20-25% of UCAS records of which a high proportion are from disadvantaged backgrounds (Hatt, Baxter and Tate, 2009). This makes unknown class the largest applicant group. Gorard (2018) outlines that as data is only available for, HE applicants and entrants, it is not possible to clearly identify who is missing from HE. Further, Gorard (2008) points out it is not clear how students' occupational status should be classified for WP programmes, as the occupations of both parents may differ, the parents may be separated and for more mature students assigning occupation on their parent's occupation is quite absurd. Due to these limitations and lack of validity, this review does not present attainment and HE progression datasets that rely on NS-SEC as a measure of disadvantage.

4.1.13 Parental Education

This section considers the evidence for the association between a parent's educational qualifications and those of their children.

4.1.14 Parental Education and Attainment

There are no national population-based datasets that examine the extent to which parent qualifications influence their child's attainment or participation in HE. However, research studies provide evidence to support such an association. Morris and Rutt's (2006) evaluation of the Aimhigher Excellence Challenge programme found that children whose parents were educated to degree level obtained the highest GCSE grades, followed by parents who had at least stayed on in education to age 16. The Longitudinal Study of Young People in England (DCSF, 2009) tracked the outcomes of 15,000 young people. The study found that 78% of pupils with a Level 4 in Key Stage 2 Maths later achieved a C or above in GCSE Maths if their parents had a degree. This proportion fell to 43% for those with a Level 4, whose parents had no qualifications. Evidence suggests that 'the achievement gap is almost entirely accounted for by the fact that children with degree-educated parents are more likely to attend higher-performing secondary schools and so benefit from a positive school effect' (The Sutton Trust, 2010, p.4).

Dearden, Sibieta, and Sylva's (2011) analysis of the LYPSE study (Longitudinal study of young people in England) found that parent education accounted for the largest amount of variance (18%) in cognitive development between rich and poor children that are evident at age 3. Greenman, Bodovski and Reed (2011) suggest that mothers who are better educated provide higher levels of early education-oriented parental practices which are associated with higher pupil attainment during the early school years. However, findings from Chowdry, Crawford, and Goodman (2010) and Goodman and Gregg's (2010) review found that the influence of parental attainment (and family background) on their child's attainment significantly diminishes by the time they reach 16, and accounts for only 6% of the variance in KS4 exam scores.

4.1.15 Parental Higher Education Experience

Higher education WP programmes often target pupils whose parents do not hold a HE level qualification, as it is suggested that educational outcomes and trajectories are engrained across families. Gorard, Rees and Fevre (1999) found that patterns of participation in education and training seem to run in families. Forty-six per cent of children who were lifelong learners had parents who were lifelong learners. Sixty-one per cent of children who did not participate in lifelong learning had parents who have followed a similar trajectory. Biggart *et al.,* (2004) found that parents were the most significant source of advice for continuing in education and these choices were associated with their parents' occupational class. Children with parents from higher-class backgrounds had higher aspirations to HE than lower-class students.

4.1.16 Limitations of Data

There are no published national datasets that show if there is an association between parents' HE background and their child's likelihood of participating in HE. The only support for the importance of this factor comes from theory (e.g., cultural capital theory, see chapter 3) and research studies that are sample-based. As data is not available for the whole population it is not possible to determine if this factor is associated with under-representation in, HE (Gorard *et al.,* 2018). Gorard suggests that parental HE background on itself cannot be the only important factor in determining if their child goes to HE, as since 1963 HE participation rates have significantly risen from 6% (The Robins Report, 1963) to 50.2% in 20017/18 (DfE, 2019). Therefore, if parental HE alone was the major variable in predicting their child's participation, we would expect participation rates to be static.

4.1.17 Free School Meals (FSM)

A pupil's FSM status is regularly employed as a proxy measure of income and disadvantage. There are several DfE measures including whether a pupil is in receipt of FSM, FSM eligible or has been eligible in the last six years (FSM6). FSM status is collected nationally by the DFE within the pupil-level annual school census (PLASC) and is recorded via binary 'yes' or 'no' response. Those eligible or claiming FSM are from some of the lowest-income households in the UK. FSM[x] is a means-tested benefit provided to eligible children up to year 11 if they are from a low-income household. DfE data for state-funded secondary schools in England shows that the proportion of pupils known to be eligible and claiming FSM meals has decreased slightly from 14.6% in 2011 to 14.1% in 2019. Gorard (2012) analysis of 2007 PLASC data found that FSM eligible pupils' are more likely to be Black African, Pakistani, or Bangladeshi, have an SEN and in care status, moved schools recently, live in areas of low income and are less likely to speak English as a first language.

4.1.18 KS4 Attainment by FSM

DFE data presented in table 2 shows that eligible FSM pupils (aged 11, 16 and 19 years) perform poorly compared to their peers across all key stages. The DfE (2019) key stage 4 (average attainment 8 scores) reports that scores have fallen for both FSM (2.1 percentage points) and all other pupils (1.7 percentage points) from 2014/15 to 2018/19. During this period the gap in attainment 8 scores between FSM and all other pupils has increased slightly from 13.3 percentage points to 13.7 percentage points. Due to changes in methodology scores are not comparable across the time series.

Table 2: Average Attainment 8 score per pupil by free school meals (FSM) (state-funded schools, academies, and CTCs in England)

FSM status	2014/15	2015/16	2016/17	2017/18	2018/19
FSM	37.0	39.0	35.0	34.4	34.9
all other pupils'*	50.3	51.6	48.0	48.3	48.6
All pupils'	**48.4**	**49.9**	**46.3**	**46.5**	**46.7**

Source DfE (2020) Characteristics summary: GCSE and equivalent entries and achievements of pupils at the end of key stage 4 by pupil characteristics years: 2014/15 to 2018/19
* All other pupils', includes those known not to be eligible for free school meals or with an unclassified status

4.1.19 KS5 Attainment by FSM

Evidence from the DCSF Youth Cohort Study (2007) suggests that even when young people achieve similar attainment up to age 16, inequalities can still emerge. Low-income pupils' who achieved 5 or more A-C * GCSEs were less likely to obtain the equivalent of two or more A-levels than their more advantaged peers (DfE, 2009).

4.1.20 HE Progression Rates from Level 3 Courses by FSM

The DfE (2016-2020) provide data on the sustained destinations of level 3 students by FSM status after 16-18 study and their progression rates to HE (further education, apprenticeship, or training providers in England) at level 4 or higher. The most recent data reports on students who completed 16 to 18 study in the 2015/16 academic year and their destinations two years later (earlier data has been omitted from the table due to changes in measurement). The data within table 3, shows that FSM students were much less likely to progress to HE than all other students with a 3 to 6 percentage point gap across all cohorts. The DfE (2020) report that although FSM pupil progression rates are lower, they are higher than would be expected once prior attainment and qualification type are considered.

Table 3: Destinations of level 3 students by FSM after 16-18 study (at state-funded mainstream schools and colleges) and their progression rates to HE (further education, apprenticeship or training providers in England) at level 4 or higher

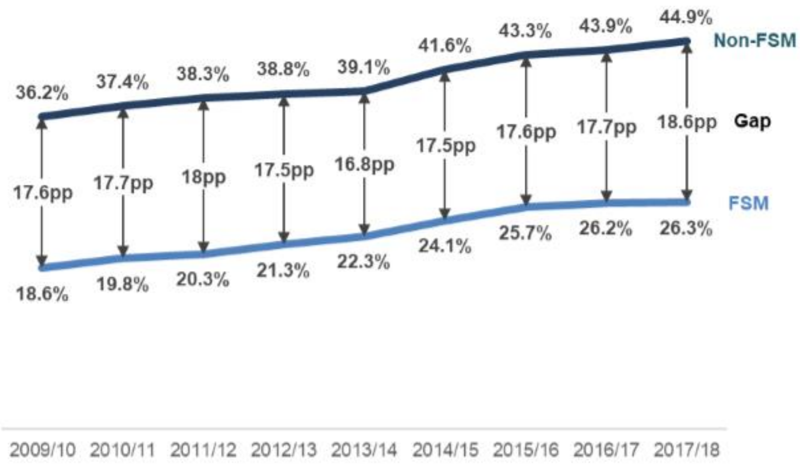
FSM status	2013/14 cohort (1 year after level 3)	2014/15 cohort (1 year after level 3)	2015/16 cohort (2 years after level 3)
FSM	43%	46%	56%
All other students	49%	51%	59%

Source: Department for Education (2020) Progression to higher education or training, England

4.1.21 HE Entry Progression Rates of the KS4 Population by FSM

National data on HE acceptances and entry rates of FSM students are provided by both UCAS and the OfS respectively. This data has been excluded from this review as it is based on only those applying and entering HE and excludes the non-participant population. These measures lack validity as variations in HE progression rates could be due to fluctuations in those eligible to claim and changes in FSM / non-FSM pupils' attainment rates. DfE data addresses these issues by providing data on the whole population of pupils' who were and were not in receipt of FSM aged 15 in 2013/14 and who entered HE by age 19. Figure 2 (DfE, 2019) shows that the HE progression rate for non-FSM pupils' has increased from 36.2% (2009/10) to 44.9% (2017/18), which amounts to an 8.7 percentage point increase. Over the same period, the FSM eligible cohort has risen from 18.6% to 26.3% (a 7.7 percentage point increase), but this remains the largest gap with non-FSM students since 2006/07. Over a nine-year period, the gap between FSM and non-FSM entrants has increased from 17.6 percentage points in 2009/10 to 18.6 percentage points in 2017/18. In 2009/10 the non-FSM eligible cohort was 1.9 times more likely to enter HE than the FSM eligible cohort and this gap decreased each year to 1.7 times more likely in 2017/18.

Figure 2: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by Free School Meal status, Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort

4.1.22 Limitations of Data

Gorard *et al.*, (2018, p.24) suggest that 'FSM has many advantages as an indicator of SES background and is …. one of the most comprehensive and accurate measures of SES available'. It is available for most pupils' via the NPD, it 'has a clear and consistent legal definition in which a child either is or is not FSM-eligible based on benefits' and this makes it reliable and easy to compare patterns of participation over the years. They suggest that FSM is improved as an indicator of relative poverty if the measure refers to the number of years a student has been eligible as their circumstances may change.

There are issues relating to the coverage of FSM data. Firstly, the DfE (2012) report that 18% of 15-year-olds (from state schools in England) claimed FSM and a further 3% were entitled but did not claim (this represents a 14% under-registration rate). Further, Gorard (2012) analysis of the NPD found that around 11% of KS4 pupils' FSM status is unknown for state-maintained and private schools in England. Seven per cent of these were from fee-paying independent schools and performed more poorly in terms of KS4 attainment. Further, employing FSM as a proxy indicator for income is an oversimplification, as some on the fringes miss out and the measure does not into account a person's actual assets and wealth. Hobbs and Vignoles (2010) outline how receiving FSM could lift some families out of the lowest-income households, pushing them above low-income households who were not eligible to receive FSM. However, despite these limitations, this measure does provide a valid and reliable individualised indicator of HE participation inequalities.

4.1.23 Ethnicity

Within the field of sociology, ethnicity is often used to refer to a shared identity that is often characterised by a common ancestry, language, culture, religion, and beliefs (Cornell and Hartmann, 2007). The DfE (2019) report that at the end of key stage 4, the ethnicity of pupils was 75% White, 10.7% Asian, 5.7% Black, 5.0% Mixed, 0.4% Chinese and 3.2% were either unclassified or from any other ethnic background.

4.1.24 KS4 Attainment by Ethnicity

DfE (2019) analysis of key stage 4 (average attainment 8) scores for pupils' in state-funded schools in England, shows that there are major disparities between ethnic groups (see table 4). Chinese, Mixed and Asian groups' Attainment 8 scores were above the national average (46.7%) whereas, White and Black pupils were below. In 2018/19 Chinese students obtained the highest attainment 8 scores (64.3%), followed by Asian (51.2%), Mixed (47.6%), White (46.1%) and Black pupils' (44.9%). These patterns have been consistent since 2014/15. During the time-period, the scores for some groups have fallen, including Black pupils' (2.3 percentage points), White pupils' (2 percentage points), and Mixed pupils' (1.8 percentage points). Conversely, scores for Chinese pupils increased by 3.2 percentage points whereas Asian pupils' have remained relatively static. At a finer level, the data shows that both the Gypsy / Roma and travellers of Irish heritage groups are the lowest performing with a decrease in scores (2.6 percentage points). Only the Black Caribbean ethnic group and unclassified group have seen larger decreases over the period.

Table 4: Average Attainment 8 score per pupil by Ethnicity (England state-funded schools)

Ethnic group	2014/15	2015/16	2016/17	2017/18	2018/19
White	**48.1**	**49.7**	**45.9**	**46.1**	**46.1**
white British	48.2	49.8	45.9	46.1	46.2
Irish	52.9	54.5	51.6	52.2	52.1
traveller of Irish heritage	24.0	29.3	23.8	21.9	26.6
Gypsy / Roma	18.6	20.4	18.0	18.2	19.1
any other white background	48.0	49.5	46.5	47.0	46.8
Mixed	**49.4**	**50.5**	**47.0**	**47.3**	**47.6**
white and black Caribbean	44.9	46.3	41.3	41.3	41.0
white and black African	49.8	50.2	47.1	46.5	47.4
white and Asian	53.5	54.5	51.8	52.5	53.2
any other mixed background	51.0	51.8	48.8	49.1	49.2
Asian	**51.1**	**52.5**	**49.8**	**50.4**	**51.2**
Indian	56.0	57.0	55.4	56.3	57.3
Pakistani	46.8	48.5	45.0	45.7	46.2
Bangladeshi	51.0	52.1	49.9	49.6	50.6
any other Asian background	53.4	55.0	52.3	53.6	54.5
Black	**47.2**	**48.7**	**44.8**	**45.0**	**44.9**
black Caribbean	44.4	45.4	40.5	39.6	39.4
black African	48.9	50.3	46.9	47.5	47.3
any other black background	45.1	47.0	42.6	43.0	43.0
Chinese	**61.1**	**62.4**	**62.6**	**64.2**	**64.3**
any other ethnic group	49.7	50.2	46.8	47.2	47.3
Unclassified	46.3	44.0	40.1	40.0	40.5
All pupils'	**48.4**	**49.9**	**46.3**	**46.5**	**46.7**

Source DfE (2020) characteristics summary: GCSE and equivalent entries and achievements of pupils at the end of KS4 by pupil characteristics (2014/15 to 2018/19)

4.1.25 HE Progression from Level 3 Courses by Ethnicity

The DfE (2016-2020) provide data on the sustained destinations of level 3 students by ethnicity after 16-18 study and their progression rates to HE at level 4 or higher. The 2015/16 data is not comparable to previous years due to changes in methodology. Table 5 summarises HE progression rates by ethnic group. Patterns in HE progression are consistent with Chinese pupils' having the highest rates, followed by Asian, Black, Any other, Mixed, White, and lastly the unclassified ethnic group. Most ethnic groups saw an increase in progression rates from 2013/14 to 2014/15 with the exception of Chinese pupils. When looking at patterns of HE progression for the 2015/16 cohorts, it can be seen that the Gypsy / Roma ethnic group have the lowest HE participation rate (30%), followed by White British (55%) and White and Black Caribbean groups (56%). The DfE (2020) report that pupils' from a Black ethnic group, followed by any other ethnic group, Asian and Chinese ethnic group progression rates to HE are higher than would be expected once prior attainment and qualification type are considered. Whereas White pupils' have lower progression rates than would be expected.

Table 5: Destinations of level 3 students by ethnicity after 16-18 study (at state-funded mainstream schools and colleges) and their progression rates to HE (further education, apprenticeship, or training providers in England) at level 4 or higher

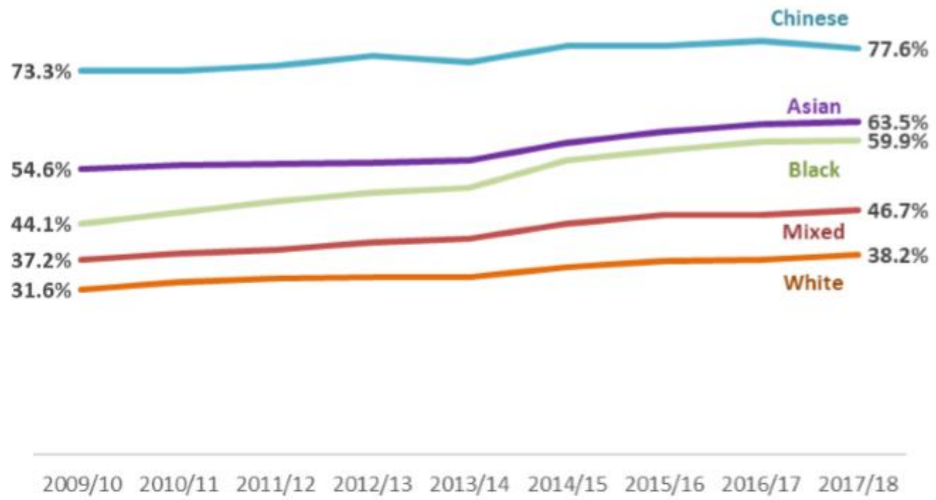
Ethnic group	2013/14 cohort (1 year after level 3)	2014/15 cohort (1 year after level 3)	2015/16 cohort (2 years after level 3)
White	**45**	**47**	**55**
white British	45	47	55
Irish	53	56	63
traveller of Irish heritage	58	19	X
Gypsy / Roma	31	24	30
any other white background	51	52	59
Mixed	**51**	**54**	**62**
white and black Caribbean	45	47	56
white and black African	52	55	63
white and Asian	56	59	65
any other mixed background	53	55	62
Asian	**64**	**66**	**71**
Indian	69	70	75
Pakistani	60	62	66
Bangladeshi	62	67	72
any other Asian background	64	66	71
Black	**62**	**64**	**70**
black Caribbean	50	54	61
black African	68	68	73
any other black background	57	60	67
Chinese	**74**	**74**	**77**
any other ethnic group	**60**	**61**	**67**
unclassified[1]	40	43	58
All students	**48**	**50**	**59**

Source: Department for Education (2020) Progression to higher education or training, England.

4.1.26 HE Progression Rates by Ethnicity

The DfE (2019) provide an analysis of HE entry rates of 15-year-old pupils' (from state-funded and special schools) by ethnic group who entered HE in the UK (HE providers and further education colleges) by age 19. Figure 3 shows that HE entry rates have increased for all ethnic groups from 2009/10 to 2017/18. During this time-period, the Chinese cohort was more likely to progress to HE relative to the proportions within the population, followed by the Asian, Black, Mixed cohort and the White cohort having the lowest HE progression rate. Across the period the Black cohort has seen the largest percentage point increase (15.8) followed by White (6.6) and the Chinese (4.3) cohort has seen the smallest percentage point increase. When comparing the ethnic groups with the highest and lowest progression rates, the gap between Chinese and White pupils' has decreased from 41.7 percentage points in 2009/10 to 39.4 percentage points in 2017/18. In 2009/10 Chinese pupils were just over 2.3 more times likely to progress to HE than White pupils' and this decreased to just over 2 times more likely in 2017/18. UCAS (2019) acceptance data report similar patterns of HE participation.

Figure 3: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by Ethnic Group Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education

4.1.27 Limitations of Data

One major limitation with most of these datasets is that disparities in HE participation rates are reported in terms of high-level ethnic codes which can mask disparities within ethnic sub-groups (e.g., Gypsy / Roma pupils'). Further, Gorard (2018) points out that within the NPD, ethnicity has similar amounts of missing data to that of FSM and SEN. Further, ethnicity is a self-reported characteristic and has no standardised definition or meaning. Gorard (2018, p.34) suggests that ethnicity is 'not a particularly reliable or valid indicator' of disadvantage, as it may serve as a proxy indicator for other forms of disadvantage (Strand, 2007).

4.1.28 Gender

Data from the DfE (2018/19) outlines that in the UK 51.5% of KS4 pupils were male and 48.5% were female. The statistics that follow vary in terms of categorisation, where some organisations rely on self-reported sex or biological gender.

4.1.29 KS4 Attainment by Gender

The DfE (2019) key stage 4 average attainment 8 scores by gender in state-funded schools in England show that across all years' female pupils outperform male pupils' (see table 6). However, scores have fallen for both boys (2.3 percentage points) and girls (1.2 percentage points) from 2014/15 to 2018/19. During this period the gap in attainment 8 scores between boys and girls has increased slightly from 4.4 percentage points to 5.5 percentage points.

Table 6: Average Attainment 8 score per pupil by gender (England – state-funded schools)

Gender	2014/15	2015/16	2016/17	2017/18	2018/19
Boys	46.3	47.7	43.7	43.8	44.0
Girls	50.7	52.3	49.0	49.3	49.5
All pupils'	**48.4**	**49.9**	**46.3**	**46.5**	**46.7**

Source DfE (2020) -Characteristics summary: GCSE and equivalent entries and achievements of pupils at the end of key stage 4 by pupil characteristics years: 2014/15 to 2018/19

4.1.30 HE Progression from Level 3 Courses by Gender

The DfE (2016-2020) provide data on the sustained destinations of level 3 male and female students after 16-18 study and their progression rates to HE at level 4 or higher. The 2015/16 data is not comparable to previous years due to changes in methodology. The data within table 7 shows that male students were much less likely to progress to HE than female students with a 3 to 5 percentage point gap across cohorts. Although male pupils progression rates are lower, the progression gap drops markedly with female pupils' once prior attainment and qualification type are considered (DfE, 2020).

Table 7: Destinations of level 3 students by gender after 16-18 study (at state-funded mainstream schools and colleges) and their progression rates to HE (further education, apprenticeship, or training providers in England) at level 4 or higher

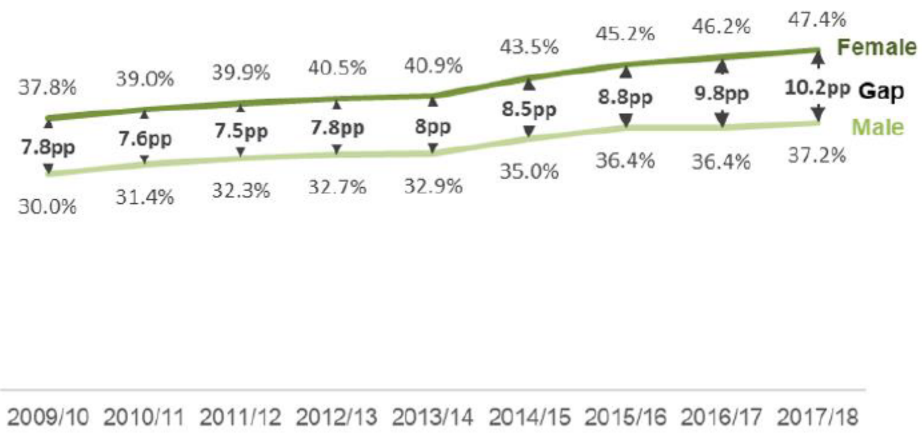
Gender	2013/14 cohort (1 year after level 3)	2014/15 cohort (1 year after level 3)	2015/16 cohort (2 years after level 3)
Males	47%	48%	57%
Females	49%	53%	60%

Source: Department for Education (2020) Progression to higher education or training, England

4.1.31 HE Progression Rates by Gender

The DfE (2019) provide an analysis of HE entry rates of 15-year-old pupils by gender who entered HE by age 19. Figure 4 provides a summary of this data and shows that progression to HE varies significantly by sex. Across the nine-year period in every year, females are more likely to progress to HE than males. The proportion of both females and males progressing to HE has increased relative to their numbers in the population. Across the period females have seen the largest percentage point increase (9.6) and males (7.2). The gap in progression rates between females and males has increased from 7.8 percentage points in 2009/10 to its highest level of 10.2 percentage points in 2017/18. In 2009/10 females were almost 1.3 more times likely to progress to HE than males and this ratio has not changed in 2017/18. Both UCAS (2019) and the OfS (2019) present similar findings of participation by gender and sex respectively.

Figure 4: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by gender Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort – Official Statistics.

4.1.32 Limitations of Data

Data on gender is relatively easy to measure and collect and in turn, this provides a useful measure of inequalities in HE inequality. However, it is likely that such disparities are caused by other factors such as prior attainment.

4.1.33 Disability

There are various definitions of what constitutes a disability and categorisation includes either learning difficulties, physical disabilities, or both. The Children Act 1989 states that: *A child is disabled if he is blind, deaf, or dumb or suffers from a mental disorder of any kind or is substantially and permanently handicapped by illness, injury or congenital deformity or such other disability as may be prescribed* (Section 17 (11). The DfE (2019, p.4) report that across all school types in the UK, '14.9% of all pupils' have special educational needs…., with 3.1% of all pupils' having an Education, Health, and Care plan. The number of pupils with special educational needs (SEN) has increased in recent years (DfE, 2019).

4.1.34 KS4 Attainment by SEN Status

Through the school census (PLASC) the DfE collect data on pupil SEN status. SEN refers to whether a pupil has learning difficulties or disabilities that make it harder for them to learn compared to children of the same age. This includes pupils with SEN support, statements of SEN or an education, health, and care (EHC) plan (DfE, 2019). The DfE (2019) report that the attainment difference between pupils with SEN and no SEN remains the largest gap compared to all other pupil characteristics reported within DfE statistical releases. The DfE (2019) key stage 4 average attainment 8 scores by SEN status in state-funded schools in England, presented in table 8 shows that across all years' pupils with no identified SEN outperform SEN pupils'. However, scores have fallen for both pupils with no identified SEN (2.1 percentage points) and pupils' with an SEN (2.4 percentage points) from 2014/15 to 2018/19. During this period that gap in attainment 8 scores between pupils with and without an SEN has increased slightly from 22 percentage points to 22.3 percentage points.

Table 8: Average Attainment 8 score per pupil by Special Educational Needs (SEN)

SEN Status	2014/15	2015/16	2016/17	2017/18	2018/19
No identified SEN	52.0	53.2	49.5	49.8	49.9
All SEN pupils'	30.0	31.2	27.1	27.2	27.6

Source DfE (2020) Characteristics summary: GCSE and equivalent entries and achievements of pupils at the end of key stage 4 by pupil characteristics (reports 2014/15 to 2018/19)

4.1.35 HE Progression from Level 3 Courses by SEN Status

The DfE (2016-2020) provide data on the sustained destinations of level 3 students by SEN[xi] status after 16-18 study and their progression rates to HE (further education, apprenticeship, or training providers in England) at level 4 or higher. The 2015/16 data is not comparable to previous years due to changes in methodology. Table 9 shows that SEN students were much less likely to progress to HE than all other students with a 6 percentage-point gap in 2013/14 and rising to 9 percentage points in 2015/16. The DfE (2020) report that although SEN pupils' progression rates are low, they are higher than would be expected once prior attainment and qualification type are considered.

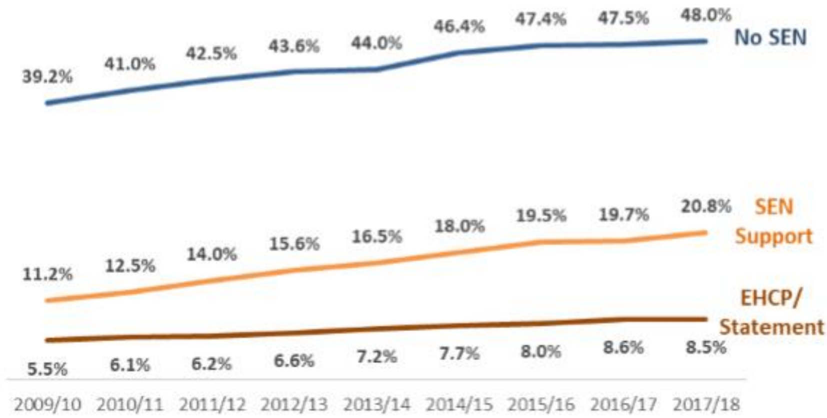
Table 9: Destinations of level 3 students by SEN after 16-18 study (at state-funded mainstream schools and colleges) and their progression rates to HE (further education, apprenticeship, or training providers in England) at level 4 or higher

Special Educational Needs (SEN)*	2013/14 cohort (1 year after level 3)	2014/15 cohort (1 year after level 3)	2015/16 cohort (2 years after level 3)
SEN students	33%	No data**	50%
All other students	39%	No data**	59%

4.1.36 HE Progression Rates by Disability

UCAS report on the proportions of young students accepted to HE by students' self-reports of a disability. HESA provide data on entrants who are / are not in receipt of disabled students allowance (DSA). These analyses have been excluded from the current review as data is not based on populations. DfE (2019) data addresses these limitations by providing an analysis of HE entry rates of 15-year-old pupils' by SEN status[xii] who entered HE by age 19. Figure 5 shows that across the nine-year period in every year, those with no SEN were more likely to progress to HE, followed by those with SEN support and lastly pupils with an Education, Health, and Care Plan (EHCP) or Statement of SEN. The proportion of all groups progressing to HE increased relative to their population. Across the period the SEN support cohort has seen the largest percentage point increase (9.6), followed by the no SEN cohort (8.8). Those with an EHCP/statement experienced the lowest percentage point increase (3). The gap in progression rates between no SEN and EHCP/Statement cohorts increased from 33.7 percentage points in 2009/10 to its highest level of 39.5 percentage points in 2017/18. The gap in progression rates between no SEN and SEN support pupils' decreased from 28 percentage points in 2009/10 to 27.2 percentage points in 2017/18. In 2009/10 pupils with no SEN were 7.1 times more likely to progress to HE than those with an EHCP / statement, and this decreased to 5.6 times more likely in 2017/18. In 2009/10 pupils with no SEN were 3.5 times more likely to progress to HE than those with SEN support, and this decreased to 2.3 times more likely in 2017/18.

Figure 5: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by SEN status Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort – Official Statistics.

4.1.37 Limitations of Data

In addition to the limitations already outlined many of the useful population-based datasets discussed have issues in terms of their refinement, where SEN is presented as a binary measure. Gorard *et al.,* (2018) suggest that data should be disaggregated, as certain SEN/disabled groups may be more likely to participate in HE than others.

4.1.38 First Language

The DfE (2019) report on differential attainment and HE progression rates of pupils and their first language (English or English as an additional language). The DfE (2019) outline that, pupils recorded as having English as an additional language, are those believed to be exposed to another language at home or within their community. The DfE (2019) reported that 16.6% of known pupils at the end of key stage 4 had a first language other than English.

4.1.39 KS4 Attainment by First Language

The DfE (2019) key stage 4 average attainment 8 scores by first language in state-funded schools in England shows (table 10) that across most years' pupils with English as an additional language outperform pupils' whose first language is English. However, scores have fallen for both groups over the time period by 1.4 and 1.9 percentage points respectively. During this period the gap in attainment 8 scores between these groups increased slightly from 0.2 percentage points to 1 percentage point. Pupils with an unclassified first language had the lowest scores and experienced the largest percentage point drop (5.9). The DfE does not provide a breakdown of progression from level 3 courses to HE by first language.

Table 10: Average Attainment 8 score per pupil by first language (England – state-funded schools)

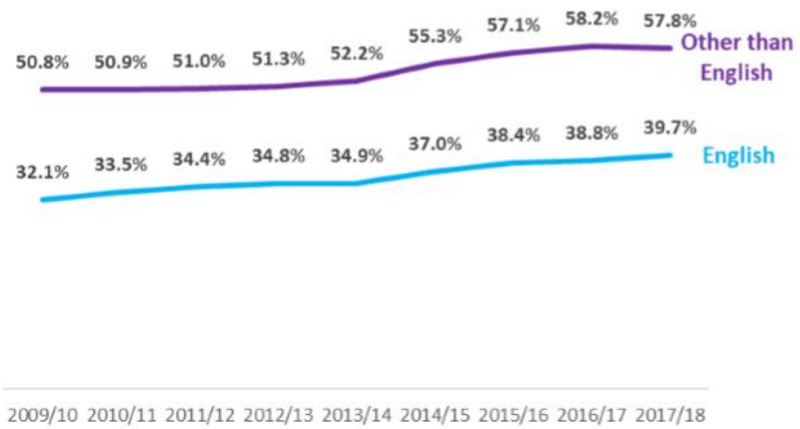
First language	2014/15	2015/16	2016/17	2017/18	2018/19
English	48.4	50.0	46.3	46.5	46.6
Other than English	48.6	49.9	46.8	47.2	47.6
Unclassified	37.7	30.9	24.7	27.9	31.8
All pupils'	**48.4**	**49.9**	**46.3**	**46.5**	**46.7**

Source DfE (2020) Characteristics summary: GCSE and equivalent entries and achievements of pupils at the end of key stage 4 by pupil characteristics (report 2014/15 to 2018/19)

4.1.40 HE Progression Rates by First Language

The DfE (2019) provide an analysis of HE entry rates of 15-year-old pupils' by first language who entered HE by age 19. Figure 6 shows that across the nine-year period in every year pupils with a first language other than English were more likely to progress to HE, than their peers. The proportion of both groups progressing to HE has increased relative to their population, with only a small drop in 2017/18 for those pupils with a first language other than English. Across the period pupils with English as a first language have seen the largest percentage point increase (7.8) compared to pupils with a first language other than English (7.0). The gap in progression rates between both groups has decreased from 18.7 percentage points in 2009/10 to 18.1 percentage points in 2017/18. In 2009/10 those whose first language was other than English were almost 1.6 times more likely to progress to HE than their peers and this decreased to almost 1.5 times more likely in 2017/18.

Figure 6: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by First Language Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort

4.1.41 Limitations of Data

Gorard *et al.,* (2018) point out that 9% of NPD pupils' have missing values in terms of first language. This brings bias into the data as the unclassified group has the lowest level of attainment at KS4. First language is a binary measure and is likely to mask more important variables that lead to educational disadvantage.

4.1.42 Looked-after Children (LAC)

Data for looked-after children (LAC) is collected within the DfE school census (PLASC). The DfE (2019) define such pupils' as 'looked-after by a local authority under the Children Act 1989 if they fall into one of the following: is provided with accommodation for a continuous period of more than 24 hours [Children Act 1989, Section 20 & 21]; is subject to a care order [Children Act 1989, Part IV]; or is subject to a placement order' (DfE, 2019). The DfE (2019) report that in 2019 the number of looked-after children in England increased by 4%, an 80-percentage point increase on 2009 figures. Evidence suggests that children in care are more likely to come from low-income families (Barth, Wildfire and Green, 2006).

4.1.43 KS4 Attainment by LAC

The DfE (2019) provide a statistical analysis for LAC and their average attainment 8 scores. Within these datasets, the DfE define a 'looked-after child' as those that have been continuously looked-after for at least 12 months. The DfE (2019) key stage 4 average attainment 8 scores for LAC in England (state-funded and special schools) presented in table 11 shows that across every year, the average attainment 8 scores of LAC pupils' are lower than non-LAC pupils. During the time period average scores have decreased for both LAC pupils' (3.7 percentage points) and non-LAC pupils (3.5 percentage points). The gap in attainment 8 scores between LAC and all other pupils has increased slightly from 25.3 to 25.5 percentage points. The DfE does not publish similar data for HE destinations after level 3.

Table 11: Average Attainment 8 score per pupil by looked-after status

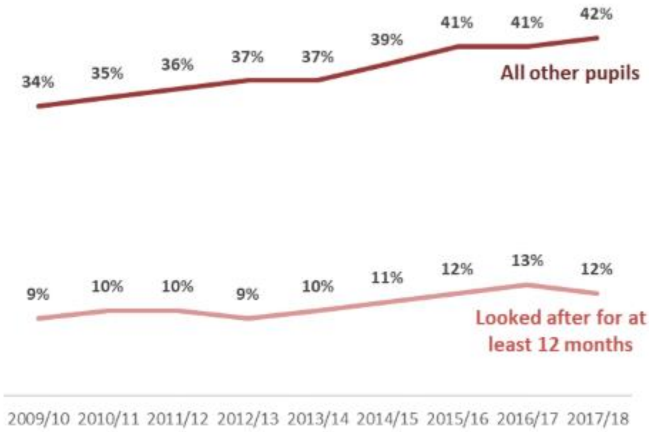
Looked-after status	2015/16	2016/17	2017/18	2018/19
Looked-after children	22.8	19.3	18.8	19.1
Non-looked-after children	48.1	44.5	44.4	44.6

Source DfE: outcomes by looked-after status.

4.1.44 HE Progression Rates by LAC

The DfE (2019) provide an analysis of HE entry rates of 15-year-old pupils' by looked-after status who entered HE by age 19. Figure 7 shows that across the nine-year period in every year, LAC are less likely to progress to HE than their peers. The proportion of both groups progressing to HE has increased relative to their population, with only a small drop from 2016/17 to 2017/18 in progression rates for LAC. Across the period all other pupils' have seen the largest percentage point increase (8.0) compared to LAC (3.0). The gap in progression rates between both groups has increased from 25 percentage points in 2009/10 to 30 percentage points in 2017/18. In 2009/10 those pupils' not looked after were almost 3.8 times more likely to progress to HE than those with a LAC status and this decreased to 3.5 times more likely in 2017/18.

Figure 7: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by Children Looked After status, Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort

4.1.45 Limitations of Data

One limitation of the DfE data is that the non-LAC cohort can potentially include some former LAC pupils. This limits the validity of data, as these children are likely to have lower attainment and be disadvantaged throughout their life. This disadvantage does not end when they cease to be LAC. Gorard *et al.*, (2018) suggest that the measure could be improved if it encompassed if a pupil has ever had a LAC status.

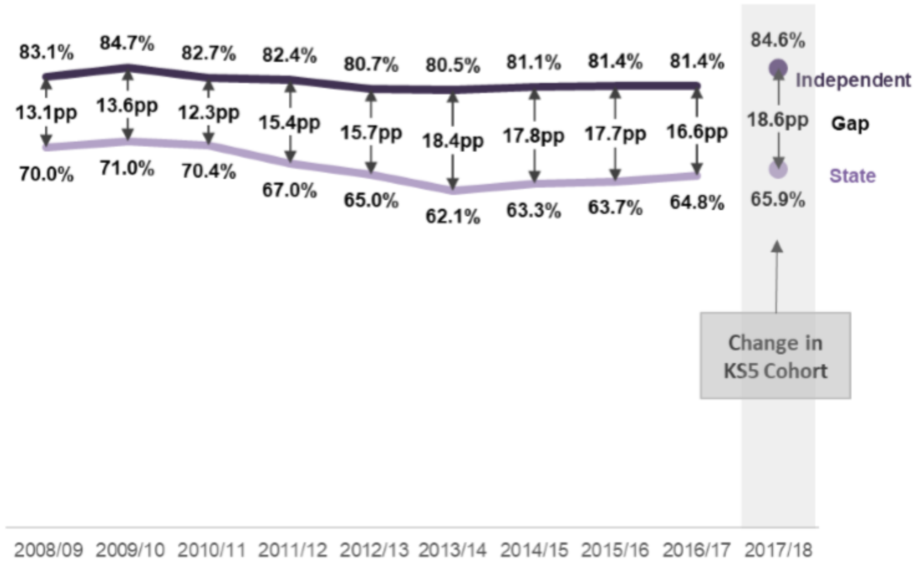
4.1.46 School Type

Comparisons in HE participation outcomes are often made between pupils' attending state-maintained schools/colleges and independent/private schools. It is not possible to compare attainment rates and the characteristics of pupils' attending these school types, as the independent schools do not return pupil background data to the DfE, and the syllabus often includes un-regulated GCSE which are not included within DfE performance tables. As the parents of pupils attending private schools pay fees (although some bursaries and assisted places are available), they a more likely to come from higher SES groups than pupils attending state schools. Chowdry *et al.,* (2012) analysis of LYPSE data found almost two-thirds of private school pupils were from the top two SES quintiles, a quarter from the middle quintile and only one in ten from the lowest quintile.

4.1.47 HE Progression from Level 3 Courses by School Type

The DfE (2019) provide an analysis of HE entry rates of pupils' who studied A level and equivalent qualifications in state schools and colleges at age 17 and who entered HE by age 19. Figure 8 shows that across the nine-year period (excluding 2017/18 when there were changes in measurement) in every year, pupils from independent schools were more likely to progress to HE, than pupils from state schools and colleges. The proportion of both groups progressing to HE has decreased from 2008/09 to 2016/17 from 1.7 percentage points for independent schools and a larger 5.2 percentage point decrease has been observed for state schools and colleges. The gap in progression rates favouring independent schools has increased from 13.1 percentage points in 2009/10 to 16.6 percentage points in 2016/17. In 2008/09 those pupils from independent schools were almost 1.2 times more likely to progress to HE than pupils' from state schools and colleges, and this increased to almost 1.3 times more likely in 2016/17. The more recent 2017/18 data show that the gap has increased between independent and state schools. As outlined this data is not comparable to previous years.

Figure 8: Percentage of A level and equivalent students who entered HE by age 19, by independent and state school/college Academic Years 2008/09 to 2017/18 UK Higher Education Providers



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort

4.1.48 HE Progression Rates by School Type

HESA (2020) provide data on the percentage of young full-time first-degree[xiii] entrants from state schools or colleges in the UK. Data shows that from 2015/16 to 2018/19 entry rates have stayed relatively static with around 90% of students coming from state schools. Boliver (2013; 2016) outlines that private school pupils are overrepresented in UK HEI's, if attainment is not taken-into-account.

4.1.49 Limitations of Data

The data presented does not make any reference to population statistics and in turn, is difficult to discern the extent to which state-maintained school pupils' are under-represented in HE. Further, school type is a crude measure, as it assumes that all state school pupils are disadvantaged, and all independent school pupils' are advantaged. However, these pupils are unlikely to be from homogenous groups.

4.1.50 Area-Level Statistics

Neighbourhood statistics derived from home postcodes, are often employed as proxy measures of disadvantage within national school attainment and HE datasets and are used to identify and target underrepresented groups within WP programmes. Within the field of WP, the most common neighbourhood-level proxy measures of disadvantage are obtained from census population statistics, the ONS and the OfS. Commonly employed measures such as POLAR, IMD, IDACI and new composite measures of intersectionality will be discussed. These measures provide an aggregate modal level of disadvantage for people domiciled within localities of various population sizes. There are a number of important issues relating to such measure validity which will be considered.

4.1.51 Participation of Local Areas (POLAR)

The OfS Participation of Local Areas (POLAR4) classification tracks youth and adult cohorts in terms of participation rates in HE within the UK. This is a measure of educational and not socio-economic disadvantage. The data provides information on youth (full and part-time) HE participation rates (YPR) of young people who entered UK HE between the academic years 2009/10 and 2013/14, if they entered aged 18, or between 2010/11 and 2014/15 if they entered aged 19. POLAR4 also provides data on adult (aged 16-74 years) participation rates (AHE) with a HE qualification. The POLAR4 classification is a relative measure that is formed by ranking the population into five groups ranging from quintile 1 areas that has the lowest participation (most disadvantaged), up to quintile 5 areas with the highest rates (most advantaged), each representing 20 per cent of the UK young (YPR) or adult (AHE) cohort. Students have been allocated to the neighbourhoods on the basis of their postcode (based on middle layer super output areas (MSOAs) in England and equivalents in devolved nations. The thresholds for each POLAR4 YPR quintiles are set out below. POLAR is a key WP equity measure reported across various HE and school national administrative statistics (UCAS, HESA KPI's, OfS KPM's and the DfE). As outlined in chapter 1 closing the gap in participation rates between quintiles 1 and 5 is a key strategic objective set by the OfS within HE providers' APPs and has been supported through the targeting of various national WP programmes.

Table 12: POLAR4 (YPR) quintiles based on MSOA participation rates

Quintile	Threshold (YPR)
1	under 21.8% participated in HE
2	21.8% to 31.6% participated in HE
3	31.7% to 39.3% participated in HE
4	39.4% to 49.4% participated in HE
5	49.5% to 100% participated in HE

Source: OfS (2019) POLAR4 classification: A local geography classification for young participation in higher education

4.1.52 KS4 Attainment by POLAR4 (YPR)

The DfE does not publish attainment rates for KS4 or KS5 pupils' by POLAR and therefore it is not possible to identify if there are different levels of achievement across quintiles. However, in 2016 HEFCE completed an analysis of the NPD by tacking 5 cohorts (2006/07 to 2010/11) of pupils in maintained schools from key stage 4 to HESA HE entry records (UK full or part-time undergraduates), to see whether they participated in HE by the age of 19. The analysis found that HE participation of young people from lower quintile areas was below the level expected, based on their GCSE level attainment (known as a 'participation gap'). If participation rates increased to their expected levels there would be an additional 3,800 HE entrants, on average each year (HEFCE, 2016).

4.1.53 HE Progression by POLAR4 (YPR)

The OfS (2020) present data on HE entry rates across the most and least advantaged cohorts. Table 13 shows that the proportion of 18-year-olds entering HE (full-time undergraduates) in England from POLAR4 quintile 5 areas are much higher (19.7 percentage points) than that of quintile 1 areas. Further, the entry rate of quintile 1 areas was 6.5 percentage points lower than the proportion of 18-year-olds living in POLAR4 quintile 5 areas in 2018-19 (where entry rates were 7.5 percentage points higher than their proportions in the population). In 2018/19, Q5 18-year-olds were 2.7 times more likely to enter HE than those from Q1 areas.

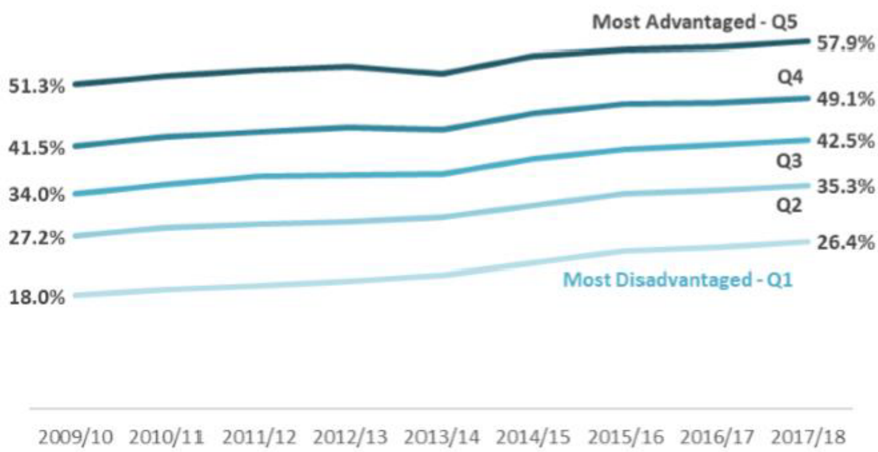
Table 13: The proportion of 18-year-olds in the UK entering English higher education as full-time undergraduate students (2018/19), POLAR4 (Q1 to Q5)

Characteristic	Category	Proportion of 18-year-olds in UK population (%)	Proportion of 18-year-olds in English higher education sector (%)	Gap between population and higher education sector (PP)
POLAR 4	Quintile 5	23.6	31.1	-7.5
	Quintile 1	18.0	11.4	6.5

All figures have been rounded. Source: OfS Access and participation dataset (May 2020).

The DfE (2019) provide an analysis of HE entry rates of 15-year-old pupils' (attending state-funded and special schools) by POLAR4 quintiles who entered UK HE (HE providers and English further education colleges) by age 19. Figure 9 shows that HE progression rates have increased across all quintiles, favouring Q5 over Q1 across the time period. However, over the time period disadvantaged (Q1) pupils have seen the largest percentage point increase (8.4) compared to advantaged (Q5) pupils' (6.6). The gap in progression rates between both groups favour the most advantaged pupils' (Q5), but this has decreased from 33.3 percentage points in 2009/10 to 31.5 percentage points in 2017/18. In 2009/10, Q5 pupils' were almost 2.9 times more likely to progress to HE than Q1 pupils', and this decreased to almost 2.2 times more likely in 2017/18. UCAS (2019) present broadly similar findings in terms of acceptance rates by POLAR4 quintiles.

Figure 9: Percentage of 15-year-old state-funded and special school pupils' who entered HE by age 19 by Disadvantage Quintile (POLAR4) Academic Years 2009/10 to 2017/18 UK Higher Education Providers and English Further Education Colleges



Source: DfE (2019) Widening Participation in Higher Education, England, 2017/18 age cohort

4.1.54 Limitations of Data

Individual-level datasets are generally seen as more robust than proxy-based measures of disadvantage derived from area-level aggregate statistics. The main justification for using the POLAR4 measure is that it provides an actual direct measure of participation in HE by area and supports comparisons between areas in terms of high and low participation rates. POLAR4 data is based on HE entry rates for 5 cohorts, the earliest entering HE in 2009/10. This data is now up to eleven years out of date and is unlikely to reflect recent changes in HE progression. Further, Ramsden (2005) notes that as the indicator is relative it is unhelpful as when low participation is alleviated in one area, then another area will be deemed as being underrepresented in HE.

Another limitation of postcode measures is that modal scores are employed to aggregate data. There may be significant variations in the characteristics of individuals living in these areas as populations are not homogenous, leading to an ecological fallacy (Harrison and McCaig, 2013; Gorard and See, 2013). HEFCE's (2014) own analysis shows that 43% of young people living in POLAR3 quintile 1 areas are from NS-SEC 1-3 households (e.g., their parent(s) are working in managerial and professional occupations). Thompson (2002) reports that once prior attainment is considered neighbourhood measures of disadvantage only account for 3% of the variance in school test scores. Further, there are also issues with missing data, as the OfS and other datasets reported above rely on matching records to the DfE school census, where between 11 and 13 per cent of cases have missing postcodes (Gorard *et al.*, 2018) and additionally a few POLAR areas are suppressed (3%) due to small populations. Missing data and suppression are likely to bias data. Missing data will be more pronounced when HE outreach programmes collect such data directly from pupils / parents. Due to the many limitations outlined Gorard *et al.*, (2018) suggest that POLAR has little or no promise in terms of identifying under-represented groups in HE.

4.1.55 Tracking Underrepresentation by Area (TUNDRA)

The OfS (2019) have developed a new widening participation measure called TUNDRA. This is an area-based measure that tracks state-funded mainstream school pupils in England to calculate young participation rates at age 18 or 19 in HE. This measure is similar to POLAR4 with the exception that private schools are excluded. TUNDRA[xiv] classifies local areas

(MSOAs) across England into five equal quintiles, based on the proportion of 16-year-old state-funded mainstream school pupils. The mean participation rates across these quintiles are Q1 (23.9%), Q2 (32.8%), Q3 (39.7%), Q4 (47%) and Q5 58.5%. The measure aims to support outreach programmes to identify and target areas of low participation more effectively. As this is a new measure there are no other datasets in terms of school attainment data and HE participation.

4.1.56 Limitations of Data

As TUNDRA is based on POLAR4, it suffers the same issues in terms of validity outlined earlier. However, TUNDRA provides a more useful estimate of HE participation as it excludes private schools, which are known to have higher participation rates in HE. This omission is useful, as these schools can mask lower participation rates of mainstream schools located within the same area. However, the measure only includes state-funded mainstream schools and excludes special schools and PRUs which have lower HE participation rates.

4.1.57 The Index of Multiple Deprivation (IMD) and Income Deprivation Affecting Children (IDACI)

IMD and IDACI are relative measures of deprivation produced by The Department for Communities and Local Government. Both provide Lower layer Super Output Area (LSOA) level measures of multiple deprivation. IMD is a composite measure of deprivation and is made up of seven LSOA level domain indices. These relate to deprivation relating to income, employment, health, disability, education skills and training, barriers to housing and services, living environment and crime. The measures reflect the broad range of deprivation that people can experience. The overall Index of Multiple Deprivation is conceptualised as a weighted area-level aggregation of these specific dimensions of deprivation[xv]. IDACI is a supplementary index that measures the proportion of a super output area with children aged under 16 living in 'income deprived' families. This is defined as families in receipt of Income Support and Job Seekers Allowance (Income Based) or families in receipt of Working Family Tax Credit/Disabled Persons Tax credit whose equivalised income is below 60% of the median before housing costs. The indices allow each area in England, Scotland, Wales, and Northern Ireland to be ranked relative to one another according to their level of deprivation.

Postcodes are ranked in terms of deprivation against all super output areas (LSOAs). In England, the most deprived is ranked 1 and the least deprived area is ranked 32,844 (IMD and IDACI, 2015). Ranks are also split into deciles. Generally, postcodes in the top 4 deciles are regarded as disadvantaged and deciles 5 to 10 as advantaged LSOA's. The average population of an LSOA is 1500 people (Office for National Statistics, 2019).

4.1.58 KS4 Attainment by IDACI

The DfE (2019) key stage 4 average attainment 8 scores by IDACI in state-funded schools in England show (table 14) that across the time period scores have fallen for all four of the most disadvantaged deciles from 3.4 to 4.3 percentage points. Across all years, pupils living in the least disadvantaged deciles obtained higher scores. The DfE does not provide a similar analysis by IMD for KS4 attainment or KS5 destinations.

Table 14: Average Attainment 8 score per pupil by IDACI (England – state-funded schools)

IDACI Decile*	2015/16	2016/17	2017/18	2018/19
0-10%	43.2	39.4	39.3	38.9
10-20%	45.4	41.4	41.3	41.6
20-30%	46.9	43.1	43.1	43.2
30-40%	48.2	44.4	44.8	44.8

*IDACI bands are based on 2015 IDACI scores. *Source 2018/19: pupil residency and school location data*

4.1.59 HE Progression by IMD

The OfS (2020) provide an analysis of the full-time HE entry rates of young people (aged 18) domiciled in advantaged and disadvantaged IMD (2015) areas. Similar data for IDACI is not available. Over a five-year period, Q5 students had the highest entry rate compared to Q1. There has been a decrease in Q5 entrants from 27.8% in 2014/15 to 26.7% in 2018/19 (a 1.1 percentage point decrease) and an increase in Q1 entrants over the same period from 15.2% to 16.9% (a 1.7 percentage point increase). Q5 entrants are overrepresented in entry rates in terms of their population in England (e.g., in 2018/19 the population was 19.9% and the entry rate was 26.7%) and Q1 entrants are underrepresented (e.g., in 2018/19 the population was 22.3% and the entry rate was 16.9%). However, this picture is improving as the gap for Q1 entrants relative to the population has decreased year on year across the cycle from a 6.7

percentage point gap in 2014/2015 to a 5.4 percentage point gap in 2018/19. In terms of the HE entry gap between Q1 and Q5 pupils', this stood at 12.6 percentage points in 2014/15 and decreased to 9.8 percentage points in 2018/19. In 2014/15, Q5 pupils' were almost 1.8 times more likely to progress to HE than Q1 pupils', and this decreased to almost 1.6 times more likely in 2018/19.

4.1.60 Limitations of Data

As IMD and IDACI are area measures they face similar validity and reliability issues as POLAR4, outlined earlier. Further, IMD and IDACI data are obtained from several sources. Some of this data is obtained from the 2011 census which is now 9 years old and consequently, data may lack validity. IMD and IDACI suffer from missing data and bias is increased with further missing values when this data is self-reported from pupils / parents within WP programmes. In addition to this as Gorard *et al.,* (2018) outline that within the NPD between 11% and 13% of pupils' have missing postcodes. This biases aggregate scores, as these pupils are more likely to be from the most disadvantaged groups (children in care and travellers). It is not possible to provide a consistent picture of which pupils' are performing more poorly in school and then entering HE, as IDACI and IMD are not consistently reported within administrative datasets. Gorard *et al.,* (2018) suggest that IMD and IDACI have little or no promise in terms of identifying under-represented groups in HE. The next part of this chapter outlines other composite measures that have been developed to look at the intersectionality of HE participation rates by different characteristics.

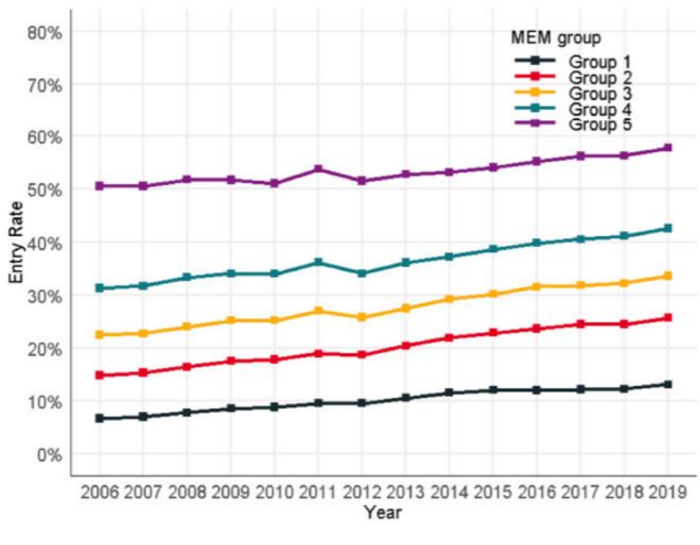
4.1.61 Composite SES measures

A criticism directed at many WP contextual measures is that they often treat disadvantage as a one-dimensional binary characteristic. This is an oversimplification as people are made up of multiple characteristics. Over recent years there has been a drive to improve HE progression measures through the development of composite indicators that incorporate multiple factors into one variable. Such measures developed by the OfS and UCAS account for the intersectionality between important factors influencing the likelihood of progressing to HE. Such practices are often employed within WP programmes and more recently both UCAS and the OfS have recently developed new measures, which will now be discussed.

4.1.62 Multiple Equity Measure (MEM)

UCAS have developed a multiple equity measure (MEM) that combines a number of factors shown to be associated with the probability of progression into HE. The MEM links UCAS full-time acceptances (UK degree level courses) to the National Pupil Database (NPD) school census for all English-domiciled 18-year-olds and their characteristics. This measure includes sex, ethnic group, neighbourhood (using the POLAR3 and IMD classifications), secondary education school type and income measured via FSM claimant status. Following the analysis of this data students were allocated to one of five MEM groups. Students in MEM group one, are less likely to be accepted to HE, compared to those in MEM group five. In 2019, UCAS reported (see figure 10) that there were small increases in acceptance rates within all MEM groups and the smallest ever recorded gap between those most and least advantaged. In 2016 MEM group five were 4.6 times more likely to be accepted to HE than MEM group one and this fell to 4.4 times more likely in 2018.

Figure 10: Acceptance rates for England domiciled 18-year-old students by MEM group



Source: UCAS (2019) Multiple Equity Measure (MEM)

4.1.63 Association Between Characteristics of Students (ABCDs)

Recently the OfS (2020) have developed an experimental multiple composite measure for student access and continuation. The ABCD's measure seeks to better understand which groups by characteristics are least likely to enter HE (first-degree entrants aged 18 or 19 years). The model includes student characteristics and area-based measures such as ethnicity (detailed level), IDACI, IMD, FSM status, POLAR4 and sex. The OfS linked data for five cohorts of school pupils (KS4 cohorts 2010-2014) via the DfE's National Pupil Database (NPD) and then tracked these students until they reached 18 or 19 years of age to see if they entered a HE undergraduate course (via HESA records). Through statistical modelling, the OfS have categorised students into five access groups. Access group 1 are the least likely to enter HE and access group 5 who are the most likely to enter HE. At the extremes access group 1 contains students with HE access rates between 2.3 and 24.4 per cent. Whereas access group 5 contains groups of students with HE access rates between 46.3 and 87.6 per cent. The modelling provides a further analysis of the likelihood of progressing to HE when including one, two or three characteristics.

4.1.64 Limitations of Data (MEM and ABCDs)

These metrics have several advantages by providing a better understanding of disadvantage through the intersectionality of characteristics. However, there are still several limitations to these measures. Both measures exclude part-time students who are more likely to be from disadvantaged backgrounds (see section 4.1.6). Both models exclude data for pupils' attending independent schools[9], as the data required is not available through the NPD. The MEM is limited in that it only reports ethnicity at a high level, masking disparities in HE participation for subgroups. Both models include postcode measures of disadvantage. As outlined earlier, neighbourhood measures of disadvantage lack validity and are a poor indicator of educational disadvantage. Gorard *et al.*, (2018, p.22) point out that 'if an individual is known to be disadvantaged there is little to be gained by also knowing that there are others nearby like them' via aggregated postcode data. Further, both the UCAS and OfS measures exclude prior attainment (KS4 or earlier) which has been shown to be the most important factor in terms of the likelihood of students entering HE. Layering on prior attainment within the data would improve this measure and help to provide a better understanding of the scale of the most important barriers to HE.

The OfS, outline that within the modelling they employed Stepwise entry in their regression model to determine which two-level interactions should also be included. Field (2009)

[9] Although UCAS provide a separate MEM for independent schools that includes the gender variable only.

outlines that there are important limitations to employing this approach as it does not allow the researcher to model the theoretical predictors in order of importance based on previous theory or research. In turn, important predictors may be lost within the modelling. UCAS claim that the MEM is a measure of equity and the OfS claims that ABCD's provides a measure of the groups most likely to be underrepresented in HE. However, these claims are misleading as the measure excludes groups that are most likely to be under-represented in HE, including looked after children/those formerly looked-after, students with a disability and those with low prior attainment. The exclusion of such groups and missing data reduces the validity of these claims and suggests there is still some way to go until a true equity measure of HE participation is available.

4.1.65 Chapter Summary

National administrative datasets for England and the UK, suggest that both attainment and participation in HE are stratified by a pupil's prior attainment, socio-economic and demographic characteristics. Over the past few decades, government policies and initiatives within compulsory schooling and post 16 education have aimed to redress these inequalities. This chapter has provided a review of contextual measures, which are often employed within WP outreach programmes to target pupils that are thought to be under-represented in HE. However, for some of these indicators, it remains a point of debate in terms of their relevance, validity, and reliability as measures of disadvantage.

Measures employed to report on education inequalities broadly fall into three categories relating to a pupil's individual/family characteristics, aggregate data based on where they live and the type of school that they attend. Appendix 1 provides a summary of the patterns of attainment (KS4 attainment 8) and HE participation rates across various WP indicators that have been presented and are reported within national administrative datasets. DfE (2014/2020) data suggests that KS4 attainment 8 scores over recent years have fallen for all pupils' where data is available (FSM status, ethnicity high-level categories, gender, disability status, first Language and LAC status), with the exception of Chinese pupils'. However, these decreases are in the main likely to be due to changes in the national curriculum and methodology. In 2018/19 the poorest performing groups in terms of attainment 8, included pupils' who had a LAC status, followed by pupils with a Gypsy and Roma or traveller or

Irish heritage, SEN status, pupils' eligible for FSM, Black Caribbean, White and Black Caribbean, any other Black background, males, White British, Pakistani and those whose first language is English.

Across all groups, over recent years there has been an increase in the attainment gap (percentage point) between advantaged and disadvantaged pupils. The widening of this gap has been small (1 percentage point or lower) for most groups but has increased more significantly (5.2pp) between Chinese and White pupils'. There are no consistently published administrative datasets to compare KS4 scores between different school types and indicators based on neighbourhood measures. The evidence reviewed suggests that these attainment gaps between advantaged and disadvantaged groups continue to persist into post-compulsory schooling influencing the likelihood of progression to level 3 courses and HE.

The DfE (2009/10 to 2017/18) data shows that HE participation rates have increased for all pupils (relative to their population in England) regardless of their background characteristics. The only exception to this is pupils living in the most advantaged IMD areas (quintile 5) who have experienced a slight decrease. Data suggests that relative to their population, pupils' who are Chinese (77.6%), those from POLAR (Q5) neighbourhoods (57.9%), whose first language is not English (57.8%), MEM group 5 (57.5% - UCAS most advantaged group) have the highest HE participation rates. Conversely pupils with an EHCP / Statement (8.5%), LAC (12%), MEM group 1 (13.1% - UCAS most disadvantaged group), SEN support (20.8%), FSM (26.3%), POLAR Q1 (26.4%), male (37.2%) White (38.2%), and whose first language is English (39.7%) are the most under-represented in HE (DfE, 2017/18 and UCAS 2020).

DfE (2009/10 to 2007/18) data also shows that over recent years (across all groups for which data was available) there has been a decrease in the HE entry participation gap for most indicators. The largest decreases observed are for pupils living in IMD Q1 compared to Q5 areas (2.8pp), White pupils' compared to Chinese pupils (2.3pp) and those living in POLAR Q1 compared to Q5 areas (1.5pp) and other groups have seen a less than 1 percentage point decrease (pupils' receiving SEN support, whose first language is English and MEM group 1). However, the HE participation gap is significantly widening for pupils with an EHCP / Statement (5.8pp) and those with a LAC (5pp) status and has widened to a smaller extent for males compared to females (2.4pp) and FSM compared to non-FSM pupils' (1pp). Despite these results, the HE entry ratio participation gap between advantaged and disadvantaged pupils of all characteristics has closed over recent years with the exception of females and males, which remains unchanged.

The DfE (2020) outline that the HE participation rates of FSM pupils', most ethnic groups (with the exception of White), males, pupils' whose first language is English and pupils' with an SEN or LAC status are higher than would be expected when considering their prior attainment. It is likely that there are participation entry gaps within certain ethnic groups, however, these data are generally published at a high level which masks any disparities. However, the new OfS ABCDs measure provides a more detailed breakdown by ethnicity and shows that (for full-time graduates only) pupils with a Gypsy, Roma or Traveller background are one of the most under-represented groups in HE. Despite these differences in HE participation rates between various groups, young people who do not progress to HE are just as likely to participate in other forms of education as their peers (DfE, 2020).

The data presented suggests that prior attainment is the most important factor that determines educational outcomes and the evidence for the influence of individual/family-based indicators is much stronger than indicators based on neighbourhood proxy measures and school type. These indicators have been reviewed in terms of their strengths and limitations. Measures such as LAC, SEN, FSM, gender, ethnicity (detailed subgroups) and first language provide more robust measures of HE inequalities and such groups perform less well than their peers across key stages 4 and 5 and are under-represented in HE. However, these measures could be further improved by disaggregating disability into groups and measures to identify if FSM and LAC pupils' have ever had this status.

Due to limitations (e.g., coverage of data, missing data, consistency of measures etc.) or a lack of published national administrative data, there is less evidence to determine whether other groups of children are either under or over-represented in HE. This includes parents' HE background, ethnic subgroups, young carers and school type. Evidence is extremely weak for the under-representation in HE of pupils, based on where they live (POLAR, IMD, IDACI and TUNDRA). None of the contextual measures discussed are perfect in terms of illustrating inequalities in attainment and HE participation, although some indicators are more limited than others. Most administrative datasets presented tend to focus on a single binary characteristic and fail to look at the intersectionality between different characteristics which make up who we are. The UCAS MEM and OfS ABCDs measures have attempted to address these limitations by including a number of indicators of disadvantage into a composite measure. However, these measures include neighbourhood measures of disadvantage and fail to include many of the groups most under-represented in HE (e.g., students with a disability and LAC etc.) and are therefore, are limited in terms of their validity.

The review of school attainment and HE participation outcomes has provided an understanding of which SES and demographic indicators are most important in accounting for inequalities in educational outcomes. The review has also questioned both the reliability and validity of some widely employed indicators within WP and fair access programmes to target 'so-called' under-represented groups.

Chapter 1 outlined that a recent OfS (2020) analysis of access and participation plans (APPs) found that HEI access targets in order of prominence focus on 128 targets for low participation neighbourhoods (POLAR), 91 ethnicity, 57 socio-economic status, 33 care leavers, 30 disabled, 29 multiple measures, 26 mature students, 11 White economically disadvantaged men, 8 attainment raising, 3 state schools and 2 low-income backgrounds. The review suggests that there is some disconnection between what the evidence tells us about who is underrepresented in HE (when employing valid and reliable indicators) and which groups are being targeted in practice. For example, few APPs focus on the most underrepresented groups White men, FSM students and most notably low attaining students. None of the targets focuses on other highly underrepresented groups including students whose first language is English and Gypsy, Roma and Travellers. As outlined within this review less reliable and valid measures of target groups include indicators pertaining to POLAR, socio-economic status and state schools. However, the former two indicators are the most prominent targets set out within APPs and appear above other highly underrepresented groups including care leavers and disabled students. In part, this is due to the OfS reliance on the POLAR measure to widen participation and associated sector wider key performance measures and an earlier HEFCE and HESA reliance on NS-SEC, which has now been dropped due to its unreliability but seemingly is still being employed widely across the sector. None of these issues can be justified through local context or need, as these proxy measures of disadvantaged are neither valid, reliable nor fit for the purposes they are being employed.

Within the OfS (2020) review of APPs they argue that the sector needs to do more to widen the access of other groups who continue to be widely under-represented in HE, including care leavers, people estranged from their families, young people from military families, and people from Gypsy, Roma and Traveller communities. As national datasets on participation rates are not available for people estranged from their families and young people from military families, setting robust targets to improve participation would be extremely challenging. In consequence, there are major discrepancies in policy, practice and evidence leading to a disjointed approach in terms of whom the OfS would like HEI providers to target, what HEI providers are doing in practice and what the evidence tells us in terms of which groups are actually under-represented in HE, when considering valid and reliable indicators. These gaps in targeting approaches are concerning as without a robust evidence-based approach that employs valid indicators of HE progression, it is unlikely that improvements in HE participation rates will be made for those that are the furthest away from and most under-represented in HE.

In summary, evidence has outlined that the key challenge for WP programmes is to increase the proportion of poorer pupils' getting good GCSE and A-level results (Chowdry *et al.*, 2012). However, theory and research discussed in chapter 2 suggested that other cognitive and non-cognitive factors may be important in influencing pupil attainment outcomes and HE participation (Crawford, Goodman and Joyce, 2010; Chowdry *et al.*, 2012). Many of these factors are not collected within administrative datasets and in turn, these confounding variables may be contributing to the inequalities discussed. The last section of the chapter provides an overview of the Aimhigher programme, the purpose and design of the research study undertaken and how this was informed by the literature review and gaps in evidence.

Chapter 4b: The Study

4.2 Introduction

This chapter provides an overview of the Aimhigher programme and how interventions (summer schools and mentoring) have been designed and targeted to support national and local policy objectives to widen the participation of disadvantaged groups into HE. The chapter provides an overview of the conceptual framework employed within the study, which was underpinned by Theory of a Change (ToC) and associated outcome and impact measures. This is followed by a consideration of the gaps and limitations of previous research and how the research undertaken aims to address these.

4.2.1 The Aimhigher West Midlands Widening Participation Programme

Aimhigher is a partnership of five HE institutions (HEIs) located within the West Midlands of England. From 2004-2011 the programme was funded by HEFCE as part of the national Aimhigher programme which aimed to increase the proportions of disadvantaged learners progressing to HE. In 2011 national funding ceased and the local partnership continued to deliver WP outreach programmes by securing funding from local universities, schools, and colleges. In 2011, the partnership formed a collaborative Access Agreement, aiming to support the government's ambition to close the gap in HE progression rates between disadvantaged and advantaged learners. This study focuses on learners that were part of the Access Agreement from 2012 to 2016. During this time the programme also received HEFCE and funding for the NNCO programme (2015/2016). This programme is not part of the research undertaken for this thesis.

The Aimhigher programme targets learners mainly in year groups 9-11 (and some post-16 students). The programme consists of Aimhigher summer schools and a mentoring scheme. Both interventions are regarded as intensive programmes due to their duration and nature. The programme targets disadvantaged learners who have the potential to progress to HE (e.g., 5 GCSEs or equivalent at *A-C or above including English and maths). The programme is not expected to have a significant impact on attainment. However, a small proportion of the mentoring programme focuses on subject-specific mentoring and may focus on learners who are seen to have the potential to progress to HE but are not currently obtaining the required grades to progress. Further, as discussed (in Chapter 3) raising aspirations, knowledge and understanding of HE, confidence and self-efficacy may also have a positive impact in terms of improving attainment.

4.2.2 Aimhigher Interventions

This section provides an overview of the aims, content and delivery models employed across the summer school and mentoring interventions to provide a wider understanding of what is being evaluated.

Aimhigher Summer Schools

The summer school programme provides learners with an immersive hands-on experience of university life. The intervention aims to address learners' misconceptions of university and reduce any perceived barriers (e.g., university is not for people like me, student finance and ability to cope etc.), increase knowledge of HE and intentions / expectations towards progressing to HE. Importantly the intervention aims to help learners feel more at ease in a university environment. The content of these activities aims to enable learners to make informed decisions about their future progression pathways. In June/July each year, Aimhigher co-ordinates a programme of residential and non-residential summer schools (referred to as UniFest) for over 300 year 10 learners. Most UniFest events are residential (on campus) which allows learners to experience student life throughout the day and stay in halls overnight for 3-4 days. Up to five HEIs take part in this scheme. The content of UniFest events vary and are either subject-specific (e.g., such as Science, Technology, Engineering and Maths, Creative Arts, Business and Sport) or provide a more general overview of HE. UniFest aims to provide disadvantaged learners with the opportunity to explore the world of HE first-hand by taking part in subject-specific activities often delivered by university lecturers and outreach staff providing information sessions (focusing on student finance, grades and qualifications required, living away from home and student life) team building and social activities.

Aimhigher Mentoring Programme

Aimhigher places over 100 undergraduate mentors in circa 30 schools and academies each year. Mentors support more than 500 young people across year groups 9-13. All mentors attend training with a focus on how to support learners within schools. Standardised resources are provided (mentoring handbook) to support the structure and ideas for session content. Mentors provide support to 5/6 learners for up to a period of 12 weeks (on average 1-hour sessions), using a mix of one-to-one, group and online support (e-mentoring). Sessions are learner-centred where mentors work with young people to identify their needs and agree on a range of personal and learning-related development objectives. This often includes providing information, advice and guidance on HE progression and other pathways, increasing motivation and aspirations within school and for post-16 options, increasing confidence and in some circumstances support to improve attainment (e.g., subject-specific mentoring, study skills and revision techniques) and dispelling the myths about HE. Overall mentoring aims to provide learners with the knowledge of HE, to enable them to make an informed decision on whether to go to HE or not.

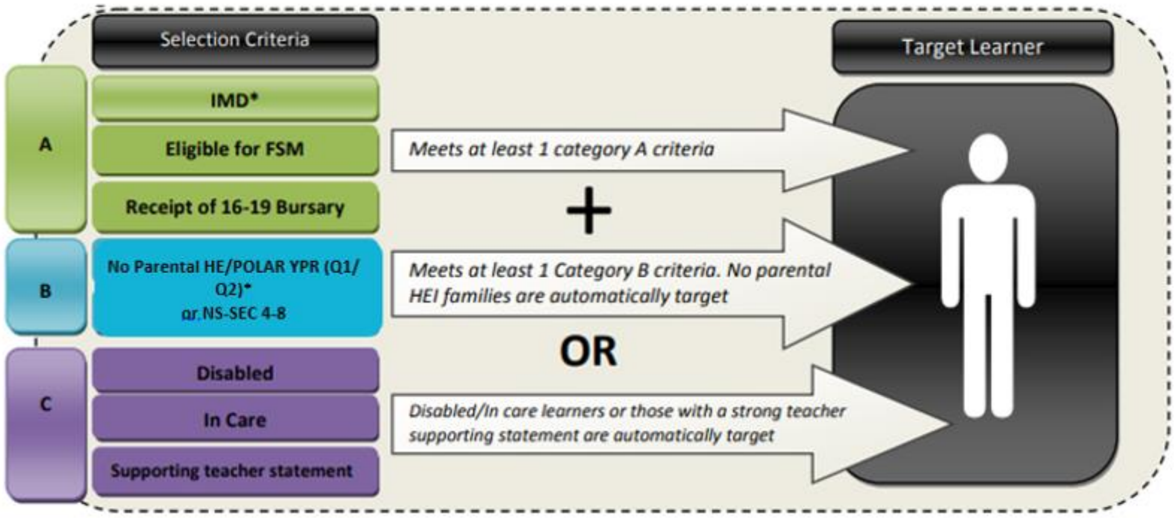
4.2.3 How are Aimhigher Interventions Targeted at Disadvantaged Pupils'?

The Aimhigher programme employs a standardised methodology to identify and select disadvantaged learners for activities. The model illustrated in figure 11 outlines the Aimhigher composite targeting model consisting of both individualised learner level and proxy measures of socio-economic and demographic disadvantage. For selection purposes learners attending Aimhigher activities (summer schools and mentoring) should meet at least two WP target criteria, one from both categories A (IMD or FSM eligible or in receipt of the 16-19 bursary) and B (no parental experience of HE or POLAR3 Q1/Q2 or NS-SEC 4-8). Learners who are disabled/in care or have a strong supporting teacher statement (Category C) are prioritised and do not have to meet any of the above criteria[10]. Further, all learners that take part in the programme must also have the potential to progress to HE in that they are on course or close to achieving 5 A*-C grades at GCSE (or equivalent) including English and

[10] All measures were weighted with a score of 1 with the exception learners that are, in care or those that receive a strong supporting teacher statement received a weighting of 7 for each measure and if neither parent had experience of HE a weighting of 7 was scored. In particular this approach supported learner prioritisation for programmes such as summer schools.

maths, although some borderline learners do participate within the programme. For summer schools this data is collected before learners are selected to take part. Within the mentoring scheme guidance is provided to both outreach and school staff to ensure the programme is well-targeted.[11]

Figure 11: Aimhigher Learner Targeting Model



4.2.4 Conceptual Framework of the Study

The literature review has outlined how the sociological concepts of cultural, social, intellectual, human (economic) capital, social identity, and psychological concept of self-efficacy (sections 3.1.1 to 3.1.4) provide a plausible explanatory framework for WP programmes to address the mechanisms that may contribute to socio-economic inequalities in HE participation. Within the WP sector, these concepts are often referred to as AABs (or non-cognitive skills) that are stratified by SES and act as barriers to disadvantaged learners' progression to HE (chapter 3). Both theory and research suggest that non-cognitive skills may be important in influencing pupil attainment outcomes and HE participation (Goodman *et al.*, 2010; Chowdry, Crawford, and Goodman 2010; and Chowdry *et al.*, 2012). Evidence suggests that WP interventions have been successful in improving learners' non-cognitive skills including, HE knowledge, aspirations, attitudes academic motivations and confidence

[11] Within the mentoring programme, Aimhigher and school staff employ this guidance to support targeting. Data on individual learners is collected whilst they are on the programme due to logistical problems in obtaining this data beforehand which would mean the delivery of the programme would have to be delayed.

(Morris, Rutt, and Yeshanew, 2005; Morris and Golden, 2005; Morris and Rutt, 2006; Kerrigan and Carpenter, 2009; Hatt, Baxter, and Tate, 2009; Aimhigher Birmingham and Solihull, 2010; HEFCE, 2010; Dumais and Ward; 2010; Davies and Qiu, 2014; Green *et al.*, 2018; Häs *et al.*, 2021). Other studies have reported that interventions have led to improvements in HE participation rates (Morris, Rutt, and Mehta, 2009; Chilosi *et al*., 2010; Burgess, Horton and Moores, 2021). Causal evidence to support these claims is lacking (Gorard, See and Davies., 2012) due to a lack of controls, sampling attrition / bias and a lack of comparison groups. A number of more robust studies including UK RCT's have provided no evidence to suggest that WP interventions improved either pupil AABs or HE participation (CfE, 2019). However, these studies were impacted by high attrition rates within the treatment group and perhaps may have led to sampling bias.

The Aimhigher programme predominately targets learners that have the potential (e.g., a good level of attainment) to progress to HE. Evidence suggests that even when disadvantaged learners obtain similar GCSE grades to their more advantaged peers, they are less likely to progress to HE (Chowdry *et al.*, 2010; HEFCE 2016). The Aimhigher programme is based on the premise that learners from disadvantaged backgrounds lack forms of capital (Becker, 1964; Bourdieu, 1984; 1986; 1988; Coleman, 1988), as their families are less likely to have been to university (Bourdieu, 1984; Archer, DeWitt, and Wong, 2014). In turn, their family environment and socialisation practices tend not to provide the relevant knowledge, experience, connections and ownership or resources that enable them to identify and see university as a viable option (e.g., it is not for people like me), compared to their more advantaged counterparts (Coleman, 1988; Bourdieu and Wacquant, 1992). Bandura's (1977) concept of self-efficacy compliments this theory, as it suggests that parents with lower academic qualifications, will find it more difficult to support peer modelling as they themselves have struggled to obtain academic qualifications.

The Aimhigher programme seeks to address these barriers by working with key influencers surrounding the young person including teachers, Aimhigher peer mentors and ambassadors. Often disadvantaged learners do not have social networks or role models who have been to university and in turn are unable to offer support to enable them to make an informed decision (Maguire, Ball and Macrae, 2000; Moschetti and Hudley 2008). Aimhigher undergraduate peer mentors (mentoring programme) and summer school ambassadors are a key component (influencers) of this support and often include young undergraduates of a similar age and background that learners can identify with. Summer schools also aim to support learners' social and cultural capital by providing exposure and familiarity with university settings, so that learners feel more comfortable. By creating familiarity and a feeling of belonging, interventions aim to make disadvantaged students feel that 'university is for people like me'. The combination of learner-focused interventions and engagement with key influencers aims to enhance learners' networks (St John, 2013) and their social and cultural capital to address associated barriers that purportedly inhibit disadvantaged learners' progression to HE.

The Aimhigher programme works with disadvantaged learners with the potential to progress to HE (good attainment) and aims to address these barriers, which include:

a) Due to a lack of parental HE experience and differing socialisation practices (Archer, DeWitt and Wong, 2014; Bourdieu, 1984), disadvantaged learners are less likely than their (advantaged) peers to have a ***knowledge and understanding*** of HE and progression pathways (qualifications and grades required, how to apply, course and institutions to apply for, what will student life will be like etc.)
b) this may lead disadvantaged learners having, ***less positive attitudes*** towards HE in terms of feeling university 'is not for people like me' (Reay, Crozier and Clayton, 2009) and due to financial concerns (e.g., misconceptions about student finance and the graduate premium)

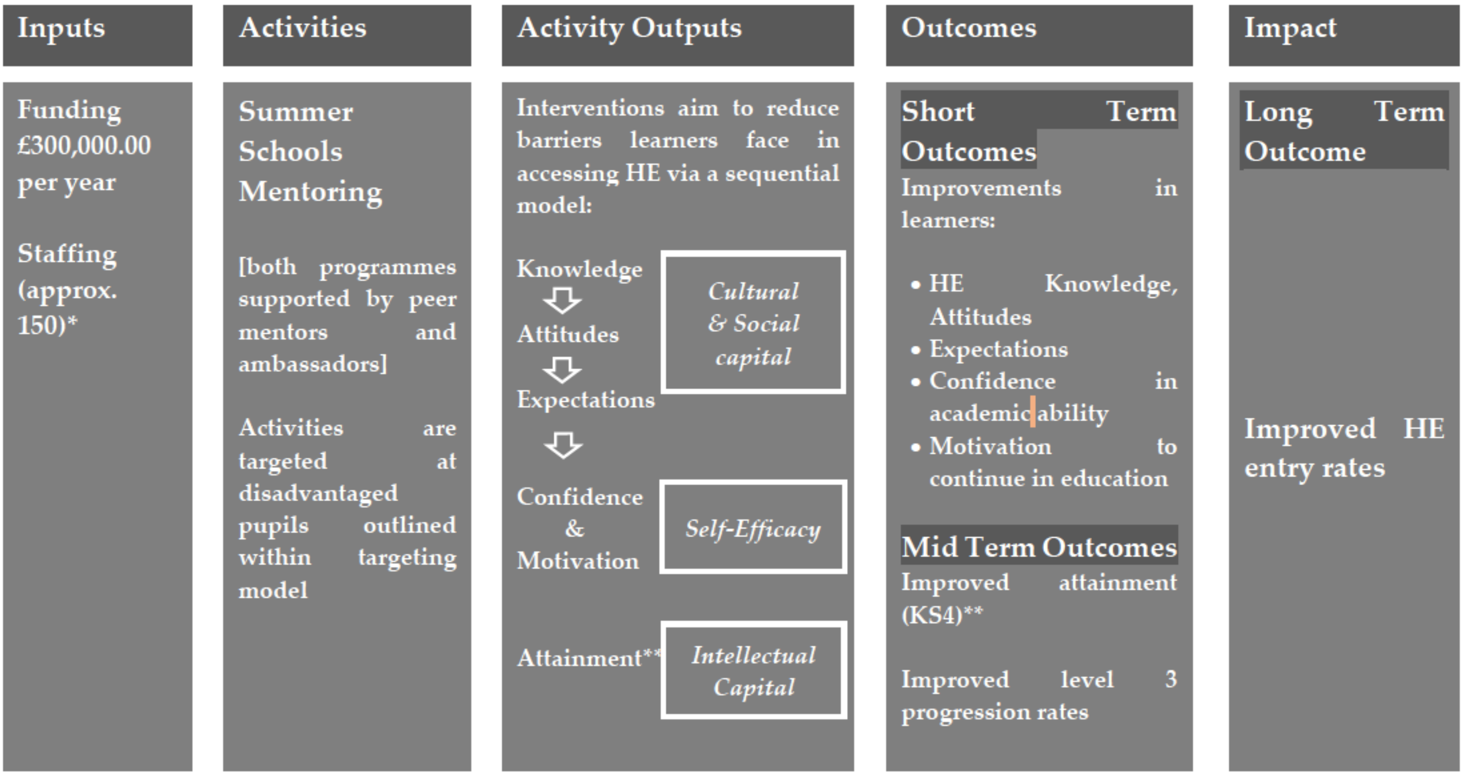
These barriers will limit disadvantaged learners' ability to make an ***informed decision*** on whether to go to HE or not. In turn, this may lower their:

c) ***intentions / expectations and motivations*** to progress to HE. A lack of Knowledge about the financial support available and misconceptions about the true costs and benefits of HE may reduce expectations and aspirations discouraging some disadvantaged students from participating in HE (Becker, 1993)

Disadvantaged learners may have lower levels of self-efficacy (Bandura, 1977) and confidence in their academic ability (Crawford, Goodman, and Joyce, 2010) and may have lower attainment levels (although the latter is less of concern to the current programme, as higher attaining learners are targeted).

These mechanisms / possible causal factors for low participation have been drawn together to provide a Theory of Change (ToC) to evaluate the impact of the Aimhigher programme (see figure 12). The ToC has been developed with reference to the theoretical models and research discussed to ensure that important mechanisms that may influence disadvantaged students' HE outcomes are appropriately operationalised, measured, and controlled. The framework is supported by evidence of SES differences in pupil attainment (DfE, 2009-2019) and which largely account for SES differences in HE participation rates (DfE 2009-2019, OfS, 2020, UCAS, 2019). Through the incorporation of these factors, the conceptual framework employs a psycho-sociological model to evaluate the impact of Aimhigher summer schools and mentoring interventions upon these pupil-level factors (e.g., AABs) and whether improvements lead to an increased likelihood of entering HE[12].

Figure 12: Aimhigher Theory of Change (ToC)



*Includes university outreach staff and student mentors and ambassadors. Aimhigher funding does not cover all university costs to deliver the programme (e.g., outreach staff).**it is important to note that the Aimhigher programme is targeted at learners who have the potential to progress to HE in that they are predicted to obtain a good level of KS4 attainment to enable them to progress onto a level 3 qualification. The programme does provide some subject-specific tutoring to a few borderline-attaining learners, but this is a small aspect of the programme.

[12] The study intended to investigate whether engagement within Aimhigher interventions improved pupil outcomes in terms of KS4 attainment and progression to a level 3 course. However, these factors have been dropped from the study due to problems in accessing administrative datasets (this is discussed in more detail within the method chapter).

4.2.5 How Does the Study Address Limitations and Gaps of Previous Widening Participation Research

Despite two decades of concerted effort across the sector to widen participation into HE, there is very little causal evidence in terms of the effectiveness of programmes. This evidence is often limited due to sampling bias, a lack of controls and a lack of experimental design. Reviews of this evidence (Robinson and Salvestrini, 2020) have outlined that there is little robust evidence in terms of the effectiveness of high-cost and resource-intensive summer schools and mentoring programmes, which are widely employed across the HE sector. McCaig, Stevens and Bowers-Brown (2006) report that HEIs perceive these interventions as being the most effective in terms of increasing HE entry rates for under-represented groups. The research presented in this thesis provided a step forward in evidencing the impact of WP interventions. The research involved tracking a large cohort of learners (circa 4,700) from year group nine and above, over six academic years to the point of HE entry. The research addresses many of the limitations of previous studies by employing a quasi-experimental approach, a comparison group and appropriate controls. The study investigated a number of policy relevant questions in terms of the effectiveness of Aimhigher summer school and mentoring programmes on increasing pupils:

1. likelihood of entering HE and,
2. AABs and,
3. if AABs played a mediating role in terms of pupils' HE entry behaviours.

The later analysis focused on the validity and predictive power of AABs, which were measured via baseline and follow-up surveys. This aspect of the research undertaken covers a major gap in the literature as there is no published research on whether such causal link exists between the cohorts of learners commonly targeted by WP programmes (e.g., learners with good attainment and the potential to progress to HE). Studies investigating inequalities in HE participation tend to rely upon administrative data sets (NPD) and report that most of the differences in HE participation (80% to 85%), can be accounted for by KS4 attainment and SES (Crawford and Greaves, 2015; Gorard 2018).

A few studies have linked national survey data to the NPD to investigate the importance of learner aspirations on HE entry. Some promising findings for learners' aspirations have been presented (Croll and Attwood, 2013), whereas other studies have found that attainment and SES are more important predictors of HE entry (Siddiqui, Boliver and Gorard, 2019). Problematically this research provides little understanding of the cohorts of learners commonly targeted by WP programmes who often have good levels of attainment. Evidence suggests that advantaged learners are more likely to participate in HE, than disadvantaged learners with similar GCSE scores (Chowdry, Crawford, and Goodman, 2010; HEFCE 2016). It is possible that this is due to pre-existing differences in learners' AABs.

Further, both Croll and Attwood (2013) and Gorard *et al.,* (2018) analysis do not include other AABs that may mediate learners' likelihood of entering HE. The research study undertaken measures several important learner AABs including, knowledge of HE, attitudes towards HE, confidence in their academic ability, academic motivations and including HE expectations. The study compares changes in AABs between learners who have and have not engaged within the programme. WP programmes regularly employ AABs to measure the impact of interventions. However, there is no published evidence on the reliability and validity of these measures. The research presented in this thesis aims to address this gap.

The research undertaken is an improvement on previous research by including a wider range of controls for pupil characteristics (attainment, demographic, SES, and AABs) that have been shown to be associated with inequalities in school achievement and HE participation outcomes (as referenced within the literature review). WP programmes and associated evaluations have been criticised for self-selection bias, in that the learners who chose to engage are more likely to have good attainment, higher academic motivations and HE expectations to participate in HE. This leads to 'deadweight' as these learners may already be on a HE trajectory irrespective of whether they engaged (Harrison and Waller, 2015). The inclusion of control measures enabled the analysis to establish how well-matched the treatment and non-treatment groups were and whether differences in outcomes could be explained by pre-existing differences within learners' characteristics. Further, the employment of a wide range of controls allowed the study to provide a detailed investigation of treatment effect heterogeneity (e.g., was treatment more or less effective for learners' holding different characteristics). Very few WP studies have investigated this and those that do have been limited in the number of controls employed or focused analysis at programme-level and not specific interventions (e.g., Burgess, Horton and Moores, 2021).

The research undertaken focused on the impact of Aimhigher interventions on learners in year groups 9-13. Previous studies have been critiqued for focusing on students completing level 3 courses (A level or equivalent where there are only small differences in HE participation between disadvantaged and advantaged SES groups (Gorard, 2018). The research will have important practical and policy implications for the Aimhigher programme and wider sector, by providing robust evidence on what types of interventions are most effective and for whom, if frequency (dosage) of engagement matters (in mentoring) and which AABs, if any played a mediating role in determining disadvantaged learners HE trajectories. Establishing if an association exists between AABs and HE entry behaviours has important implications for WP programmes which spend a considerable amount of time, resources, and funding (£887.7 million in 2016/17 OfS, 2018) addressing such factors. In turn, findings may have practical implications by providing insights on improving programme effectiveness, design, delivery and targeting.

Chapter 5: Research Methodology

5.1 Introduction

The purpose of the research presented in this thesis was to investigate whether Aimhigher mentoring, and summer school programmes improved pupils' non-cognitive functions (AABs) and likelihood of entering higher education (HE). The programme aimed to address the widely reported SES inequalities in HE participation (see Chapter 4a). The Aimhigher programme was accessed by disadvantaged pupils', aged between 11 and 18 years (year groups 9-13), attending secondary schools/academies in the West Midlands region of England. The programme targeted pupils' with the potential to progress to HE (e.g., those on course to achieve 5 *A-C GCSE's or equivalent including English and maths). There is limited evidence for the effectiveness of WP interventions in improving pupil AABs and HE entry outcomes (see chapter 3). Many studies have been criticised for focusing on post-16 students (see Robinson and Salvestrini, 2020) where there are only small differences in HE participation between disadvantaged and advantaged SES groups (Gorard *et al.*, 2018). Previous evidence and reviews of the research literature (see chapters 3 and 4) outlined that, evaluations often suffered from poor methodology, sampling, and a lack of controlled or randomised comparisons between participants and non-participants (Gorard *et al.*, 2006; Gorard, See and Davies, 2012; Younger *et al.*, 2019, Robinson and Salvestrini, 2020). The research undertaken was designed to ensure that many of these methodological limitations were avoided. Widening participation programmes (including Aimhigher) spend a considerable amount of resource on improving pupils' AABs. However, importantly there is no published research as to whether AABs play a mediating role in the HE entry behaviours for the cohorts of pupils often targeted by WP programmes (e.g., pupils' with good attainment). The research undertaken addressed this important gap.

Findings will have important practical and policy implications in terms of how WP programmes are designed, delivered and targeted to reduce inequalities in HE participation. The following sections detail the research aims, design, ethical considerations, the outcome, and control variables employed, the samples and the analysis plan.

5.1.1 Research Design

The main dependent variables within the study were whether a participant entered HE and measures of participants' HE knowledge, expectations, attitudes, academic confidence, and motivation (AABs). The research investigated if Aimhigher interventions improved; a) pupils' likelihood of entering HE; b) pupils' AABs; c) if AABs were associated with HE entry behaviours. The study also investigated the reliability and validity of the survey items.

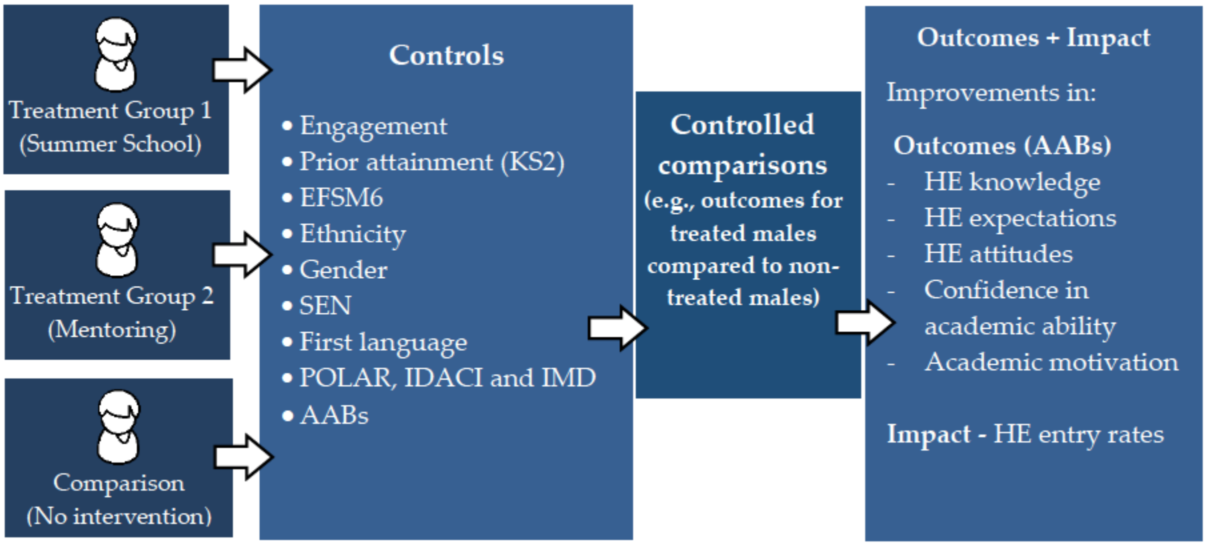
To evaluate the effectiveness of the Aimhigher programme a quasi-experimental design approach (QED) was employed. Pupils' AAB and HE outcomes were tracked from 2011/12 to 2018/19. The study compared outcomes between pupils who engaged in Aimhigher summer school or mentoring interventions (treatment group) against those that did not engage in Aimhigher interventions (comparison / non-treatment group). As participation within the programme was entirely voluntary, pupils were not randomly assigned to treatment types.

The design of the study employed a wide number of pupil controls that have been found to be associated with the stratification of educational outcomes (see chapters 2 and 3). These controls were obtained via the National Pupil Database (NPD) and included KS2 attainment, gender, ethnicity, first language, EVERFSM6, SEN status, various postcode measures and AABs collected via surveys (see section 5.3). This enabled the study to understand the comparability between the treatment and non-treatment groups and enabled treatment types to be matched post-hoc to support controlled comparisons in terms of each outcome (see figure 13 below and section 5.5).

The comparison group was obtained by conducting online surveys (to measure AAB outcomes) with pupils in a sub-sample of schools (see section 5.4.3). A difference-in-differences (DiD) approach was employed to compare changes in AABs (between the treatment and non-treatment groups). This was measured via baseline and follow-up surveys completed one year apart. The study also compared differences in HE entry rates (HESA entry data) between both groups. Figure 13 provides an overview of the research design. The research undertaken also addressed other gaps within the published literature by investigating whether a) frequency of engagement in mentoring was associated with pupil outcomes, b) whether there were heterogeneous treatment effects for mentoring and summer school programmes (e.g., did some pupils benefit more from treatment than others).

Widening participation programmes widely employ AAB surveys to measure the impact of programmes. However, there is no published evidence on the validity and reliability of these measures. The study addressed this gap. The reliability of surveys was tested by comparing baseline and follow-up survey scores (taken one year apart) for the non-treatment group. The validity of survey items was tested by investigating whether there was an association between survey scores and a pupil's likelihood of entering HE (see section analysis plan section 5.5, for more detail). This analysis was conducted with the non-treatment group, as the sample was much larger than the treatment group and non-treated pupils' follow-up survey scores had not been impacted by the intervention. Previous studies that have investigated the mediating role of AABs on HE entry have tended to focus on different cohorts not targeted by WP programmes and only one or two AABs (e.g., see chapter 3, Croll and Attwood, 2013; Siddiqui Boliver, and Gorard, 2019). The research undertaken aimed to address these gaps by investigating if a wider range of pupil AABs (five) could be improved by the Aimhigher programme and if these AABs were associated with their HE entry behaviours.

Figure 13: Study Design – Treatments, Control and Outcome Measures



5.1.1(a) Methodological Considerations

This section outlines the methodological and ethical considerations made in choosing the quasi-experimental design compared to other approaches.

Over recent years UK government policy has placed an increased emphasis on utilising robust evidence to inform public spending and decision-making. This has led to the establishment of several 'what works' centres supporting schools (Education Endowment Foundation) and HE (see What Works Network, 2023). One such centre is led by TASO which aims to improve evidence within the field of HE widening participation. Both TASO guidance and that from the OfS (see APP standards of evidence, 2019) outline the importance of employing experimental approaches (RCTs and quasi-experimental designs) as a way of demonstrating the effectiveness of interventions and causality.

RCT's have been widely employed since the mid-twentieth century within the field of health sciences and have proved essential in demonstrating that some treatments which were shown to be beneficial (via weaker methods) were in fact harmful and in some cases increasing mortality rates (Torgerson and Torgerson, 2008). The strength of an RCT, is that participants are randomly assigned to an intervention (experimental group) or to a control group, which may be an existing treatment, placebo and / or no treatment (NESTA, 2017) Randomisation ensures both samples are similar in terms of known and unknown characteristics, thus addressing the issue of selection bias. This allows RCTs to infer causality (Taber, 2019) and in turn are regarded as providing the gold standard in understanding 'what works' (Torgerson *et al*., 2008).

Across the sector widening participation activities are commonly delivered as part of a multi-intervention programme (Robinson and Salvestrini, 2020) of inter-related activities to learners from year groups 9 to 13. The few RCTs (CfE, 2019) that have been employed within the field of WP have tended to focus on a single isolated intervention delivered over a short period of time (e.g., 3-4-day summer schools or mentoring over several weeks). Employing an RCT to evaluate the impact of a single intervention simplifies the purpose of such programmes, which tend to target disadvantaged learners that often experience a multitude of barriers to HE. Expecting one intervention, such as an information, advice, and guidance session on student fees to address all young peoples experienced barriers to HE, is unlikely to be effective on its own. This is because other needs-led support may also be required to address barriers, such as mentoring via peer role models and visits to universities, so that disadvantaged pupils feel a better sense of belonging and fitting in. In turn, each component of the intervention is dependent on the next component to ensure that the programme is successful in increasing HE participation. These activities vary by type and sequence and together in combination, an optimal number of activities is more likely to be more effective in increasing HE progression rates as observed within previous studies of multi-intervention programmes (e.g., Burgess, Horton and Moores, 2021). An RCT conducted on an isolated intervention at a single point of time is unable to take into account such complexities in terms of all the important short to long-term outcomes that may support future HE participation.

For the study, a quasi-experimental design (QED) was chosen over an RCT due to several practical and ethical issues. Pupils were tracked from year 9 to the point of HE entry. Participation within interventions was voluntary. It was not deemed ethically appropriate to employ an RCT as pupil outcomes were being tracked to HE. In turn with an RCT some pupils would have been excluded throughout their secondary education from accessing interventions. Exclusion could impact on their future educational trajectories and social mobility. However, advocates of RCTs may argue that this is ethical, as randomisation helps to establish a strong evidence base in terms of 'what works', ensuring that resources are deployed more effectively. Alternatively, in some cases, RCTs address these ethical concerns by offering the intervention after the experiment (Ruthven, Mercer, and Taber, 2016). However, this is only useful within a WP context when short-term outcomes are being measured (e.g., changes in AABs) rather than longer-term outcomes such as HE entry. As HE entry was the main outcome of interest an RCT was not deemed appropriate.

These ethical objections are why RCTs currently tend to focus on isolated individual interventions (see CfE 2019 report). As outlined this approach is limited in improving our understanding of 'what works'. Further, the findings from the few RCTs that have taken place in England (CfE, 2019) have shown that summer school, mentoring and other types of interventions have not improved pupils' AABs or likelihood of participating in HE. However, these results are lacking in validity due to large attrition rates from the experimental group. For these reasons outlined the research undertaken employed a quasi-experiment approach. This approach can address many of the ethical concerns raised and in turn provided a more appropriate approach to evaluate multi-intervention programmes. The approach allowed a larger cohort of pupils to be tracked over a number of years so that data could be gathered on their engagement (dosage) within interventions and associated outcomes over their educational lifecycle.

Further, a QED was preferred over qualitative methods, due to the nature of the programme's aims and the associated study research questions. Experimental approaches are more suited to assessing impact via quantitative data (HE entry and AABs measured via surveys) and larger populations. Qualitative approaches generally are more supportive of understanding the processes (e.g., programme content and contexts) that lead to impact. It is argued that experimental research is more objective than qualitative approaches which are often criticised for more subjectivity in terms of the interpretation of data (Taber, 2019).
However, QEDs have also been criticised for bias and an inability to demonstrate causality due to non-randomisation (Torgerson *et al.*, 2008) leading to selection bias. For example, pupils engaging in WP interventions are likely to have higher attainment and be more motivated to engage in the intervention than pupils' who are not on a HE trajectory, leading to 'deadweight' (Harrison and Waller, 2015). If the treatment and non-treatment groups are biased in this way, then differences in outcomes could in turn be due to pre-existing differences in pupil attainment, motivation, or other factors. To some extent, this can be addressed by matching experimental and comparison groups before the study, so both groups are similar across variables that can affect the outcome (Taber, 2019). Alternatively, a post-hoc matching approach can be employed via propensity score matching (PSM) or a controlled regression analysis (e.g., comparing outcomes for pupils of the same characteristics). These later approaches were included within the planned analysis design within the study (see section 5.5). As outlined in the design section most but not all of the important controls associated with educational outcomes were employed (a detailed consideration of these factors is provided within the discussion chapter (section 7.5.1). In turn, the experiment and comparison groups may have differed in terms of known and unknown variables that could affect outcomes. Other intermediary outcomes of interest to the study included pupils' KS4 attainment and whether they progressed to a level 3 course. However, these data were unavailable, due to restrictions in accessing administrative datasets (NPD), changes in GDPR and delays in processing before and during the Covid-19 pandemic. However, pupil KS2 attainment was available for the research undertaken and provides a strong indicator of KS4 attainment (Goodman and Gregg, 2010).
The validity of RCTs and QEDs may be impacted by other confounders. Importantly attrition bias concerns where participants who drop out of a study are unlikely to be random and may

differ from those who remain, thus affecting the outcome (Torgerson *et al.*, 2008). Further, Silverman (1997) outlines that participants are likely to have different characteristics to those that do not volunteer. Another problem is dilution bias, which refers to the possibility that participants may access similar interventions during or after the trial period and thus may dilute outcomes (Torgerson *et al.*, 2008). This is relevant to widening participation programmes where outcomes (HE entry) are often measured many years later. Taber (2019) outlines findings within experimental studies may be influenced by maturation. This refers to that our cognitive abilities develop as we mature (Goswami, 2008; Piaget, 1972). In turn, regardless of whether or not a participant takes part in an intervention, we would expect some improvement in their cognitive abilities. This improvement could mistakenly be attributed to the intervention. The study addressed this issue to some extent by comparing changes in AAB survey scores between the experiment and comparison group (e.g., if the experiment group experienced larger increases this could be attributed to a treatment effect). There are several other factors that could have affected the validity and reliability of the research in terms of missing data, attrition, and the comparability of samples. These are examined in more detail later within the method (see sampling and analysis plan) and discussion chapters.

It is important to consider the potential limitations and benefits of employing online surveys to measure shifts in pupils' AABs. Online surveys were deemed the most efficient way to collect data on pupils' AABs, due to the size of the cohorts being tracked. As the surveys were online, this could reduce the effects of researcher contamination (Labov, 1973), but can increase misunderstanding of questions. However, pupils' understanding of question items was improved through piloting and ensuring the reading age was appropriate for participants. This validation work and the strengths and limitations of surveys are discussed in more detail within section 5.2.2.

Research Questions

The study investigated seven research questions:

RQ 1 (a): Is engagement in Aimhigher (summer schools or mentoring) associated with an increased likelihood of pupils' entering higher education?

RQ 1 (b): Is there heterogeneity in the treatment effect?

RQ 2 (a): Is there an association between knowledge of HE and HE expectations; attitudes to HE; academic motivation; confidence in academic ability and pupils' likelihood of entering HE?

RQ 2 (b): Is this association stratified by pupil characteristics (attainment, demographic, socio-economic and baseline AABs)?

RQ 2 (c): Are Aimhigher survey measures reliable?

RQ 3 (a): Is engagement in Aimhigher (summer schools or mentoring) associated with an increase in pupils' knowledge of HE and HE expectations; attitudes to HE; academic motivation; confidence in academic ability?

RQ 3 (b): Is there heterogeneity in the treatment effect?

5.1.3 Ethics

The research undertaken was granted ethical approval by the University of Birmingham Ethics Committee in November 2012 (Application no. ERN_12-1065 see Appendix 2). The research was passed by the Committee on its first application with only minor alterations required to the parent information and consent form. The research design addressed four risks identified by Diener and Crandall (1978):

a) Whether there is harm to participants
b) Whether there is a lack of informed consent
c) Whether there is an invasion of privacy
d) Whether deception is involved

Harm to participants was judged to be insignificant due to the nature of the study. Further, as outlined participation in Aimhigher interventions was voluntary. This addresses concerns often raised towards RCTs in terms of random allocation. Points a, b and c were addressed through fully informed explicit consent and Data Sharing Agreements. These mechanisms provided safeguards for the sharing of pupil data in a legally compliant way across the Aimhigher partnership and organisations providing access to national administrative datasets (NPD, ILR and HESA).

Informed Consent

Participation was supported via informed consent. The Social Research Association (2003, p.29) defines informed consent as: 'A procedure for ensuring that research participants understand what is being done to them, the limits to their participation and awareness of any potential risks they incur'. The research employed two layers of consent to support a lawful basis for participation in the study and access to administrative data sets (e.g., NPD and HESA). Fully informed explicit consent was obtained via school headteachers / deputy heads and pupils' parents. A letter and consent form was sent out to schools inviting them to participate in the research (see Appendix 3 school information and consent letter). The letter outlined the purpose of the research, how data would be collected from pupils', how it would be matched to local and national administrative data sets, and how findings would be used. Following recruitment, a planning meeting was held with each school to discuss the study, purpose, timescales, which year group(s) would be longitudinally tracked, the survey and parental consent.

Once a school's participation in the research was confirmed, parent information and consent forms were distributed. Parents of pupils who participated in Aimhigher interventions received the treatment group parent information and consent form (see Appendix 4). Parents of pupils within the non-treatment group received the non-treatment group parent information and consent form (see Appendix 5). Every effort was made to ensure that both parents and pupils understood the information provided about the nature of the study. The consent forms provided information about the Aimhigher programme including aims, and what data would be collected (e.g., programme engagement and surveys), processed and matched to administrative data (NPD and HESA). Further, information and consent forms were worded in an age-appropriate manner to ensure pupils' understood the nature of the research (see section 5.2.2).

Confidentiality and Anonymity

Several safeguards were employed to ensure that personal data was stored safely and only used for the purposes outlined to participants. Information letters and consent forms sent to schools and parents outlined that personal data collected for the study would only be shared with the researcher, school, and third-party organisations for data-matching purposes (NPD and HESA). Data Sharing Agreements between Aimhigher, the NPD and HESA outlined how personal data would be processed lawfully and securely in accordance with the eight core principles set out within the Data Protection Act (1998 and 2018). The following lawful conditions for processing data were employed: a) ‘the individual has given clear consent for the organisation to process their individual data for a specific purpose’. As the request included special categories of data an additional condition was required to process data in relation to the DPA 2018 Schedule 1: b) Explicit consent (Article 9(2)(a)) – ‘the data subject has given explicit consent to the processing of those individual data for one or more specified purposes.’ It is important to note that the research undertaken tracked pupils from 2011/12 to the 2018/2019 academic years. In 2018 the new General Data Protection Regulations (GDPR) and Data Protection Act were implemented across the UK. All data collected and consents were compliant with this regulation.

Participant consent forms also outlined how data would be kept confidential and anonymous, and that reports and outputs from the research would not identify individual children or the school. All personal data was stored on a password-encrypted database. Questionnaires were stored on a secure server and paper-based forms (questionnaires, consent, and monitoring data) were locked securely within filing cabinets. All data was kept confidential by assigning participants with a unique pupil identifier code. All data was stored in line with the University of Birmingham policies and procedures. Due to the nature of the study, data was stored for ten years to allow time for tracking, securing national datasets and analysis. In the unlikely event that a student disclosed any information regarding safeguarding issues, the programme would immediately report this to the school and local authority. Aimhigher had well-developed processes in place for such safeguarding issues.

The Right to Withdraw

Consent forms included the contact details of the Aimhigher Research Officer if parents or pupils’ required a further discussion about the research, before deciding whether participate. Consent forms explicitly outlined the right to withdraw from the study and to have data destroyed at any stage. All parents and pupils were made aware that if they opted out of the research, there would be no adverse consequences and they could still participate in Aimhigher interventions.

5.2 Outcome Variables – Definitions and Measurement

The primary outcome variable of interest to the research undertaken was whether participants entered HE (RQs 1a and 1b). Other intermediary outcome variables of interest to the research included non-cognitive functions (AABs) measured via the survey. The survey measures provided data to investigate RQs 3a and 3b, in terms of whether improvements in AABs were associated to engagement within Aimhigher; and RQs 2a and 2b, in terms of whether improvements in ABBs were associated with an increased likelihood of entering HE. This section outlines how the outcome variables employed within the research were defined, operationalised, and measured. The coding sheet (Appendices 6 and 7) provides a full overview of the control and outcome measures employed, their levels of measurement and how they were coded.

5.2.1 HE Participation

The literature review provided evidence to suggest that pupils with particular socio-economic and demographic characteristics and lower prior attainment were less likely to progress to HE (DfE, 2009-2020, OfS, 2020, UCAS, 2019). Two national data sets support the measurement of UK-domiciled students' progression to HE. The Universities and Colleges Admission Service (UCAS) provides data on HE applications and acceptances. Whereas the Higher Education Statistics Agency (HESA) provides data on students who enter HE. One major limitation of these data sets is that they do not account for the influence of prior attainment, as analysis often excludes those that have not applied to HE (see Gorard *et al.*, 2006). HESA data have several advantages over UCAS data. Firstly, HESA accounts for 92% of HE students in publicly funded HE institutions throughout the UK (including full and part-time students and those attending the Open University). UCAS data only provides analysis for full-time students. There are some limitations of HESA data in that it excludes domiciled UK students that study HE level courses abroad. Further, there is an 18-month delay from the time of entry to when data is released.

The research undertaken utilised the HESA data set to track pupil outcomes, as it provided a wider coverage of university pathways. Within the study, HE entry is defined as pupils aged 18 years entering HE on a programme above level 3 (any course of prescribed HE, whatever the mode of study e.g., HND, HNC, foundation degree) and staying on their course for a least 50 days. This data was collected for pupils' who had participated in Aimhigher interventions and for pupils' who had not participated. HESA records were matched to Aimhigher records to identify who had entered HE (field name academic year of entry). This was transformed into a dummy nominal variable where a coding of "1" signified the pupil had entered HE and "0" signified that the pupil had not entered HE.

One major limitation of this approach is that some pupils' that are coded as "0" (did not enter HE), may have entered HE but cannot be matched due to errors in their personal data. To reduce such error, pupils' were only matched to a HESA student record if they had been matched successfully to the NPD (e.g., either a KS2, KS4 or KS5 record). Participants who were not matched to a record were coded as missing data, ".". Another limitation of the above approach is that many participants are likely to enter HE after 18 years of age and in turn, HE entry rates will be higher than those reported within the study.

5.2.2 Outcomes Measured via Surveys

A key aim of the research was to investigate if engaging in Aimhigher interventions led to improvements in pupils' AABs and whether AABs mediated pupils' likelihood of entering HE. Data on pupils' knowledge, intentions / expectations, and attitudes towards progressing to HE ('cultural capital') confidence in their academic ability (self-efficacy) and academic motivations was collected via an online survey. Standardised baseline and follow-up surveys were completed one year apart by a sub-sample of treated and non-treated pupils within year groups 9-13 (see sampling section 5.4.3. for more detail). Surveys were employed to measure whether engagement (compared to non-engagement) in Aimhigher interventions led to improvements in pupils' non-cognitive functions (AABs).

The survey items within this study were developed from the Aimhigher West Midlands survey employed to measure the impact of interventions. This original survey consisted of nine survey items that measured pupils' HE knowledge, expectations, and attitudes. This Aimhigher survey was employed routinely within the programme, at the start of mentoring and summer schools and then again at the end of each intervention.

For the purposes of the research, this survey was refined and improved with reference to the literature review (see chapter 3) and the aims of the Aimhigher programme. This led to the survey being expanded to include 15 survey items. Notably, the original Aimhigher survey did not include any question items on academic confidence and motivations. The literature review outlined the importance of these factors and in turn, a number of survey items were included. All questions were validated to ensure pupils' participating in the research could understand each item. This was achieved by improving the readability age by cognitive testing with pupils. The first stage of this process involved employing the SMOG calculator to test and reduce the reading age of questions. McLaughlin (1969) developed the SMOG (Simple Measure of Gobbledygook) reading level calculator to determine the grade level (year group level) a person must have to understand the text. Readability scores are based on the number of polysyllabic words, where a higher number increases the reading level of the text. The original nine Aimhigher survey item items were pasted into the SMOG calculator and provided a reading age of year 12 (age 16-17). As the survey was employed with pupils' in years 9-13, the question items were refined to decrease the reading level. This involved refining (reducing the number of polysyllabic words) the original nine question items to reduce the readability age and developing six new question items. Further, the validity of all question items was increased through cognitive testing on a cohort of 15 pupils (years 9-12) to check their understanding. Refinements were made to the wording of question items where needed. The vast majority of question items within the final survey ended up with a reading age of year 8 (12-13 years) and a few had a reading age of year 9 (13-14 years). The detailed SMOG analysis for each question item is provided in Appendix 5a.

The survey took approximately 20 minutes to complete. Pupils were asked to respond to the 15 statements using an ordinal five-point Likert Scale (d*efinitely to definitely not or strongly agree to strongly disagree*). All question items included within the survey are outlined within the sections that follow and were employed as both a baseline (control) and as outcome measures.

5.2.3 Knowledge of HE Survey Outcome

Evidence presented in chapter 3 outlined that disadvantaged pupils' socialisation and upbringing practices within the home and the greater likelihood that their parents have not been to HE make it more difficult for them to succeed at school and progress to HE (Bourdieu, 1973). Empirical evidence supports this claim in that knowledge of HE has been found to be stratified by socio-economic class (Connor *et al*., 2001; Plank and Jordan, 2001; Rosa, 2006; Grodsky and Jones., 2007; Bell, Rowan-Kenyon and Perna (2009) and may also be associated with the likelihood of entering HE (Dumais and Ward, 2010; Davies and Qiu, 2012).

The research undertaken proposed that a pupil's knowledge and understanding of HE was a key determinant of whether they enter HE in the future. Knowledge and information about HE can support pupils' to make informed decisions on whether or not to go to HE. However, the importance of this factor has been largely overlooked within research and theory into HE inequalities. Knowledge about HE may be regarded as an element of a pupil's cultural and social capital (Bourdieu (1973; 1984). Within the research undertaken HE knowledge and understanding were defined as the information that pupils have about, HE in terms of the qualifications/grades required for entry, the types of courses available, how to apply and what student life will be like. Eight HE knowledge question items were included in the survey (see table 15). It was expected that engagement within Aimhigher interventions would improve pupils' HE knowledge compared to the non-treatment group.

Table 15: Knowledge of HE Question Items

Statements	Response format (coding)
I understand what student life would be like in higher education	Definitely 5 Probably 4 Not Sure 3 Probably not 2 Definitely not 1 Missing data "."
I know enough about higher education to decide whether to go or not	
I understand how to apply to higher education	
I know the qualifications that I will need to be able to go to higher education	
I know the grades that I will need to be able to go to higher education	
I am clear on which higher education course/subject to apply for	
I am clear on which higher education institutions I want to apply for	
I understand how the UCAS application process works (UCAS is the organisation responsible for managing applications to higher education courses)	

5.2.4 Attitudes to HE Survey Outcome

Evidence presented in chapter 3 outlined that the formation of negative or positive attitudes towards HE education was a key determinant of whether someone enters HE. Attitudes towards HE may be regarded as an element of a pupil's cultural and social capital (Bourdieu, 1973). Empirical evidence suggested that parent/child HE attitudes are stratified by socio-economic class (Connor *et al*., 2001; Avery and Kane, 2004; Gabaix and Laibson, 2006; Bowes *et al.*, 2015; Callender and Mason, 2017), pupil/parent characteristics (Morris and Rutt, 2005; 2006) and may also be associated with the likelihood of entering HE (Dumais and Ward, 2010; DCSF, 2009, Goodman *et al.*, 2010, Chowdry, Crawford, and Goodman, 2010; Davies, Qiu and Davies, 2014).

Five survey question items were employed to measure pupils' attitudes towards HE. Attitudes are defined as an individual's negative or positive perceptions and opinions about compulsory schooling and HE. Factors measured within this survey included whether pupils' were interested in education, perceptions of the affordability of HE and whether they felt they would fit in HE. One question item crossed over with pupils' confidence in their academic ability. The question items and Likert Scale response formats are summarised in table 16 below. The last four questions were routed and dependent on a participant's response to the question: '*I am planning/considering going to higher education before I am 30 years old*' (see next section). Participants that responded: *'not sure'*, *'probably not'* or *'definitely not'* to this question were routed to a bank of other questions that focused on the reasons (barriers) why they did not intend (or were not sure) on going to HE. These questions consisted of negative statements and were reversed scored as outlined below. It is expected that engagement within Aimhigher interventions would improve pupils' HE attitudes compared to the non-treatment group.

Table 16: Attitudes to HE Question Items

Statements	Construct	Response format (coding)
University is for people like me	Attitudes	Definitely 5, Probably 4 Not Sure 3, Probably not 2 Definitely not 1 Missing data "."
I can't afford to continue into higher education because I am worried about getting into debt		Strongly agree 1, Agree 2 Not Sure 3, Disagree 4 Strongly Disagree 5 Missing data "."
It is not worthwhile continuing with education	Attitudes and academic motivation	
I'm not interested in education		
I do not feel confident in my ability to cope with learning in higher education	Attitudes / confidence in academic ability	

5.2.5 Expectations and Intentions to Progress to HE Survey Outcome

Evidence presented in chapter 3 outlined that expectations and aspirations about progressing to HE may be regarded as an element of a learner's cultural and social capital and in turn may be stratified by SES (Bourdieu, 1984). Goodman *et al.*, (2010) presented evidence to suggest that aspirations and expectations may also be influenced by prior attainment and other demographic characteristics. Socialisation and upbringing practices within the home make it more difficult for disadvantaged children to succeed at school and progress to higher education (Bourdieu, 1984; Cabinet Office, 2009; DCSF, 2009; Goodman *et al.*, 2010; Chowdry, Crawford, and Goodman, 2010; Khattab, 2015). Baker *et al.*, (2014, p.1) outlined that 'poverty of aspirations', reinforce inequality because parents fail to emphasise the value of education, and children from disadvantaged backgrounds do not make 'ambitious' choices regarding university or aim to go into high-status occupations.'

Many WP programmes are based on the premise that disadvantaged pupils' often have low aspirations and this inhibits their progression to HE. The research undertaken focussed on measuring pupils' intentions and expectations to progress to HE, as this provided a more realistic measurement of their aims, plans and what they actually thought they would be doing in the future. The difference between aspirations and expectations/intentions has been discussed in the literature review (see Harrison and Waller, 2018). Within the research undertaken a pupil's expectations and intentions were defined as the extent to which they were planning or considering going to HE. Two survey question items were employed to measure pupils' future expectations in terms of whether they were confident in obtaining the required grades to progress to HE and their expectations in terms of progressing to HE. One of the question items was also associated with learners' confidence in their academic ability. The question items and Likert Scale response formats are summarised in table 17. Improvements in these non-cognitive functions were expected to increase the likelihood of HE entry for students in the treatment group than the non-treatment group. The second question within the table was not answered by all participants. This question was routed dependent on a respondent's answer to the HE expectation question. The question was reverse coded as outlined in table 17.

Table 17: Expectations and Intentions to Progress to HE Question Items

Statements	Construct	Response format (coding)
I am planning/considering going to higher education before I am 30 years old	Intentions / expectations and academic motivation	Definitely 5 Probably 4 Not Sure 3 Probably not 2 Definitely not 1 Missing data "."
I will not get the required grades to go into higher education	Intentions / Expectations / confidence in academic ability	Strongly agree 1 Agree 2 Not sure 3 Disagree 4 Strongly Disagree 5 Missing data "."

5.2.6 Confidence in Academic Ability Survey Outcome

Within the research undertaken confidence in academic ability was defined as a pupil's feeling or belief that they would succeed in their studies at school to enable them to progress to university or cope with the learning demands within HE. This was associated with the concept of self-efficacy (Bandura, 1977) and defined as an individual's belief in their innate ability to succeed in specific situations. A pupil's confidence in their academic/intellectual ability was associated with the concepts of cultural and intellectual capital (as discussed in chapter 3).

Two survey question items measured pupils' confidence in their academic ability to obtain the grades required to progress to HE and to cope with learning in a HE environment. Within the research undertaken improvements in non-cognitive functions were expected to increase the likelihood of HE entry for pupils' in the treatment group than the non-treatment group. Both question items have been outlined within previous sections as they overlap with HE expectations and attitudes. Both questions were routed and based on a participant's response to the HE expectations question and were reversed scored as previously outlined.

5.2.7 Academic Motivation Survey Outcome

Within the research undertaken academic motivation was defined as a pupil's academic desire to do well in school and continue into post-compulsory schooling and HE. Chapter 3 outlined how motivation was associated with the concept of human capital (Becker, 1964). Whether or not a person decides to go to HE is dependent on their academic qualifications and the extent to which they perceive the economic value of a degree outweighing the costs (Becker, 1993). Most WP programmes and associated evaluations have been criticised for self-selection bias in that they tend to target disadvantaged pupils with good attainment, who were more likely to have higher motivations and expectations to go to HE. This could lead to 'deadweight' as these pupils' are more likely to engage in the intervention than pupils' who were not on a HE trajectory (Harrison and Waller, 2015). Three survey question items were employed to measure pupils' academic motivation. Improvements in academic motivation were expected to increase the likelihood of HE entry for pupils in the treatment group than the non-treatment group. The question items outlined in previous sections overlap with the HE expectations and attitudes question items. The latter two questions were routed, based on a participant's response to the HE expectations question and were reversed scored in the same manner as outlined for the other questions focusing on HE barriers.

5.2.8 Survey Proxy Variables

To support analysis, the question items outlined were amalgamated into proxy variables. Baseline scores for each knowledge (8), attitudes (5) expectations (2) confidence in academic ability (2) and academic motivation (2) question items were separately combined to provide an overall mean aggregate score for each of the five measures. The same approach was employed for the follow-up survey. Aggregating scores in this way enabled the analysis to clearly test the key research questions in terms of Aimhigher's impact on ABBs and the mediating power of AABs on HE entry. For the purposes of the outcome analysis, the follow-up survey scores were subtracted from the baseline survey scores to measure mean changes in scores for each measure. Therefore, for the outcome variable, it was possible for mean scores to range from -4 to +4 across each measure. This transformation of data enabled the analysis to show if AAB scores from the baseline to follow-up surveys had either increased (signified by a '+'), not changed (signified by a '0') or decreased (signified by a '-'). Shifts in scores for each question item were only measured if a participant completed the same question within the baseline and follow-up survey. Missing data were coded as ".". As outlined the aim of the survey was to measure whether engagement within Aimhigher activities led to improvements in pupils' AABs. To support the analysis, another variable was created to identify whether the treatment group had engaged within Aimhigher interventions after the baseline survey and before the follow-up survey. This variable ensured that treatment group participants were only included within this analysis if they had engaged between the baseline and follow-up surveys (see Appendix 7 for coding of variable).

5.3 Control Variables – Definitions and Measurement

A number of controls were employed which have been shown to influence a pupil's academic achievement within compulsory schooling and the likelihood of progressing to HE. These included pupil characteristics relating to their prior attainment, demographic and socio-economic background and ABBs (Goodman *et al.,* 2010; DfE, 2009-2020; OfS, 2020; UCAS, 2019). Controls employed included measures of pupil attainment (KS2 level 4), FSM (Ever FSM6), disability status, gender, first spoken language, ethnicity and measures of disadvantage based on home postcode (POLAR, IMD and IDACI). Including most of the known important variables as controls, enabled the research undertaken to investigate the comparability between the treatment and non-treatment groups, thus enabling more robust inferences to be drawn from findings. The issue of comparability was an important concern to address as previous WP empirical studies have been criticised for a lack of control and selection bias (Gorard *et al.,* 2006; Gorard, See and Davies, 2012; Younger *et al.,* 2019, Robinson and Salvestrini, 2020). Including these controls also allowed statistical analysis to make controlled comparisons via heterogeneity in the treatment effect.

It is important to note the selection of pupils into the Aimhigher programme was based on the potential to progress to HE (defined as a good level of attainment), and their socio-economic and demographic characteristics. Programme targeting was based on a composite proxy measure, as outlined in section 4.2.3. Data for the non-treatment group was not available for participants in terms of their in-care and NS-SEC status and parents' experience of HE. In turn, this proxy composite model was not employed as a control measure within the research. The sections that follow outline how pupil engagement and controls were collected, defined, operationalised and measured. The review of national administrative datasets in chapter 4a has provided a more detailed understanding of the inherent strengths and weaknesses of these measures.

5.3.1 Engagement Within Widening Participation Activities

As outlined within chapter 4b **(section 4.2.3)** the Aimhigher programme was targeted at schools with large proportions of disadvantaged pupils. The programme had a well-established network of schools that encouraged pupils' to take part in interventions. Aimhigher registers were used to identify which pupils engaged within summer schools and their frequency ('dosage') of engagement within mentoring. Engagement could vary from pupils' participating in zero or one Aimhigher summer school per year (lasting 3-4 days) and zero or between 1-15 (or more) Aimhigher mentoring sessions per year. Pupils in year groups 9-13 were able to access the mentoring programme, whilst summer schools were open to year 10 pupils only. Aimhigher staff recorded the engagement of pupils' within these interventions into a standardised Excel spreadsheet. This ensured data was recorded in a consistent manner. The primary analysis focused on comparing outcomes between participants who engaged in mentoring or summer schools with participants who engaged in neither of these interventions (non-treatment group). The research did not investigate if there were differences in outcomes for participants who engaged in both summer schools and mentoring, as the samples were too small (< 85). The research also investigated if there was an association between the frequency of engagement (dosage) within the mentoring scheme and positive outcomes. Table 18 sets out how this data was coded for the study.

Table 18: Treatment and Non-Treatment Groups

Treatment Type	Category	Coding
Mentoring		Category (nominal)
	Mentoring (treatment group 1)	1
	Non-treatment group	0
	Missing data	"."
Summer School		Category (nominal)
	Summer schools (treatment group 2)	1
	Non-treatment group	0
	Missing data	"."
Frequency of engagements in mentoring		Category (ordinal)
	0 engagements (non-treatment group)	0
	1-5 engagements	1
	6-10 engagements	2
	11-15 engagements	3
	More than 15 engagements	4
	Missing data	"."

5.3.2 Pupil Level Control Variables

5.3.3 Prior Attainment (Key Stage 2)

Evidence within the literature review suggested that the most significant factor associated with progression to HE was a pupil's prior level of attainment, and which is stratified by a pupil's demographic and social-economic characteristics (DfE 2009-2020). Goodman *et al's.*, (2010) review found that 60% of the differences in KS4 attainment were accounted for by earlier levels of attainment for advantaged and disadvantaged pupils.

Key stage 2 final assessments are completed at the end of year 6. The Aimhigher programme and most WP interventions do not start to engage pupils' until they reach secondary school. KS2 data was accessed via the NPD and provided a clean baseline measure unaffected by WP interventions. By year 6 (age of 11) pupils take SATs tests in reading, maths, grammar, punctuation, and spelling (GPS) and receive a teacher assessment (TA) in writing. At the end of Key Stage 2 children are expected to reach a level 4 or above (expected level 27+ points) in KS2 English, Maths and Science Teacher Assessments (NPD variable name KS2_LEVXEMSTA). Pupils reaching level 4 or above, were coded as 1 and those that did not reach this level were coded as 0. Missing data were coded as "."

5.3.4 Free School Meals (Ever FSM6)

Evidence within the literature review outlined that FSM pupils were less likely to enter HE than non-FSM pupils' (DfE 2019; 2020). FSM eligibility is often used as a proxy measure of low family income. Families in receipt of benefit payments[xvi] may be entitled for their child(ren) to receive free school meals. FSM eligibility refers to whether a pupil was known to be eligible. Ever FSM6 was employed as a control measure rather than FSM eligibility, as the former measure refers to whether a pupil was known to be eligible for FSM on census day in the last 6 years. Data was accessed via the NPD pupil-level school census (PLASC). Within the NPD pupils' are recorded as Ever FSM6 on census day if a claim has been made and the local authority has confirmed their eligibility. Pupils recorded as Ever FSM6 were coded as '1' and those not Ever FSM6 were coded as '0'. Missing data on this variable was coded as ".".

5.3.5 Ethnicity

Evidence within the literature review outlined that, academic outcomes including HE entry, were stratified by ethnic group (DfE, 2019). These disparities were more apparent when data was provided for minor rather than higher ethnic codes. The research intended to employ minor ethnic codes. As the sample was far too small for some ethnic groups (<10) major ethnic codes were employed. The data was sourced via the NPD PLASC census (field name: EthnicGroupMajor) and provided six ethnic codes. The ethnic categories employed for the study were White, Black, Asian, Mixed, Any other and unknown ethnic group. The literature review outlined some limitations of this measure in terms of self-reporting (see Gorard *et al*., 2018). Appendix 6 provides an overview of the NPD major ethnicity codes and how they were coded (1-5). Missing data were coded as "."

5.3.6 Gender

Evidence within the literature review outlined that, males were less likely to enter HE than females (DfE 2016-2020; UCAS 2020; OfS 2020). Gender refers to which group (male or female) each student identified and not their biological sex. Data was accessed via the NPD PLASC census (field name: Gender), where pupils were coded as 'M' for males and 'F' for females. For the analysis this binary categorical variable was recoded into a dummy variable where a code of '1' signified male, '0' signified a female and missing data were coded as ''.''.

5.3.7 First Language

Evidence presented within the literature review outlined that, pupils with English as an additional language (EAL) were more likely to enter HE than pupils whose first language was English, followed by pupils' with an unclassified language (DfE, 2019). Data on pupils' first language was accessed via the NPD PLASC census (field name: EALGRP). Pupils' were coded as '1' to signify English as a 1st language, '2' to signify English as an additional language (EAL), '3' to signify an unclassified language and missing data was coded as ".". 9% of pupils' within the NPD had missing values (Gorard *et al*., 2018) and the unclassified group had the lowest level of KS4 attainment. This may have biased data, as their first language was unknown.

5.3.8 Special Educational Needs and Disabilities (SEND)

Evidence within the literature review outlined that, pupils with SEND were less likely to enter HE than pupils' without SEND (DfE 2016-2012; 2019). SEND data was sourced via the NPD PLASC census (field name: SENprovision) which outlined provision types under the Special Educational Needs (SEN) Code of Practice (DfE, 2019). Up to 2014/15 SEN provision types were coded in the following categories: No special educational need (N), school action (A), school action plus (P), statement (S). From 2014/15 two further categories were added including SEN support (K) and Education, health, and care plan (E). These categories were coded into a dummy variable where '1' signified a pupil has a special educational need and '0' signified that a pupil did not have an educational special need. Missing data were coded as ".". A limitation of this data is that the DfE only provides data on special education needs and excludes other physical disabilities that may disadvantage pupils'.

5.3.9 Neighbourhood measures of disadvantaged

5.3.10 Participation by Local Areas (POLAR3) YPR and AHE

The Office for Students publishes POLAR data which provides information on the proportion of different populations (young/adult) who participate in HE (UK providers) by UK areas. Two data sets are provided including youth participation rates (YPR) of 18-year-olds who entered HE by the age of 19 during the 2005-06 and 2010-11 academic years (POLAR3) and adults with a HE qualification (AHE) aged 16-74yrs. Participation rates are classified into 5 quintiles. POLAR is an ordinal *relative* measure of disadvantage, as when data is refreshed (every 4-5 years) the boundaries between quintiles shift as participation increases or decreases within specific areas. POLAR3 quintiles of geographical ward (CAS ward level) are allocated on basis of postcode. Each area is allocated to a score on a five-point scale with Quintile 1 representing the lowest participation rates (disadvantaged) and quintile 5 representing the highest participation rates (advantaged). The thresholds for each YPR and AHE quintiles are outlined in table 19.

Table 19: POLAR 3 YPR and AHE Quintiles and Thresholds

Quintile	Threshold (YPR)	Threshold (AHE)
1	under 21% participated in HE	under 11% with HE qualifications
2	21% to 29% participated in HE	11% to 15% with HE qualifications
3	29% to 36.8% participated in HE	15% to 21% with HE qualifications
4	36.9% to 47.2% participated in HE	21% to 28% with HE qualifications
5	47.2+ participated in HE	28%+ with HE qualifications

The main justification for employing this measure was that it provided an actual direct measure of participation in HE and allowed for a comparison between areas in terms of high and low participation rates. The POLAR3 YPR or AHE values were obtained using NPD school census data (postcodes) and then derived from inputting postcodes into the Aimhigher all UK postcode lookup tool. This provided data on the POLAR3 quintile in which the pupils were domiciled. In terms of POLAR3 (YPR and AHE) the research defined disadvantaged pupils as those residing in quintiles 1 and 2 where participation is up to 29% (YPR) and up to 15% (AHE). Pupils living in quintiles 1 and 2 were coded as 1, those living in advantaged areas were coded as 0 and missing data were coded ".".

5.3.11 Index of Multiple Deprivation (IMD 2010) and Income Deprivation Affecting Children (IDACI 2010)

Evidence presented within the literature review outlined that, pupils living in disadvantaged areas (IMD) were less likely to progress to HE than those living in advantaged areas (OfS, 2020). IMD and IDACI measures (2010) are produced by the Department for Communities and Local Government. Both measures have been discussed in chapter 4a. The most deprived areas are ranked 1 and the least deprived areas are ranked 32,482. People living in households that were ranked 13,000 or below, come from the 40% most deprived areas and those above resided in the most advantaged areas. This threshold was employed to categorise pupils with a dummy variable where a rank of 13,000 or below was coded as '1' (referring to a disadvantaged neighbourhood), ranks above this were coded as '0' (referring to an advantaged neighbourhood) and missing data was coded as ".". The IMD and IDACI values were obtained using NPD school census data (postcodes) and then derived from inputting postcodes into the Aimhigher postcode lookup tool to obtain a rank for each pupil.

5.3.12 Limitations of Neighbourhood Measures of Disadvantage

The literature review suggested that individual-level datasets sourced directly from families, pupils, and schools/colleges (e.g., FSM, gender, ethnicity, SEN, and First Language) were more robust than proxy-based area derived measures of disadvantage. Neighbourhood statistics such as POLAR, IMD and IDACI suffered from issues of validity as data that makes up these measures were historical and based on earlier years. POLAR data was based on HE entry rates for 5 cohorts from 2009/10 to 2012/14 and many of the measures that made up IMD and IDACI were based on the 2011 census. Both these measures used modal scores to aggregate data. There may have been variations in the characteristics of individuals living in these areas as populations were not homogenous. In turn, neighbourhood statistics suffer from an ecological fallacy. Between 11% and 13% of NPD cases had missing postcodes (Gorard *et al*., 2018) and within a few POLAR areas data are suppressed (3%) due to small populations. As with the FSM measure, postcode proxies had threshold cut-off points, where for example a young person living in an IMD LSOA ranked at 13,000 would be deemed to be disadvantaged and another living in an LSOA ranked 13,001 would be deemed advantaged.

5.3.13 Knowledge, Attitudes, Expectations to HE and Confidence in Academic Ability and Academic Motivation

Sections 5.2.2 to 5.2.7 outlined how the baseline and follow-up surveys were employed to measure changes in pupils' AAB outcomes. The research also employed participants' responses to the baseline surveys as a control measure to identify if the treatment and non-treatment groups were comparable in terms of these factors. The importance of these factors and the rationale for controlling them has been discussed within the literature review (see Chapter 3). The outcomes section provided an overview of how these measures were operationalised and measured.

5.4 Sampling

5.4.1 Recruitment of Schools and Participants

The next section outlines how schools and pupils' were recruited to both the Aimhigher programme and the research, including assignment to the treatment and non-treatment groups. This includes an overview of the sample sizes and attrition rates across the various stages of the research. The section also reviews some possible sources of bias in terms of the types of schools that participated in the research.

5.4.2 Recruitment to the Programme

From May to December (2012-2015) Aimhigher West Midlands recruited schools to take part in the programme (Summers Schools and mentoring). Recruitment was targeted directly at West Midlands maintained schools/academies and FE colleges with large cohorts of disadvantaged pupils aged 11 and 18 years (year groups 9-13). For selection onto programmes Aimhigher employed a composite targeting model to identify individual pupils' that were eligible in relation to their socio-economic and demographic characteristics. Target pupils included those that met at least 1 criterion from both basket A (IMD or FSM eligibility) and Basket B (POLAR YPR or AHE Quintile 1). If a pupil was disabled, they were automatically regarded as disadvantaged irrespective of the measures in baskets A and B (see chapter 4b section 4.2.3). Over four years (2012 to 2016), 99 out of 439[13] (22.6%) state-maintained secondary schools and FE colleges across the West Midlands participated in the Aimhigher programme.

5.4.3 Recruitment to the Study

From September 2012 to December 2015 the research was promoted via emails to relevant school leads (see ethics section 5.1.3). Pupils from schools and colleges participating in Aimhigher interventions were invited to take part in the study via a standardised parent information and consent form (see Appendix 4). A cohort of 4700 pupils' were recruited for the study (see table 20a). All participants that provided consent were tracked in terms of whether or not they entered HE and a sub-sample of these pupils' also completed surveys (e.g., they were tracked in terms of both AABs and HE entry outcomes). The recruitment, sample sizes and attrition across the three key research questions and outcomes of interest (analysis 1-3) are discussed below.

[13] Based on NPD records 2015 and excluding special schools/colleges and pupil referral units.

HE Outcomes Sample

An opportunistic sample of pupils (year groups 9-13) in ninety-nine schools were tracked over a period of eight years (2011/12 to 2018/2019). This included tracking participants' engagement in the Aimhigher programme (see section 5.3.1) until they had left their school at either age 11 or 18 in 2016/17 and then tracking HE outcomes (see section 5.2.1) up until 2020. During the eight years of the study, 3,154 pupils' engaged in the Aimhigher programme of which 2,237 (71%) were tracked for the purposes of the research. There are several reasons why all pupils were not tracked. Firstly, the study focused on certain year groups (9-13) and 207 (6.6%) pupils that engaged in the programme were in other year groups not tracked (year groups 7 and 8). Of the remaining pupils' 10.7% (339) did not provide consent to take part in the research and a further 7.3% (229) were excluded due to missing information (e.g., name, DOB and/or postcode) and could not be matched to the NPD. A further 81 pupils engaged in both summer schools and mentoring, but were removed from the analysis due to small samples (n 81). This resulted in a study treatment sample of 2,162 pupils' (mentoring 1,585 and summer schools 577). Further, a non-treatment group of 2,237 pupils was recruited for the study. This provided a total (treated and non-treaded) sample of 4,399 pupils (see analysis 1 in table 20a). The discussion (section 7.5.2.) provides a full consideration of how attrition and sampling bias within the study may have impacted the results.

AAB and HE Outcomes Sample

A sub-sample of schools and pupils was recruited to complete baseline and follow-up surveys. Schools were invited to take part in this aspect of the study if 10 or more of their pupils' were due to engage in Aimhigher activities in the current year. This aspect of the study design enabled the recruitment of a non-treatment group supporting comparisons of HE outcomes (as described above) and AABs with the treatment group. To encourage schools to engage with the surveys, they were permitted to include five additional questions to the Aimhigher survey. This often included questions on careers support or pupils' year 9 options choices.

The online baseline and follow-up surveys were completed in school time and often during IT or PHSE lessons. Table 19a provides a summary of when baseline and follow-up surveys were completed, and the year groups involved. Nine schools were invited to participate in this part of the study, of which seven agreed to participate. This sample encompassed a small proportion (7.1%) of schools that engaged in the Aimhigher programme. Across the seven schools, twenty-year groups completed the surveys. Baselines were completed by ten cohorts of pupils in year 9, eight cohorts of pupils in year 10, one cohort of pupils in year 11 and one cohort of pupils in year 12. Baseline surveys were completed for the first cohort of ten-year groups in 2012-13, with follow-up surveys in 2013-14. The second cohort consisting of eight-year groups was recruited to complete baseline surveys in 2013-14, with follow-up surveys in 2014-15. For the second cohort, it was not possible to complete follow-up surveys with three-year groups. The final cohort of pupils (two-year groups) was recruited to complete baseline surveys in 2014-15, although it was not possible to complete follow-up surveys with both year groups. Drop-out rates were due to time/capacity pressures within schools, such as Ofsted inspections and key staff leaving. Drop-out was expected within the study, and to mitigate against this more schools were recruited than needed. In total 70% (14 out of 20) of the year groups completed both the baseline and follow-up surveys.

Table 19a: Survey Sample and Completion Schedule

School	2012/2013	2013/2014	2014/2015	2015/2016
A	Y12 (Baseline)	Y13 (Follow-up)		
A	Y11 (Baseline)	Y12 (Follow-up)		
B	Y10 (Baseline)	Y11 (Follow-up)		
C	Y10 (Baseline)	Y11 (Follow-up)		
A	Y10 (Baseline)	Y11 (Follow-up)		
D	Y10 (Baseline)	Y11 (Follow-up)		
A	Y9 (Baseline)	Y10 (Follow-up)		
E	Y9 (Baseline)	Y10 (Follow-up)		
D	Y9 (Baseline)	Y10 (Follow-up)		
C	Y9 (Baseline)	No follow-up		
F		Y10 (Baseline)	Year 11 (Follow-up)	
G		Y10 (Baseline)	no follow-up	
B		Y10 (Baseline)	no follow-up	
B		Year 9 (Baseline)	no follow-up	
F		Year 9 (Baseline)	Year 10 (Follow-up)	
E		Year 9 (Baseline)	Year 10 (Follow-up)	
A		Year 9 (Baseline)	Year 10 (Follow-up)	
D		Year 9 (Baseline)	Year 10 (Follow-up)	
B			Year 10 (Baseline)	no follow-up
E			Year 9 (Baseline)	no follow-up

Survey Sample Attrition Within Schools

Table 19b and c provide a summary of the attrition rates of the survey samples recruited for analysis 2 (do AABs mediate pupils' HE entry behaviours?) and 3 (do Aimhigher interventions improve pupil' AABs?). The analysis compares the recruitment to the treatment and non-treatment groups, based on the total of pupils' on roll within the year groups where the baseline surveys were completed. In total 2,854 pupils' were on roll within the year groups where surveys were administered.

As outlined analysis 2 investigated if AABs mediated HE entry behaviours. The sample consisted of non-treated pupils only (see Research Design, section 5.1.1) for where the HE outcome and baseline and follow-up surveys were available. Missing data and no consent levels reduced the sample by almost 17%. Baseline surveys were completed by 53.3% of pupils on roll. Both baseline and follow-up surveys were completed by 45.8% of pupils on roll.

Analysis 3 investigated if Aimhigher interventions improved pupils AABs. Of the 2,854 pupils' on roll, 80.1% were in the non-treatment group and 19.9% in the treatment group. Attrition through non-consent and missing data was relatively similar across the treatment and non-treatment groups. This attrition reduced the overall sample by almost 17%. Baseline surveys were completed by a higher proportion of the treatment group (82.6%) than the non-treatment group (53.4%). It was possible that the treatment group had a higher response rate for the baseline survey, as they may have been more motivated to complete it than pupils' who had not engaged (non-treatment group). Slightly higher proportions of the treatment group completed both baseline and follow-up surveys (49.8%) than the non-treatment group (45.9%).

Table 19b: Survey Sample and Attrition Rates: Do AABs Mediate Pupils' HE entry Behaviours? (analysis 2)

Group	Survey cohort pupils on roll	No consent	Missing data	Completed baseline survey	Completed baseline and follow-up survey
Non-treatment group	2,286	9.7% (221)	7.2% (164)	53.3% (1,219)	45.8% (1,046)

Table 19c: Survey Sample and Attrition Rates: Do AH Interventions Improve Pupils' AABs? (analysis 3)

Group	Survey cohort pupils on roll	No consent	Missing data	Completed baseline survey	Completed baseline and follow-up survey
Treatment group	19.9% (568)	9.0% (51)	6.9% (39)	82.6% (469)	49.8% (283)
Non-treatment group	80.1% (2,286)	9.7% (222)	7.1% (162)	53.4% (1,220)	46.3% (1,059)
Total	100% (2,854)	9.6% (273)	7.0% (201)	59.1% (1,689)	47.0% (1,342)

Participant Sample Sizes for the Three Analysis

This section provides a summary of the participant sample sizes across the treatment and non-treatment groups (see table 20a). As outlined within the design section, samples were split into three groups consisting of a mentoring treatment group, a summer school treatment group, and the non-treatment group. Another treatment group variable was created for mentoring to measure the number of times pupils had engaged. The first column shows the sample sizes of the full study sample, before matching to the outcome variables. Here the samples were almost evenly split across the treatment and non-treatment groups. However, most of the treatment group participants were in the mentoring group.

The table also summarises the sample sizes across the three main analyses after attrition, (missing data and non-consent) as explained earlier. The final samples experienced further attrition as the relevant outcomes needed to be available for inclusion within each analysis (e.g. HE entry and/or AABs). Further, for analysis 3, pupils were only included in the final study cohort if they had engaged in mentoring or summer school interventions in between the baseline and follow-up surveys. Sample attrition rates were much higher for analysis 2 (are AABs associated with HE entry) and 3 (was engagement in Aimhigher associated with improved AABs), as the survey was only completed by a sub-sample of participants. For analysis 3 there were only 32 participants in the summer school treatment group (e.g., they completed baseline and follow-up surveys). Therefore, samples may be biased, and results can only be seen as indicative. The results section provides a more detailed analysis of the demographic and socio-economic characteristics of the treatment and comparison groups, to identify how comparable the samples were and the prevalence of missing data.

Table 20a: Sample Sizes of the Treatment and non-Treatment Groups Across the Three Analysis**

Group	Full study sample		Analysis 1 (HE entry outcome)		Analysis 2 (AABs and HE entry)		Analysis 3 (AABs)	
	#	%	#	%	#	%	#	%
Mentoring	1,696	36.7%	1,585	93.5%	Na	na	194	11.4%
Summer School	602	13.0%	577	95.8%	Na	Na	32	5.3%
Non-treatment	2,321	50.2%	2,237	96.4%	1,036	45.1%	1,049	45.2%
Total*	4,619		4,399		1,036			1,275

*The total study sample is 4700 participants. 81 participants received both treatments (summer school and mentoring) but have been removed from the study due to the small sample.**Analysis 1,2 and 3 percentages are based on the number of pupils for which data is available (where the denominator is the full study sample).

5.4.4 Characteristics of Schools

This section provides an analysis of the characteristics of schools that participated in the study. The first analysis compares the sample of schools recruited in terms of pupil characteristics against local authority averages. This is then followed by an analysis to compare schools that did and did not complete the surveys.

Ninety-nine schools and colleges participated in the research. Ninety-eight per cent of schools were from the West Midlands region, with almost half located in Birmingham (47.5%) Local Authority (LA) area, 12.1% in Solihull and the remainder within Coventry, Dudley, Herefordshire, Shropshire, Sandwell, Telford and Wrekin, Wolverhampton, Worcestershire, Walsall and Warwickshire LAs. The vast majority were secondary schools (93%) of which two-thirds provided sixth form provision. A few schools provided all through provision (3%) and 4% were FE colleges. Table 20b summarises the characteristics of all pupils on roll within these schools/colleges if the study cohort size was greater than 30. Twenty-five per cent of schools/colleges had 30 or more pupils' participating in the research and this accounted for most (89.1%) of pupils. The school characteristics data that follows was accessed from the DfE school performance tables in 2012.

Table 20b: Pupil Characteristics of Schools with Study Cohorts >30 (2012)

	School	Age Range	% Male	% Female	% FSM eligible	% Disability	% 5 A*-C GCSEs (or equivalent) including English and Maths
Birmingham	A	11 to 18	55	45	55	20	70
	B	11 to 16	60	40	55	25	50
	C	11 to 19	60	40	60	15	50
	D	11 to 16	60	45	50	15	55
	E	11 to 19	50	50	50	25	70
	F	11 to 16	55	45	45	30	60
	G	11 to 18	55	45	35	5	60
	H	11 to 19	0	100	25	5	65
	I	11 to 18	55	45	25	10	50
	J	11 to 18	0	100	40	15	60
	K	11 to 18	50	50	10	5	70
	L	11 to 16	100	0	35	10	45
	M	11 to 18	55	45	50	5	55
	N	11 to 18	50	50	25	10	75
	O	11 to 18	50	50	45	15	65
	P	11 to 18	100	0	15	15	60
	Q	11 to 18	55	45	65	10	55
	R	11 to 16	50	50	25	15	60
	S	11 to 18	50	45	30	5	65
	T	11 to 18	50	45	25	5	50
	Birmingham LA				30	10	60

	School	Age Range	% Male	% Female	% FSM eligible	% Disability	% 5 A*-C GCSEs (or equivalent) including English and Maths
Solihull	U	11 to 18	50	50	20	5	45
	V	11 to 18	50	50	25	5	50
	W	11 to 16	55	45	10	10	60
	X	11 to 16	50	50	10	10	50
	Solihull LA				10	10	60

All data downloaded from DfE schools, pupils and their characteristics:
https://www.gov.uk/government/statistics/schools-pupils'-and-their-characteristics-january-2012

Gender

Across the Birmingham schools, there was a greater imbalance in gender than in the Solihull schools. Within Solihull schools, the proportions of male and female pupils were in the main relatively equal. Within Birmingham, the gender balance was equal in five schools and with an increased imbalance across another eight schools (variance +/- 10%). Within 35% (7) of

Birmingham schools, the gender balance was much larger (variance 20%+). Three schools catered for male or female pupils only.

Disability

The DfE (2012) disability data includes pupils' who are on school action, action plus and those who have a statement of special education needs. There were similar levels of disability across both LA areas (10%). The disability rates within Solihull schools were in line with the LA average. Within Birmingham schools on the whole disability rates were higher. 80% (16) schools were close to the LA average (variance +/-5%). The remaining four schools had higher levels of disability (+10% to +20%) than the Birmingham LA average.

Attainment

The proportions of pupils obtaining 5 A*-C GCSEs (or equivalent) including English and Maths, across both LA's was equal (60%). Within Solihull schools that participated in the study, attainment levels were relatively low compared to the Birmingham schools. In Solihull, one school was in line with the LA average and the remainder were below (variance -10% to -15%). Over half (11) of Birmingham schools were in line with the LA average (variance +/- 5%), five schools were below (variance -10% to -15%) and the remaining four schools were above (+10 to +15%).

Ethnicity

There was a larger variance in the ethnic make-up between the two LA's, as double the proportion of pupils in Solihull were from a White ethnic background compared to the Birmingham LA average (see table 20c). Consequently, there were more BAME pupils' within the Birmingham LA. Thirteen (75%) Birmingham schools that participated in the study had very low proportions of White pupils' compared to the LA average (variance -20 to -40%), none were in line and the remaining 25% (7) had proportions higher than then LA average (variance +15% to +50%). Most (70%) schools in Birmingham had similar proportions of pupils from the Black ethnic group to the LA average with 30% of schools above (variance +10% to +20%). Notably few schools had similar proportions of Asian pupils to the Birmingham LA average (2). Eleven (55%) schools had more Asian pupils (variance +10% to

+50%) and seven (35%) had fewer (variance -25% to -35%). Within Birmingham schools, the proportions of pupils' from Chinese, Mixed and any other ethnic groups, were overall in line with the Birmingham LA average. Most of the schools' ethnic groups were in line with the LA average in Solihull, with the exception of one school which had fewer White pupils.

Table 20c. Ethnicity of Schools with Study Cohorts > 30

	School	% White	% Black	% Asian	% Chinese	% Mixed	% Any other ethnic group	% Unclassified
Birmingham	A	5	25	65	0	5	5	0
	B	5	10	80	0	0	5	0
	C	5	30	30	0	5	30	0
	D	10	15	65	0	10	5	0
	E	5	15	75	0	0	5	0
	F	10	5	80	0	0	5	5
	G	0	10	85	0	0	5	0
	H	15	5	65	0	5	10	0
	I	20	25	30	0	10	10	5
	J	0	15	80	0	0	5	0
	K	75	5	10	0	5	0	5
	L	90	5	0	0	5	0	0
	M	75	5	10	0	5	0	0
	N	10	20	60	0	10	0	0
	O	0	15	80	0	0	5	0
	P	70	5	5	0	10	5	0
	Q	5	40	45	0	5	5	0
	R	85	0	0	0	5	0	0
	S	55	20	10	0	10	0	0
	T	70	10	10	0	10	5	0
Birmingham LA		40	10	35	0	10	5	0

	School	% White	% Black	% Asian	% Chinese	% Mixed	% Any other ethnic group	% Unclassified
Solihull	U	65	5	5	0	5	0	15
	V	90	5	0	0	5	0	0
	W	75	0	10	0	5	0	0
	X	70	5	20	0	5	0	5
Solihull LA		80	0	10	0	5	0	0

Data sourced from DFE Schools, pupils, and their characteristics: January 2015. https://www.gov.uk/government/statistics/schools-pupils'-and-their-characteristics-january-2015
School level data sourced from: Underlying data: SFR16/2015. *Local authority, regional and England data: local authority and regional tables. Data refers to state-funded secondary schools only.**includes other ethnic background.***includes Chinese pupils.

Survey Sample: School Characteristics

When comparing the schools that participated in the survey against those that did not, there were some differences in pupil characteristics. Data sourced from the DfE (see appendix 7a, a comparison of survey and non-survey schools - DfE school performance tables in 2012) shows that those schools completing surveys were more disadvantaged in some respects, as they had larger proportions of pupils' who were EFSM6, disabled and attended schools with lower KS4 attainment. In other respects, the survey schools were more advantaged with larger proportions of pupils' who were EAL and smaller proportions of White pupils. As attainment is the most important predictor of HE entry, it can be concluded that the cohort of schools completing surveys was more disadvantaged.

Summary School Characteristics

Most Solihull schools participating in the study were in line with LA average in terms of pupil characteristics, with some variance in terms of KS4 attainment where three schools had lower levels of attainment. The gender split across most Solihull schools was relatively equal. Within Birmingham schools there was more variance in terms of gender splits with larger variations within one-third of schools. Many of the schools taking part in the study within Birmingham tended to have higher levels FSM eligibility than the LA average. Disability overall in Birmingham schools was in line with the LA average in most schools and attainment was also in line for most schools with a few having lower or higher levels of attainment. Broadly speaking pupils' within the study and Birmingham schools were more likely to be characterised by FSM eligibility, BAME, a disability and more schools had higher levels of KS4 attainment (than the LA average) compared to the Solihull schools. In terms of the survey sub-sample findings were more mixed, although those participating in the research overall had lower attainment levels.

5.5 Analysis Plan

The seven research questions were organised into three sections within the results chapter (see table 21). The analysis investigated if engagement within Aimhigher was associated with pupils' having an increased likelihood of entering HE, improved AABs and if Aimhigher

AAB survey measures were reliable and valid. In terms of validity, the study investigated if AABs were important mediators that can improve disadvantaged pupils' likelihood of entering HE. The analysis also investigated heterogeneity in the treatment effect across the AABs and HE outcome measures.

The research compared outcomes between pupils that had (treatment group) and had not participated (non-treatment group) within Aimhigher interventions. The research included four treatment types relating to whether a pupil had been treated by engaging in an Aimhigher intervention (mentoring, summer school), frequency of treatment (mentoring) or no engagement (non-treatment group). As previously outlined pupils were not randomly assigned to the treatment or non-treatment groups. A number of pupil-level variables (prior attainment, demographic and socio-economic) enabled the study to investigate, the comparability to treatment and non-treatment group samples. Further, this data also supported post-hoc matching and controlled comparisons via heterogeneity regression analysis (RQs 1b and 3b). Initially, the study intended on employing PSM to improve the comparability of samples, however, this led to significant sample attrition and in turn was not a viable option.

Table 21: Analysis plan

Analysis & (RQs)	Research Questions (RQs)	RQs 1b and 3b.
1 (a)	*Is engagement in Aimhigher associated with an increased likelihood of pupils' entering HE?*	
2 (a)	*Is there an association between higher AABs and an increased likelihood of entering HE?*	*Is there heterogeneity in the treatment effect between the dependent variable and pupil characteristics?*
2 (b)	*Is this association stratified by pupil characteristics (attainment, demographic, socio-economic and baseline AABs)?*	
2 (c)	*Are Aimhigher survey measures reliable?*	
3 (a)	*Is engagement in Aimhigher associated with improvements in pupils' AABs?*	

Data preparation

Pupils were tracked and matched to NPD and HESA records via an application for the linked data requests. Aimhigher records were matched via pupils' first names, surnames, dates of birth and home postcodes. The data provided the controls and some of the outcome measures for the research. Once data was returned a Vlookup was used to obtain an exact match between Aimhigher records (engagement and surveys) with the NPD and HESA data. The data were matched via a pseudo pupil ID code. As outlined within the method to improve the validity of data, HE entry records were only included within the analysis if a pupil had successfully matched to the NPD (e.g., either a KS2, KS4 or KS5 record was available).

To prepare data for the regression models an analysis was conducted to understand levels of missing data across the outcome and control variables. Survey data (e.g., a baseline and follow-up survey was completed) was available for just over 6% of the mentored pupils', 1.5% of summer school pupils' and just over 45% of the non-treatment group. The analysis found that response rates were extremely low for the confidence in academic ability baseline and follow-up survey. Missing data was highest for this measure as not all pupils' were required to complete these questions as they were routed. Due to low response rates, this measure was dropped from the study and regression models.

Finally, an analysis was conducted to determine the extent to which control variables were associated in terms of predicting AAB and HE entry outcomes. Both IMD and IDACI were highly associated with predicting outcomes. A decision was made to drop the IMD control and only include the IDACI measure within the regression models. The analysis did not employ either imputation or excluding missing cases as it would have not been appropriate for the survey sub-samples, as missing data levels were high. Further, Gorard (2010, p. 755) and others have heavily criticised such approaches for being flawed as they are based on the 'invalid assumption that errors in data are random in nature and so can be estimated, and weighted for, by techniques based on random sampling theory'.

Descriptive and inferential analysis

For the purposes of statistical analysis, Stata was employed (version 16.1). Each of the three analyses started with an investigation of the robustness and completeness of data. This included an analysis of missing data and how well-balanced the treatment and non-treatment samples were in terms of pupil characteristics. Both analyses were important to determine the validity and the inferences that could be drawn from the findings. Descriptive analyses were also completed to understand how outcomes differed between the treatment and non-treatment groups and their characteristics.

Regression analysis

The section below summarises the regression models developed across the three analyses. A more detailed description of each model is presented within the respective analysis sections. A logistic regression analysis was conducted for analyses one and two where the dependent variable concerned whether or not a pupil entered HE ('yes' or 'no'). For analysis three a linear regression analysis was employed as the survey outcomes were measured via a 5-point Likert scale. As the research presented in this thesis was exploratory, all independent variables were added to the regression models at the same time.

Analysis 1 and 3

Analysis one and three investigated the influence of Aimhigher treatments (mentoring, mentoring frequency and summer school) on pupils' likelihood of entering HE and AAB outcomes respectively. For analysis one, three logistic models were developed consisting of the HE outcome, the three treatment groups (engaged in summer school, engaged in mentoring and mentoring frequency of engagement) and the non-treatment group. For analysis three, twelve logistic models were constructed consisting of the four AAB survey outcomes, the three treatment groups and the non-treatment group. The analysis and models were conducted in three stages.

The first stage of each regression analysis investigated the raw uncontrolled effects of the treatments (mentoring, dosage of mentoring, summer school) on improving pupil outcomes when compared to the non-treatment group. The second stage of the regression analysis investigated whether controls (pupil attainment, demographic and socio-economic) could explain more of the differences/variance in the outcome (analysis three also included pupil baseline AABs). All controls were added to the model at the same time. The third stage of the regression analysis investigated heterogeneity in the treatment effect. This provided more control to determine if engagement in Aimhigher interventions led to positive or negative outcomes for pupils' holding different characteristics and if this varied by treatment type. In analysis one, pupil controls were interacted with treatments and within analysis three pupil controls (including baseline AABs) were interacted with treatments. Variables were re-coded into dummy variables to support this analysis (e.g., for analysis one, outcomes of treated males were coded as '1' and were compared against non-treated males who were coded as '0').

Analysis 2

Analysis two investigated if AABs acted as important mediators in terms of determining pupils' likelihood of entering HE (outcome). This analysis was conducted with the non-treatment group, as the sample was much larger than the treatment group and non-treated pupils' follow-up survey scores were not impacted by the intervention. Eight linear regression models were developed consisting of the HE outcome, the non-treatment and the four baseline and four follow-up AABs. The regression analysis was conducted across three stages. The first stage of the analysis presented a raw model for each of the survey outcomes. Within the second stage of the analysis all pupil controls and AABs (at baseline and follow-up) were added to the model at the same time. This helped to investigate what controls could explain more of the differences in HE participation. This analysis also investigated whether the Aimhigher survey measures were reliable, via appropriate significance tests to determine if baseline and follow-up survey scores were correlated. The third stage of the analysis interacted pupil characteristics with AAB survey measures to understand whether any observed associations between AABs and HE entry were stratified by pupil characteristics.

Chapter 6: Findings and Analysis

6.0 Analysis One: Does engagement in Aimhigher Improve Pupils' Likelihood of Entering HE?

6.1 Introduction

Aimhigher and widening participation (WP) programmes aim to address inequalities in HE participation by increasing the proportions of disadvantaged pupils' entering HE (see chapters 3, 4a and 4b). Despite the significant amount of funding allocated to such programmes, there is limited robust evidence (e.g., experimental methods, controls, and comparison groups) in terms of what types of interventions are most effective in addressing these inequalities (see chapter 3, section 3.2 onwards).

Analysis Aims and Research Questions

The research focused on investigating the impact of Aimhigher mentoring and summer school programmes. For this analysis the following research questions were of interest:

- *RQ 1 (a): Is engagement in Aimhigher (summer schools or mentoring) associated with an increased likelihood of pupils' entering higher education?*
- *RQ 1 (b): Is there heterogeneity in the treatment effect?*

The research was also interested in whether increased engagement within Aimhigher mentoring led to improved HE outcomes. The research aimed to address a number of gaps in the evidence. This was supported by the inclusion of a comparison group and important controls to provide more robust estimates of whether improvements in HE entry rates were driven by pupils' engagement in Aimhigher interventions. Even when more robust WP studies were conducted, they tended to only include a limited number of controls. The literature review identified a number of important controls (see chapter 4a) to include within the study and which are often overlooked within WP evaluations (see chapter 3, section 3.2 onwards). A rich set of controls are required within quasi-experimental designs to determine the comparability and make controlled comparisons between the treatment and non-treatment groups. The controls employed within the research undertaken included:

- Pupil KS2 attainment (achieved/not achieved level 4)

- Gender
- Ethnicity
- ESFM6
- Language status
- SEN status
- Three measures of neighbourhood disadvantaged (IDACI, POLAR YPR and POLAR AHE)

A full understanding of the importance of these pupil characteristics and their impact on educational outcomes has been provided within the literature review (see chapter 4a). These controls are also important to investigate heterogeneous treatment effects (e.g., is there a significant difference in treated and non-treated males' likelihood of entering HE). Establishing if such effects are present is important, as pupils from different backgrounds may experience different treatment effects varying from positive, negative, or null. Such insights could have both practical and policy implications for WP programmes. However, these effects tend to be investigated at programme level (and not for specific interventions), and with a limited number of controls (e.g., see chapter 3, section 3.2 onwards). Further, Burgess, Horton and Moores (2021) reported evidence that five to six engagements within a multi-intervention programme provided the most optimal benefit in increasing pupils' likelihood of participating in HE. However, such effects for high-cost mentoring programmes are poorly understood. The research undertaken in this thesis aimed to contribute to the literature to understand if increased levels of engagement within mentoring were associated with improvements in pupils' HE entry rates.

The first two sections of the chapter focus on the robustness and completeness of the data for estimating treatment effects. This includes a consideration of the extent to which the comparison and treatment groups were balanced and the extent to which the available control variables could correct group differences to reach a robust treatment estimate and inferences. To investigate this, the sections that follow provide an analysis of missing data and how well-balanced the treatment and non-treatment samples were in terms of pupil characteristics. All analysis was based on pupils' where the HE outcome was observed.

After assessing the data, the analysis estimated treatment effects across three logistic regression models. These include models for the HE outcome and treatments (mentoring, mentoring frequency and summer schools). Each model was completed in three stages starting with a raw analysis of HE outcomes for the treatment and non-treatment groups.

This was followed by a controlled analysis, to investigate the extent to which the raw estimated treatment differences in HE entry outcomes could be explained by differences in observable pupil characteristics. The final analysis investigated treatment effect heterogeneity, where treatments were interacted with the controls to establish the impact of Aimhigher interventions. A detailed description of the aims of each analysis is provided in section 6.4. The final section of the chapter presents a summary of the key findings.

6.2 Missing Data

The first question relating to data completeness investigated was the extent of missing data across the treatment and non-treatment groups, the HE outcome and control variables. The analysis is presented in table 22. The analysis compares missingness between the treatment types within the full sample and for pupils' where the HE outcome was observed. High levels of missing data reduce the ability to control for differences between the treatment and comparison groups. Moreover, where there are different rates and items of missingness, this suggests that other unobserved differences are also more likely. Missing data levels for the HE outcome and all control variables were relatively low across the full sample (0% to 11%), and for pupils' where the HE outcome was observed (2% to 13%). Missingness was slightly higher for mentoring than summer school across most variables.

Table 22: Treatment and non-treatment group sample sizes and missing data across the outcome and control variables for where the HE entry outcome is observed.

Variable	Full Sample			Sample for which HE outcome is observed		
	Mentoring	Summer School	Non-treatment group	Mentoring	Summer School	Non-treatment group
N sample	1,696	602	2,321	1,585 (93.5%)	577 (95.8%)	2,237 (96.4%)
Outcomes						
HE entry	1,585 (93.5%)	577 (95.8%)	2,237 (96.4%)	1,585 (93.5%)	577 (95.8%)	2,237 (96.4%)
Mentoring						
Total engagement records	1,688 (99.5%)	Na	Na	1654 (97.5%)	Na	Na
Pupil controls						
KS2 above or below level 4	1,556 (91.7%)	565 (93.9%)	2,211 (95.3%)	1556 (98.2%)	565 (93.9%)	2,211 (98.8%)
Gender	1,641 (96.8%)	586 (97.3%)	2,305 (99.3%)	1,557 (91.8%)	564 (93.7%)	2,237 (96.4%)
Ever FSM6	1,610 (94.9%)	602 (100%)	2,111 (91.0%)	1,536 (90.6%)	577 (95.8%)	2,081 (89.7%)
Ethnicity	1,543 (91.0%)	594 (98.7%)	2,078 (89.5%)	1,508 (88.9%)	571 (94.9%)	2,054 (88.5%)
EAL	1,584 (93.4%)	577 (95.9%)	2,237 (96.4%)	1,584 (93.4%)	577 (95.8%)	2,237 (96.4%)
SEN	1,568 (92.5%)	602 (100%)	2,020 (87.0%)	1,524 (89.9%)	577 (95.8%)	1,998 (86.1%)
POLARYPR	1,516 (89.4%)	599 (99.5%)	2,158 (93.0%)	1,477 (87.1%)	575 (95.5%)	2,130 (91.8%)
POLARAHE	1,546 (91.2%)	600 (99.7%)	2,100 (90.5%)	1,507 (88.9%)	576 (95.7%)	2,077 (89.5%)
IDACI	1,503 (88.6%)	600 (99.7%)	2,088 (90.0%)	1,464 (86.3%)	576 (95.7%)	2,060 (88.8%)

6.2.1 How Comparable are the Treatment and Non-Treatment Groups in Terms of Observed Pupil Characteristics?

Table 23 provides a summary of the descriptive statistics and two-tailed t-tests which provide an understanding if the treatment and non-treatment groups were comparable in terms of observable pupil characteristics. Drawing valid conclusions about the findings may be problematic if the characteristics of pupils differed widely across treatment types.

Table 23: Sample characteristics – pairwise comparison between treatment and non-treatment groups where the HE outcome is observed

Significance levels are denoted as follows: *p <0.05, **, p <0.01, ***p <0.001. The remainder of results are non-significant.

Control variable	Category	Mentoring	Summer School	Non-treatment group	Percentage point difference	
		Group 1 (T)	Group 2 (T)	Group 3 (NT)	G1 & G3	G2 & G3
Mentoring engagements	Mean	M 10.5, SD 8.1 (1,585)	Na	Na	Na	Na
	1-5	18.4% (292)	Na	Na	Na	Na
	6 to 10	36.0% (571)	Na	Na	Na	Na
	11 to 15	33.2% (526)	Na	Na	Na	Na
	More than 15	12.4 (196)	Na	Na	Na	Na
KS2 achieved level 4	Achieved	78.3% (1,218)***	82.1% (464)***	70.8% (1,566)	7.5%	11.3%
	Did not achieve	21.7% (338)***	17.9% (101)***	29.2% (645)	-7.5%	-11.3%
Gender	Male	46.8% (757)**	36.7% (357)***	52.7% (1,179)	-5.90%	-16.00%
	Female	53.2% (828)**	63.3% (220)***	47.3% (1,058)	5.90%	16.00%
Ever FSM6	Yes	56.1% (861)***	54.9% (317)**	35.3% (735)	20.80%	19.90%
	No	43.9% (675)***	45.1% (260)**	64.7% (1,346)	-20.80%	-19.60%
	White	43.0% (649)***	38.4% (219)**	58.0% (1,191)	-15.00%	-19.60%
	Asian	36.0% (543)***	39.6% (226)***	25.6% (526)	10.40%	14.00%
Ethnicity	Black	10.7% (161)**	11.9% (68)***	8.0% (165)	2.70%	3.90%
	Mixed	7.0% (106)**	6.8% (39)*	4.9% (100)	2.10%	1.90%
	Other	3.2% (49)	3.3% (19)	3.5% (72)	-0.30%	-0.20%
	English 1st lang.	60.5% (958)***	57.0% (329)***	71.0% (1,588)	-10.50%	-14.00%
Language status	English as an additional lang.	37.8% (598)***	42.1% (243)***	27.5% (616)	10.30%	14.60%
	Unclassified	1.8% (28)	0.9% (5)	1.5% (33)	0.30%	-0.60%
SEN	Yes	14.4% (281)*	10.7% (62)***	17.4% (1,651)	-3.00%	-6.70%
	No	85.6% (1,304)*	89.3% (515)***	82.7% (586)	2.90%	6.60%
POLARYPR	Disadvantaged	54.3% (802)***	56.9% (327)*	62.6% (1,333)	-8.30%	-5.70%
	Advantaged	45.7% (675)***	43.1% (248)*	37.4% (797)	8.30%	5.70%
POLARAHE	Disadvantaged	73.7% (1,110)***	78.0% (449)	80.5% (1,671)	-6.80%	-2.50%
	Advantaged	26.3% (397)	22.0% (127)	19.5% (406)	6.80%	2.50%
IDACI	Disadvantaged	80.7% (1181)***	77.6% (447)**	72.1% (1,486)	8.60%	5.50%
	Advantaged	19.3% (283)***	22.4% (129)**	27.9% (574)	-8.60%	-5.50%

Comparability in Pupil Characteristics Between the Mentoring Treatment and Non-Treatment Groups

There were significant differences between the mentoring and non-treatment groups across all pupil characteristics. Mentored pupils were far more advantaged than the non-treatment group across almost all (8 out of 9) of the control variables. Mentored pupils' were significantly more likely to have higher KS2 attainment, be female, EAL, non-SEN, and live in more advantaged areas (POLARYPR, AHE and IDACI). The non-treatment group were significantly more likely to be non-EFSM6. In terms of ethnicity, the data was mixed where mentored pupils were significantly more likely to be advantaged, with higher proportions of Asian pupils' and lower proportions of White pupils. However, mentored pupils were more disadvantaged, as they were more likely to belong to a Mixed or any other ethnic group, compared to the non-treatment group.

Comparability in Pupil Characteristics Between the Summer School Treatment and Non-Treatment Groups

The summer school cohort was also more advantaged than the non-treatment group across (5 out of 8) of the characteristics. Summer school pupils had higher KS2 attainment scores, were significantly more likely to be female, EAL, and reside in advantaged areas (POLAR YPR and AHE). Summer school pupils' were more disadvantaged than the non-treatment group on a number of measures, as they were more likely to be EFSM6, SEN and reside in disadvantaged areas (IDACI). The same patterns for ethnicity are followed as observed within the mentoring cohort.

6.3 Descriptive Analysis of HE Outcomes

The analysis that follows summarises descriptive statistics, comparing the HE entry rates of the treatment and non-treatment groups in the absence of any controls. This was followed by a more detailed analysis of how HE entry rates differed by pupil characteristics, between the treatment and non-treatment groups. Figure 14 summarises data on the proportions of pupils' that entered HE by treatment type. These results suggest that there are raw differences in HE outcomes that are consistent with expectations of the treatment. Summer school pupils were most likely to enter HE (58.4%), followed by mentored pupils' (38.9%). Pupils from the non-treatment group were the least likely to enter HE (30.1%). One-tailed t-tests suggest that these results are highly significant for both mentored and summer school pupils ($p < 0.001$).

Figure 14: HE entry rates by treatment type

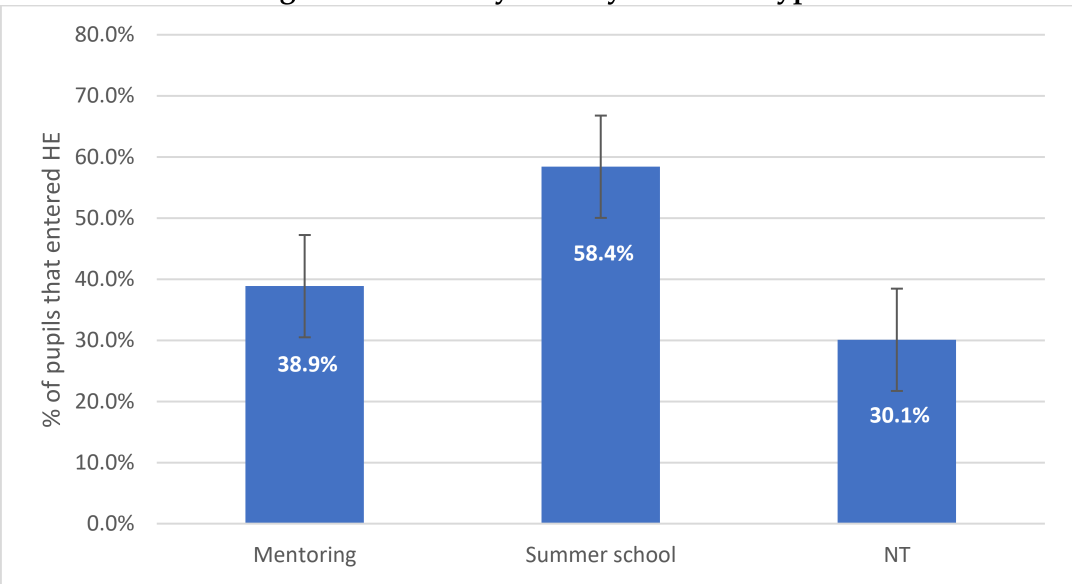
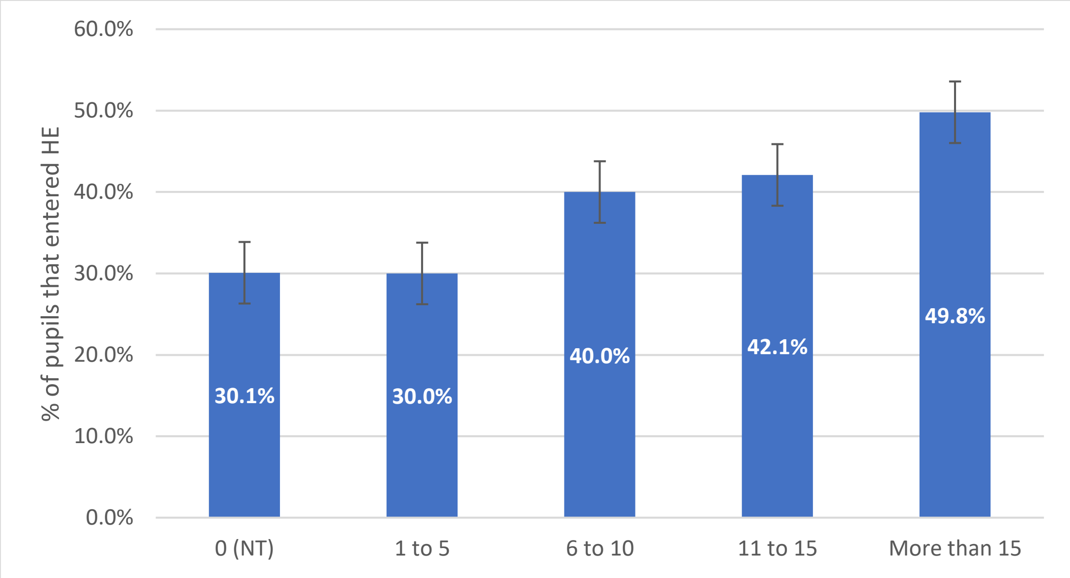


Figure 15 provides an analysis outlining how HE entry rates vary by frequency of engagement within mentoring. Pupils who engaged 1-5 times within mentoring had similar HE entry rates to the non-treatment group. There appears to be an association between higher levels of engagement and HE entry, rising to more than 15 engagements where pupils' had the highest likelihood of entering HE (49.8%). One-tailed t-tests suggest that these results are highly statistically significant when pupils' engaged in 6-10 ($p < 0.001$), 11-15 ($p < 0.001$) and more than 15 ($p < 0.001$) mentoring sessions.

These initial results should be treated with caution given that the treatment and non-treatment groups were not balanced in terms of pupil characteristics (see section 6.2.1). It is possible that differences in HE outcomes between the treatment and non-treatment groups may be due to the pre-existing differences in pupils' background characteristics rather than a treatment effect. The next section provides a more detailed analysis of how HE outcomes varied by pupils with different characteristics.

Figure 15: HE entry rates by frequency of engagement within mentoring



6.3.1 How do HE Entry Rates Differ by Pupil Characteristics?

Table 24 presents descriptive data to investigate how HE entry outcomes differed by treatment type and each pupil characteristic. Across all treatment types, advantaged pupils' who achieved KS2 level 4 and those that were female, EAL and non-SEN were much more likely to enter HE than their disadvantaged peers. There was more parity between the other controls, although advantaged pupils had slightly higher HE entry rates (difference less than <5%). These findings are broadly in line with national HE participation datasets summarised in chapter 4a.

Further, across every characteristic, a consistent pattern of results emerged where summer school pupils' had the highest proportions of pupils' entering HE (range 40% to 68.4%), followed by mentored pupils (range 26.4% to 55.3%). Non-treatment pupils had the lowest HE entry rates (range 17.3% to 43.9%). The sections that follow investigate these raw differences in more detail to determine if these effects are associated with engagement in Aimhigher.

Table 24: Sample Characteristics: HE entry rates pairwise comparison between treatment and non-treatment group pupils by characteristics where the HE outcome is observed.

Control variable	Category	Mentoring	Summer School	Comparison	Percentage point difference	
		Group 1 (T)	Group 2 (T)	Group 3 (NT)	G1 & G3	G2 & G3
KS2 level 4	*Achieved*	41.7% (1,218)	60.3% (464)	35.1% (1,566)	6.6%	25.2%
	Did not achieve	28.4% (338)	51.5% (101)	18.0% (645)	10.4%	33.5%
Gender	*Male*	31.8% (757)	50.0% (220)	24.1% (1,179)	7.7%	25.9%
	Female	45.3% (828)	63.6% (357)	36.8% (1,058)	8.5%	26.8%
Ever FSM6	*Yes*	36.6% (861)	57.4% (317)	29.8% (735)	6.8%	27.6%
	No	43.0% (675)	59.6% (260)	29.4% (1,346)	13.6%	30.2%
	White	53.2% (543)	67.3% (226)	43.9% (526)	9.3%	23.4%
	Asian	55.3% (161)	60.3% (68)	41.8% (165)	13.5%	18.5%
Ethnicity	*Black*	30.2% (106)	51.3% (39)	28.0% (100)	2.2%	23.2%
	Mixed	55.1% (49)	68.4% (19)	36.1% (72)	19%	32.3%
	Other	26.4% (649)	50.2% (219)	25.2% (1,191)	1.2%	25%
	English 1st lang.	30.6% (958)	52.9% (329)	26.1% (1,588)	4.5%	26.8%
Language status	*English as an additional lang.*	52.5% (598)	66.3% (243)	41.1% (616)	11.4%	25.2%
	Unclassified	32.1% (28)	40.0% (5)	18.2% (33)	13.9%	21.8%
SEN	*Yes*	27.7% (220)	48.4% (62)	17.3% (347)	10.4%	31.1%
	No	41.4% (1304)	59.6% (515)	32.3% (1,561)	9.1%	27.3%
POLARYPR	*Disadvantaged*	38.2% (802)	57.2% (327)	30.5% (1,333)	7.7%	26.7%
	Advantaged	42.1% (675)	60.5% (248)	32.6% (797)	9.5%	27.9%
POLARAHE	*Disadvantaged*	38.0% (1,110)	58.4% (449)	29.5% (1,671)	8.5%	28.9%
	Advantaged	42.8% (397)	59.1% (127)	29.6% (406)	13.2%	29.5%
IDACI	*Disadvantaged*	40.1% (1,181)	59.1% (447)	29.5% (1,486)	10.6%	29.6%
	Advantaged	37.1% (283)	56.6% (129)	29.8% (574)	7.3%	26.8%

Numbers in brackets refer to the total sample of pupils' – those that did and did not enter HE

6.4 Logistic Regression Models

The next stage in the analysis was to construct three logistic regression models that bought together data for the HE outcome, treatment (mentoring, mentoring frequency and summer schools) and comparison groups, and controls for observable group differences to produce an estimate of the treatment effect. The models for each treatment were developed in several stages, as presented below:

Stage 1: ***A raw uncontrolled model investigating the estimated effects of mentoring and summer schools on HE entry:*** This model compared HE outcomes between the treatment and non-treatment groups. This model helped to understand the estimated effectiveness of different treatments without controls for observed pupil characteristics.

Stage 2: ***A controlled model investigating the estimated effects of pupil characteristics on HE:*** This model compared HE outcomes between the treatment and non-treatment groups, whilst controlling for and reporting on HE outcomes across all observed pupil characteristics. The model helped to understand how much of the raw estimated differences in HE outcomes can be explained by pre-existing differences in pupil characteristics and the effectiveness of different treatments once these controls were accounted for.

Stage 3: A ***heterogeneity in the treatment effect model:*** This model compared HE outcomes between the treatment and non-treatment groups, whilst controlling for and interacting with all observed pupil characteristics. The model investigated heterogeneity in the treatment by making controlled comparisons in HE outcomes between for example treated males' vs non-treated males. This helped to understand whether different treatments vary in effectiveness for pupils with different characteristics. This final model provided the most unbiased estimate of results. Such effects are important to understand as they may have important practical and policy implications for WP programmes.

Within each analysis, the percentage differences in HE entry rates between treatment types are presented in the form of odds ratios (ORs). The OR indicates the odds of entering higher education (HE) for the treatment group against the non-treatment group. OR is a measure of association between exposure to the treatment and the odds of the outcome occurring (entering HE) compared against the odds of the outcome occurring in absence of the exposure (e.g., non-treatment group). The OR quantifies the strength of association, where an OR of 1 indicated the odds of entering HE is the same (e.g., an OR of 1.00 = 0%). An OR of less than 1 indicated a negative association / decreased likelihood of entering HE (e.g., an OR of 0.65 = -35% less likely). An OR above 1 indicated a positive association/increased likelihood of entering HE (e.g., an OR of 1.83 = 83% more likely). Within this analysis ORs are presented as a percentage.

6.4.1 Stage 1: A Raw Uncontrolled Model Investigating the Estimated Effects of Mentoring and Summer Schools on HE entry

Table 25 presents the logistic regression results for the raw uncontrolled model for pupils and treatment groups where the HE outcome was observed. The analysis compares Aimhigher mentoring and summer school programmes against the non-treatment group, in terms of their effectiveness in increasing pupils' likelihood of entering HE.

Table 25: Logistic regression for the raw estimated effects of mentoring and summer schools on HE entry

Treatment type	Mentoring (Model 1a)	Summer School (Model 1b)	Mentoring engagements (dosage) (Model 1c)			
			1-5	6-10	11-15	15+
			Odds ratios P>[z]			
Odds ratios	1.48***	3.26***	1.00 n.s.	1.42***	1.69***	2.30***
*Sample n**	*1,585*	*577*	*300*	*590*	*561*	*211*

All p values are based on the chi2 statistic.

The findings are in line with the raw descriptive outcome data presented in section 6.3. Attending an Aimhigher summer school increased pupils' chances of going to HE by far more than the mentoring scheme. Pupils engaging within summer school were 226% (OR 3.26, p< 0.01) more likely to enter HE than the non-treatment group, whereas mentored pupils' were almost 50% more likely (OR 1.48, p< 0.01). The analysis also found an association between the frequency of engagement (dosage effect) within the mentoring scheme and HE outcomes. As engagement increased beyond 1 to 5 engagements pupils' likelihood of entering HE increased. At more than 15 mentoring engagements pupils were most likely to enter HE (130%, OR 2.30,

$p < 0.01$). One to five engagements were found to provide no significant benefit. These initial raw results should not be taken at face value as they do not account for the influence of pupil controls and imbalances in pupil characteristics across the treatment and non-treatment groups (see section 6.2.1). In turn, the associations are likely to decrease once controls have been applied.

6.4.2 Stage 2: A Controlled Model Investigating the Estimated Effects of Pupil Characteristics on HE

This section compares the findings of the raw uncontrolled model presented above against the logistical analysis for the controlled model (see table 26). The controlled model includes all pupil-level controls. The analysis aims to understand the extent to which the raw differences in HE outcomes (see table 25) can be accounted for by pre-existing differences in pupil characteristics (attainment, demographic and socio-economic) and the effectiveness of different treatments once these controls were accounted for.

Almost all estimated treatment effects by group remained positive, but mentoring did not reach statistical significance (OR 1.17). When the mentoring treatment estimates were broken down by level of engagement, this revealed that at lower levels effect estimates were very close to zero and statistically non-significant (1-5 sessions, OR = 0.94, n.s; 6-10 sessions, OR = 1.10, n.s.). The suggestion of a positive overall effect for the mentoring group is driven by high engagers with 11 or more sessions (11-15 sessions, OR 1.34, $p < 0.05$ and 15 or more sessions 1.54, $p < 0.05$). Adding controls reduced the chances of summer school pupils' entering HE (compared to the raw model) to 115% (OR 2.15, $p < 0.001$) significantly more likely than the non-treatment group. Burgess, Horton and Moores (2021) reported similar results, as pupils' who engaged in summer school were significantly more likely to be accepted to HE than those that engaged in other WP interventions such as mentoring or no intervention at all. However, the research only investigated the frequency of engagement effects at a programme level and not specific effects for mentoring.

Table 26: Multiple logistic regression for the controlled estimated effects of mentoring and summer schools on HE entry

	Mentoring (Model 1a)	*Summer School (Model 1b)*	*Mentoring frequency of engagement (model 1c)*			
			1-5	6-10	11-15	More than 15
			Odds ratios *P*>[z]			
Odds ratios	1.17 n.s.	2.15***	0.94 n.s.	1.10 n.s.	1.34*	1.54*
*Sample n**	*1,585*	*577*	*300*	*590*	*561*	*211*

*Non-treatment sample n = 2,237. Odds ratios P>[z]. a. analysis includes all pupil controls. Unclassified EAL and any other ethnic group have been excluded from models due to small numbers.

What is Driving These Differences in Treatment Effects?

The data presented in table 27 provides the Pseudo R-squared values for the regression models outlined above, with controls and then with treatments added. This analysis aimed to establish the extent to which the explanatory power of the model improved by adding summer schools and mentoring treatments (e.g., how much of the differences in HE participation could be explained by treatment). The pupil level controls provided moderate[14] explanatory power within the model and were able to account for 10.1% of the differences in HE entry. The inclusion of the summer school treatment slightly improved the explanatory power of the model which could explain 13.1% of the differences in HE entry. Including mentoring frequency levels also improved the explanatory power of the model at similar levels between 1 and 15 engagements. However, at above 15 mentoring engagements the explanatory power of the model provided an excellent fit to the data, where 19.7% of the differences in HE entry could be explained.

Table 27: The explanatory power of treatment (Pseudo R-squared)

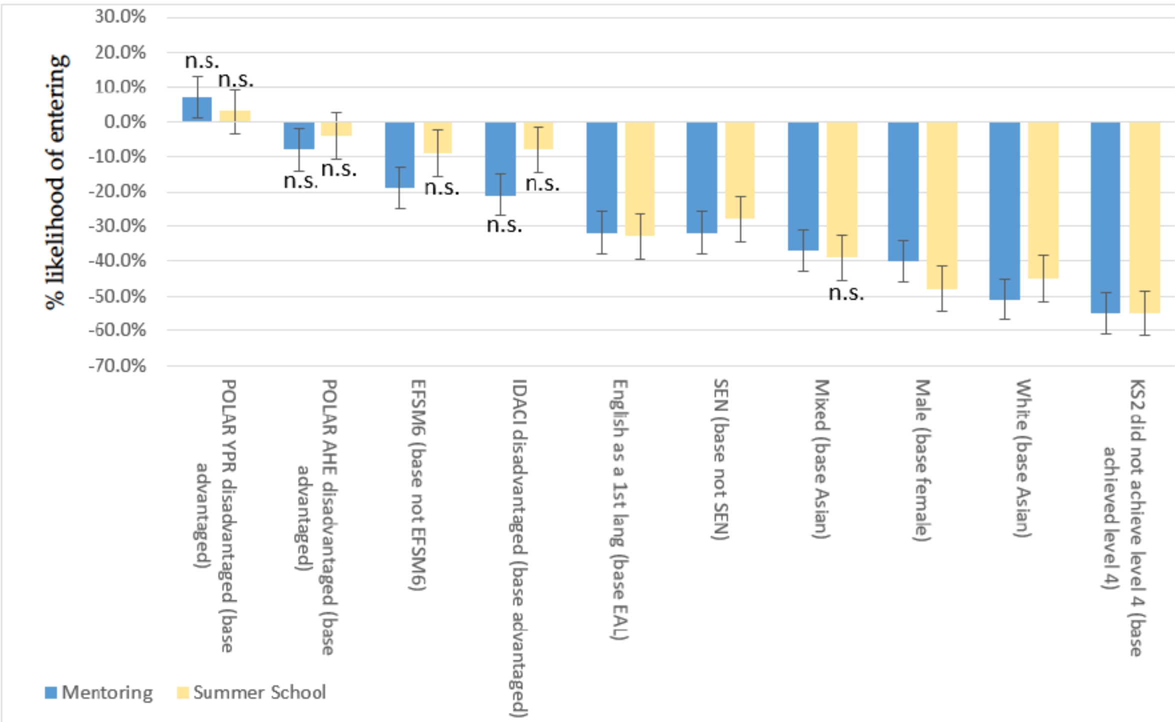
Regression analysis	**Pseudo R^2 p>(z)**
Pupil controls	R2 0.101, LR chi2(10) = 480.17***
Summer school and pupil controls	R2 0.131, LR chi2(11) = 397.61***
Mentoring and pupil controls	R2 0.092, LR chi2(11) = 453.06***
Mentoring (1-5 engagements) and pupil controls	R2 0.131, LR chi2(11) = 34.88**
Mentoring (6-10 engagements) and pupil controls	R2 0.123, LR chi2(11) = 76.19***
Mentoring (11-15 engagements) and pupil controls	R2 0.123, LR chi2(11) = 71.83***
Mentoring (>15 engagements) and pupil controls	R2 0.197, LR chi2(11) = 44.75***

[14] McFadden (1977, p.35) outlines that Pseudo R^2 values of .2 to .4 represent an excellent fit. It is also conventional to view Pseudo R2 values of less than 0.1 as weak and between 0.1 to 0.20 as moderate (Acock, 2018, p278).

Which Pupil Controls are the Strongest Predictors of HE Entry Behaviours

The previous section presented estimates of treatment effects after controlling for a range of pupil background variables. It is also of value to this study to examine which of these variables were associated with and driving these HE outcomes. This section presents results based on the odds ratio estimates to investigate the direction and strength of association between HE outcome and control variables (pupil characteristics) within the multivariate model. Figure 16 summarises the percentage likelihood that pupils with different characteristics will enter HE (the full logistic regression output is presented in Appendix 8). The chart summarises the data for each control, for example by comparing the percentage likelihood of males entering HE vs females. Each time the most advantaged group is set as the base, as they have been shown to have an increased likelihood of entering HE (as discussed within the literature review). This model does not distinguish whether pupils are in the treatment or non-treatment groups. The odds ratios were converted to percentages and are interpreted as outlined in section 6.4. Results are significant unless denoted with n.s. (non-significant).

Figure 16: Multiple controlled logistic regression showing the estimated % likelihood pupils will enter HE



All p values are based on the logistic regression chi2 statistic output. Unclassified EAL and any other ethnic group have been excluded from models due to small numbers.

Figure 16 shows that most disadvantaged pupils were less likely to enter HE. This suggested that the estimated effects reported within the previous section were driven by advantaged pupils' having an increased likelihood of entering HE within the treatment and non-treatment groups (similar findings were reported within the descriptive statistics, see section 6.3.1). Pupil attainment accounted for most of the differences in HE entry, as pupils' who did not achieve KS2 level 4, were 55% (OR 0.45, $p < 0.001$) less likely to enter HE than those who did achieve this level. Across almost all the other controls, pupils from more disadvantaged backgrounds were between 4% to 51% less likely to enter HE than their more advantaged peers. These findings are supported by the widely reported evidence within the literature that HE participation was highly stratified by a pupil's prior attainment and SES (DfE, 2009/2020; Goodman *et al.*, 2010; Chowdry *et al.*, 2012, Gorard, See and Davies, 2012; Crawford and Greaves, 2015; Gorard *et al.*, 2018; OfS 2020; UCAS 2020).

6.4.3 Stage 3: Heterogeneity in the Treatment Effect

So far, the regression analyses have investigated the raw differences in estimated treatment effects, followed by how HE outcomes differed by pupil characteristics. The analysis that follows investigated the interaction between the two (e.g., HE outcomes interacted by treatment and characteristics). This section provides a recap of the literature and then a more detailed overview of how the analysis was conducted.

As outlined within the chapter introduction the research undertaken, built on a number of more robust studies evidencing the effectiveness of WP interventions in improving disadvantaged pupils' HE outcomes (Morris, Rutt, and Mehta, 2009; Chilosi *et al*., 2010; Burgess, Horton and Moores, 2021). The research aimed to address limitations within these studies, by including a wider range of controls that had been shown to impact on educational outcomes, such as a pupil's prior attainment, socio-economic and demographic characteristics (see chapter 4a). Sparse evidence was available in terms of whether specific WP interventions were more or less effective for pupils' holding different characteristics. Studies tended to investigate this at programme level, with few controls (see Burgess, Horton and Moores, 2021). The research presented in this thesis aimed to address these gaps.

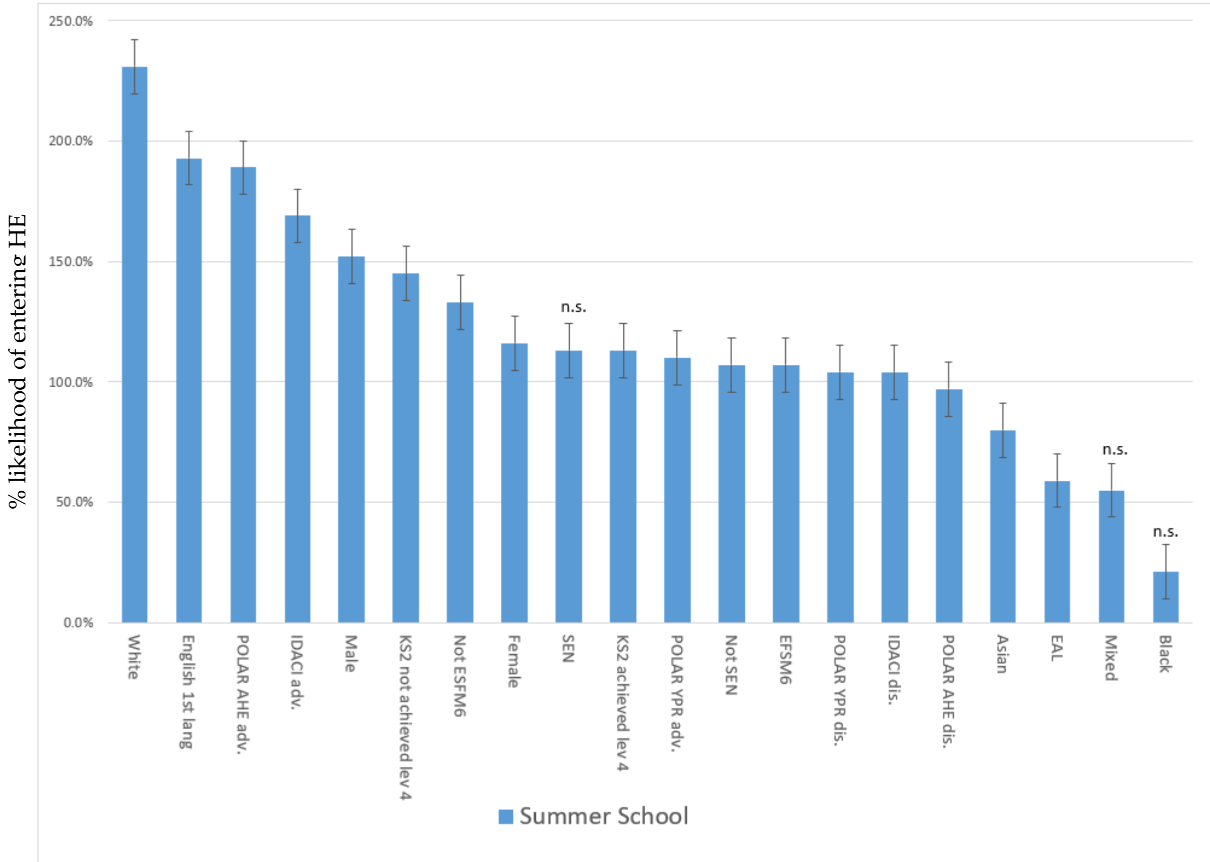
The next analysis summarises a logistic regression model that compared HE outcomes between the treatment and non-treatment groups, whilst controlling for and interacting with all observed pupil characteristics. The model investigated heterogeneity in the treatment by making controlled comparisons in HE outcomes, for example between treated males against non-treated males and then (adding separately to a new model) treated females against non-treated females. In turn, one interaction at a time was added to the controlled model with all pupil controls (outlined in stage 2) and then removed. This final model provides the most controlled and unbiased estimate of results by improving the comparability between the treatment and non-treatment groups. To support this, analysis data was coded into dummy variables (e.g., treated males were coded as "0" and non-treated males were coded as "1").

The previous controlled analysis (section 6.4.2) found that both summer schools and mentoring (above 11 sessions) improved pupils' estimated likelihood of entering HE. However, summer schools were far more effective than mentoring. The next model helps to understand if different treatments vary in effectiveness for pupils with different characteristics. Such effects are important to understand as they may have important practical and policy implications for WP programmes. The regression analysis is presented in figure 17 for the summer school model and figure 18 for the mentoring frequency model. The figures show the percentage likelihood of treated pupils' entering HE. As with the controlled analysis odds ratios were converted into percentages (see section 6.4 for full interpretation). All results are significant unless they are denoted with n.s. (non-significant). The full regression analysis is provided in Appendices 2 and 3).

Summer School Estimated Treatment Effects

The findings (see figure 17) suggested all pupils that engaged in summer schools, regardless of their characteristics, were much more likely to enter HE than non-treated pupils'. Therefore, only positive associations were observed. Pupils that benefitted most from summer schools were White, spoke English as a first language, male, not EFSM6, lived in advantaged POLAR AHE / IDACI areas and did not achieve KS2 level 4. These pupils' were between 133% to 231% more likely to enter HE than pupils' of the same background in the non-treatment group. Results also suggested that other pupils' significantly benefitted from engagement, but less so, as they were between 80% to 116% more likely to enter HE than non-treated pupils' of the same characteristics. These pupils' included those who were female, EFSM6, Asian, non-SEN, living in disadvantaged (POLAR YPR, AHE and IDACI) and advantaged areas (POLAR YPR) or had achieved KS2 level 4. All the results outlined above were statistically significant. SEN pupils were 113% more likely to enter HE, but just missed significance (p= 0.054). Three other groups of pupils' benefited, but to a much lesser extent if they were EAL (59% increased likelihood), from a Mixed ethnic group (55% increased likelihood) and lastly those of Black ethnicity (21% increased likelihood). However, the latter two results were non-significant.

Figure 17: Multiple controlled interacted logistic regression showing the estimated % likelihood that summer school pupils will enter HE



Unclassified EAL and any other ethnic group have been excluded from models due to small numbers.

Mentoring Frequency (Dosage) Estimated Treatment Effects

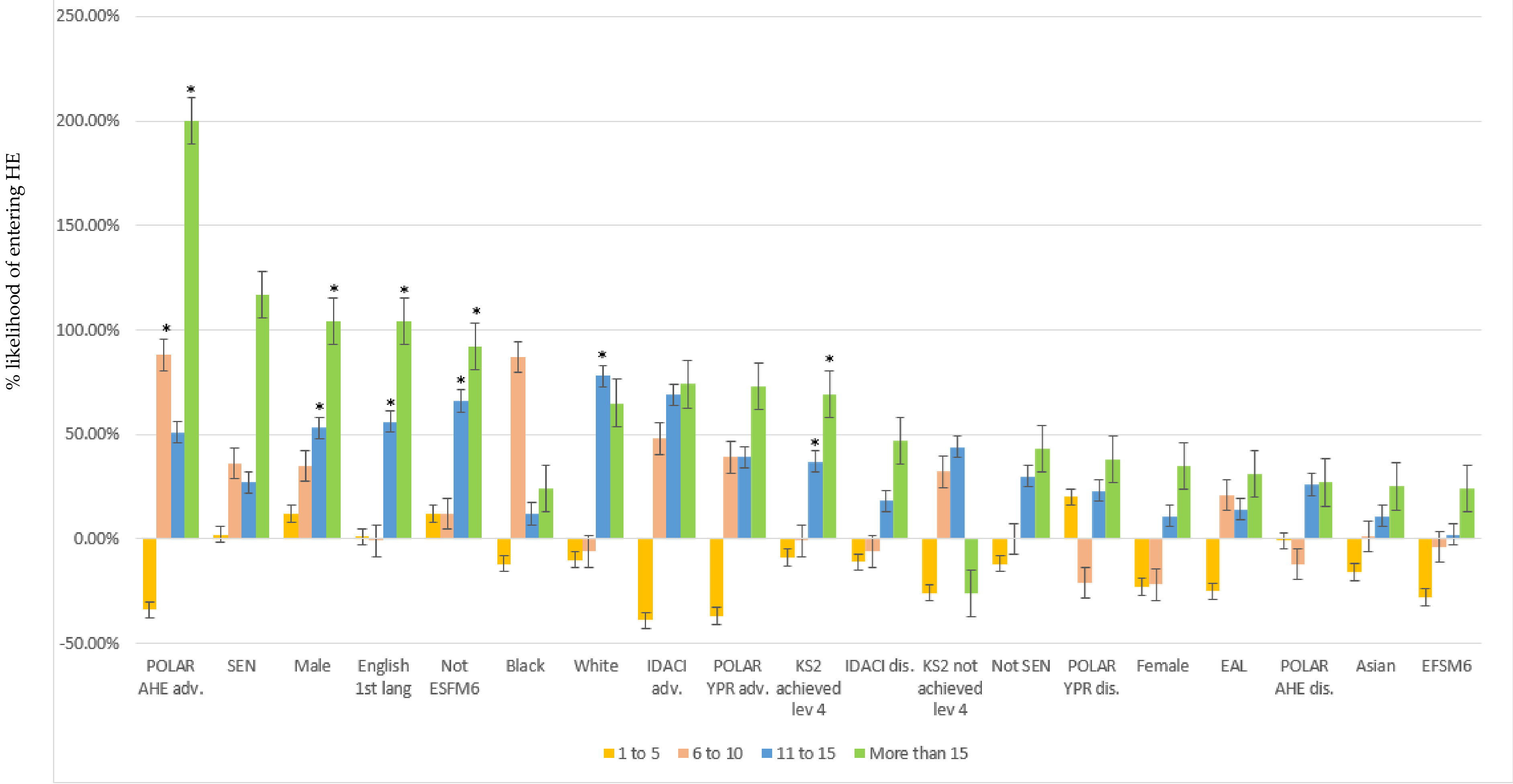
Section 6.4.2 showed that higher levels of engagement (11 or more) within mentoring was significantly associated with an increased likelihood of pupils' entering HE. The analysis that follows presents data for the mentoring frequency engagement model only. The controlled analysis (section 6.42) demonstrated that this model was more sensitive in identifying treatment effects than the stand-alone mentoring model, where effects were suppressed and non-significant. Analysis at this level of granularity is more able to identify useful findings that may have practical and policy implications. In turn, the standalone heterogeneity treatment effects are not summarised here (this analysis is available in Appendix 9). The data for the analysis below is presented in figure 18. Statistically significant results are denoted with an asterisk.

1-5 mentoring engagements: The analysis in section 6.4.2 showed that when pupils' engaged between 1-5 times within mentoring, they were 6% less likely to enter HE than non-treated pupils'. This result was non-significant. The heterogeneity analysis provides an understanding of what is driving these results (see figure 18). The analysis shows that most pupils' (11 characteristics) experienced between an 11% to 39% decreased likelihood of entering HE if they engaged between 1-5 times. The largest decreases were observed for pupils' who were from advantaged postcode areas (IDACI, 39%, POLAR YPR, 37% and POLAR AHE, 34%). None of these results was statistically significant. Only pupils' who were from a disadvantaged area (POLAR YPR), who were male or not EFM6 benefited as they were between 12% to 20% more likely to enter HE than non-treated pupils'. Again, none of these results was statistically significant. For the remaining five pupil characteristics 1-5 mentoring sessions had a null effect (ORs were between 0.90 and 1.10).

6-10 mentoring engagements: The analysis in section 6.4.2 showed that when pupils engaged between 6-10 times within mentoring, they were 10% more likely to enter HE than non-treated pupils'. Again, this result was non-significant. Figure 18 shows that for some pupils' (3 characteristics) mentoring decreased their likelihood of entering HE by between 12% to 22%, (female, POLAR YPR and AHE disadvantaged) compared to non-treated pupils'. None of these results was statistically significant. However, for other pupils (nine characteristics), 6-10 mentoring sessions improved their likelihood of entering HE by between 12% to 88% compared to non-treated pupils'. Pupils' who were Black (87%) or those from an advantaged area (88%) (POLAR AHE) benefitted the most. However, the only statistically significant result was for the latter group. For the remaining seven pupil characteristics 6-10 mentoring sessions had a null effect (ORs were between 0.90 and 1.10).

11-15 mentoring engagements: The analysis in section 6.4.2 showed that when pupils' engaged between 11-15 times within mentoring, they were 34% more likely to enter HE than non-treated pupils'. This result was statistically significant. Figure 18 shows that almost all pupils (18 characteristics) who engaged 11-15 times within mentoring, had an increased likelihood of entering HE. Many pupils' (6 characteristics) were between 51% to 78% more likely to enter HE compared to non-treated pupils' (of the same characteristic) if they were White, non-EFM6, male, spoke English as a first language or were from advantaged areas (IDACI). All of these results were statistically significant other than IDACI which just missed significance (p = 0.057). Most other pupils (12 characteristics) were between 11% to 44% more likely to enter HE than non-treated pupils'. Only the result for pupils' who achieved KS2 level 4 was significant. ***More than 15 mentoring engagements:*** The analysis in section 6.4.2 showed that when pupils' engaged more than 15 times within mentoring, they were 54% more likely to enter HE than non-treated pupils'. This result was statistically significant. Figure 18 shows that pupils from an advantaged POLAR AHE area and engaging 11-15 times within mentoring were 200% more likely to enter HE than non-treated pupils'. This result was statistically significant. Most pupils (17 characteristics) were between 24% to 117% more likely to enter HE than non-treated pupils. However, statistically significant results were observed only for pupils who were male (104%), not EFSM6 (92%), achieved KS2 level 4 (69%) or spoke English as a first language (104%). Only one result provided a negative association, as pupils' who did not achieve KS2 level 4 were 26% less likely to enter HE than non-treated pupils'. However, this result was non-significant.

Figure 18: Multiple controlled interacted logistic regression showing the estimated % likelihood that mentored pupils' (by frequency of engagement) will enter HE



Unclassified EAL and any other and Mixed ethnic groups have been excluded from models due to small numbers. *Denotes a statistically significant result.

6.5 Summary

This analysis has provided evidence to suggest that summer schools seem to be the most effective Aimhigher intervention at significantly improving most pupils' estimated likelihood of entering HE. Mentoring was also effective and led to significant positive effects above 10 engagements. Below 10 engagements effects were non-significant and close to zero. The observed raw differences were large and even when controls were added positive effects remained. However, these findings are indicative as unobserved differences may have impacted on results. Further, both the mentoring and summer school samples were far more advantaged (including attainment) than the non-treatment group. In consequence, the observed estimated treatment effects may be due to pre-existing differences within the samples, where treated pupils' could have already been on a HE trajectory prior to engagement in Aimhigher and hence more motivated to engage within the programme.

However, set against this some of the results were more promising and pointed to an Aimhigher treatment effect. In addition, to the mentoring dosage (frequency) effects outlined above, the heterogenous treatment effects provided much more control and also point to an Aimhigher effect. All estimated effects were positive and mainly significant for summer schools, and most were positive for mentoring above 10 engagements. More results were statistically significant at 11-15 engagements and fewer at more than 15 engagements. At lower levels of engagement (1-5) results showed mainly a negative association and, in some cases a null association. None of these results was statistically significant. At 6-10 engagements findings were more mixed with mainly positive and null effects and a few negative effects. All of these results were non-significant. These findings suggest that the delivery and content of Aimhigher interventions could be reviewed to improve engagement and be more inclusive to support equity of outcome. In particular, pupils of an SEN status, Black and Mixed ethnicity did not significantly benefit at all. These effects by pupil characteristics are considered in more detail within the discussion section.

The research approach and associated analysis have addressed a number of gaps within the WP literature for high-cost and resource-intensive summer school and mentoring interventions. Such interventions are widely employed across the sector. The research demonstrated that when evaluating WP schemes, it is important to investigate treatment effect heterogeneity and the frequency of engagement within specific interventions. This was important for mentoring as without this analysis many of the estimated effects would have remained hidden and thus, suppressed. Such effects are rarely investigated at all and tend to be based at a multi-intervention programme level (see Burgess, Horton and Moores, 2021). Findings have important practical and policy implications for the Aimhigher programme and WP sector in terms of how programmes are resourced, delivered, targeted, and evaluated. These implications are considered in detail within the discussion chapter.

6.6: Analysis Two: The influence of Pupil AABs on HE Entry Behaviours

6.6.1 Introduction

The literature review summarised evidence to support the view that non-cognitive skills may play an important role in influencing pupils' HE trajectories (see chapter 3). Within the field of education and widening participation (WP) these factors have been operationalised as AABs (see chapter 3). These refer to pupils' and parents' HE expectations / aspirations, knowledge of and attitudes towards HE and academic motivation. There is a tendency for WP programmes to target disadvantaged pupils with relatively good levels of attainment and the potential to progress to HE. It is widely perceived across the WP sector that these cohorts are less likely to enter HE as they have lower AABs than their more advantaged peers. Widening participation programmes commit a considerable amount of resource to improve such factors. Many studies discussed (see chapter 3) have tended to focus on HE aspirations or, at best, the influence of AABs up to the stage of HE application. While there is a strong field of evidence to suggest these AABs are stratified by pupil characteristics (see chapter 3), evidence is lacking in terms of the influence of AABs on actual HE entry behaviours for the cohorts of pupils' (good attainment) targeted by WP programmes (see chapter 3).

The research undertaken addressed these gaps by investigating the mediating power of a wider range of AABs on pupils' HE entry behaviours. The analysis will provide important insights into WP policy and programmes. If AABs are found to be stratified and important mediators for HE entry, then this would suggest that programmes are focusing on important mechanisms that can reduce inequalities in HE participation. Alternatively, if no associations are observed, this would suggest that WP interventions may need to direct resources elsewhere. Further, the research undertaken aims to address another important gap. Widening participation programmes commonly employ surveys to measure the impact of interventions on pupil AABs. However, there is no published evidence in terms of the reliability and validity of these evaluation toolkits. The research undertaken addresses this gap by testing the reliability of the survey developed and employed.

Analysis Aims and Research Questions

To following research questions were investigated to address these gaps within the literature:

- *RQ 2 (a): Is there an association between knowledge of HE and HE expectations; attitudes to HE and academic motivation with pupils' likelihood of entering HE*
- *RQ 2 (b): Is this association stratified by pupil characteristics (attainment, demographic, socio-economic and baseline AABs)?*
- *RQ 2 (c): Are Aimhigher survey measures reliable?*

The analysis employed the same attainment, demographic and socio-economic controls as outlined within analysis one (see section 6.1). This analysis differed from analysis one in that it included controls/mediators for pupils' HE knowledge, attitudes, expectations, and academic motivation measured via baseline and follow-up surveys (see method chapter 5, section 5.2.2 to 5.2.8). In turn, the analysis aimed to establish if the positive estimated effects of treatments on HE entry observed in analysis one, were in part mediated by pupils' AABs. These surveys were completed by a sub-sample of pupils' participating in the study. Pupils completed a baseline survey and then a follow-up survey in the following year. This data enabled the study to investigate the reliability of findings. This analysis focused on the non-treatment group only. The non-treatment group provided a more valid approach to investigating associations between AABs and HE entry, as samples were large, and participants had not engaged in Aimhigher interventions. The association between treatments and AABs are investigated within the final analysis of this chapter (see analyses 3, section 6.10).

The first two sections of this chapter focus on the robustness and completeness of the data for estimating the associations between AABs and pupil controls on HE entry. To support this, descriptive data is presented to compare the survey sub-sample to the full study sample (analysis one) in terms of missing data and pupil characteristics. If missing data is low and samples are comparable this will enable more robust inferences as to whether these findings (e.g., the importance of AABs) are applicable to the full study sample.

After assessing this data, the analysis investigates associations through eight logistic regression models which included the HE outcome, the non-treatment group, the four baseline and four follow-up AABs and controls relating to pupil background characteristics. Each model was completed in three stages starting with a raw analysis of HE outcomes across each AAB. This was followed by a controlled analysis, to investigate whether raw differences in HE outcomes could be explained by pupil AABs when controlling for other pupil background factors. The third stage of the analysis interacted pupil characteristics with AAB survey measures to understand whether any observed associations between AABs and HE entry were stratified by pupil characteristics. A detailed description of the aims of each analysis is provided in section 6.8. The final section of the chapter presents a summary of the key findings.

6.7 Missing Data

The first question relating to data completeness investigated was the extent of missing data across the non-treatment groups, the HE outcome and control variables. The analysis is presented in table 28a. The analysis compared missingness between the non-treatment groups within the full study sample (analysis one, n = 2,321) and for the survey sub-sample (n = 1,036) where the HE and the four AAB[15] outcomes were observed. High levels of missing data reduce the ability to control for differences between the non-treatment groups. Moreover, where there are different rates and items of missingness between these groups, this suggests that other unobserved differences are also more likely.

HE outcomes were available for 96.4% of pupils' in the full study sample (analysis one) and 44.6% of pupils who completed surveys. Baseline surveys were available for larger proportions of the full study sample (84% to 87%) and just under half of the pupils (45%) within the current analysis (e.g., the survey sub-sample). Attrition in survey response rates was higher for the later sample as pupils were only included within the analysis if they completed both the baseline and follow-up survey. Across all other control variables, data was available for between 86% and 100% of participants within the full study sample and 42% to 45% of participants within the survey sample. Due to a large amount of missing data for the survey cohort, it is possible that samples differ in terms of unobservable variables and which in turn limits any inferences that can be made (e.g., the importance of AABs) to the larger study sample in analysis one.

[15] The confidence in academic ability survey question is excluded from this analysis due to small samples (only 6.8% of pupils completed this question).

Table 28a: Non-treatment group sample sizes and missing data across the outcome and control variables (pupil and AABs) for where the HE entry outcome is observed.

Variable	Full Sample	Sample for which HE and survey outcomes are observed
	Non-treatment group (NT)	
N sample	2,321	1,036 (44.6%)
HE entry	2,237 (96.4%)	1,036 (44.6%)
Knowledge of HE (follow-up survey)	1,071 (46.1%)	1,036 (44.6%)
Attitudes to HE (follow-up survey)	1,036 (44.6%)	1,036 (44.6%)
HE Expectations (follow-up survey)	1,033 (44.5%)	1,033 (44.5%)
Academic Motivation (follow-up survey)	1,033 (44.5%)	1,033 (44.5%)
KS2 above or below level 4	2,211 (95.3%)	1,026 (44.2%)
Gender	2,305 (99.3%)	1036 (44.6%)
Ever FSM6	2,081 (89.7%)	1,031 (44.4%)
Ethnicity	2,078 (89.5%)	982 (42.3%)
First language	2,237 (96.4%)	1,036 (44.6%)
SEN	1,998 (86.1%)	1,023 (44.1%)
POLARYPR	2,158 (93.0%)	1,031 (44.4%)
POLARAHE	2,100 (90.5%)	1,031 (44.4%)
IMD	2,107 (90.8%)	1,030 (44.4%)
Knowledge of HE (survey baseline)	2,014 (86.8%)	1036 (44.6%)
Attitudes to HE (survey baseline)	2,014 (86.8%)	1036 (44.6%)
HE Expectations (survey baseline)	2,006 (84.4%)	1034 (44.5%)
Academic Motivation (survey baseline)	2,006 (84.4%)	1034 (44.5%)

6.7.1 How Comparable are the Full Study and Survey Non-Treatment Groups in Terms of Observed Pupil Characteristics?

Table 28b summarises descriptive statistics which provide an understanding of whether the full study (analysis one, see section 6.2.1) and survey non-treatment groups were comparable in terms of observable pupil characteristics. Drawing valid conclusions about the findings may be problematic if the characteristics of pupils' differed substantially across these samples (e.g., associations observed within this analysis may not be applicable to the full study sample).

The data in table 28b shows that both non-treatment samples were relatively well-matched in terms of HE entry rates which ranged from, 30.1% for the full study sample to 34.8% for the survey sample. Two-tailed t-tests show that the survey non-treatment group is well matched to the full study sample across one-third of the variables (3/9)[16]. Similar proportions of pupils were female and lived in disadvantaged neighbourhoods (POLAR YPR and AHE). The survey sample was significantly more advantaged than the full study sample in some respects, as pupils' who had higher KS2 attainment, were less likely to have an EFMS6 or SEN status. However, the survey sample was significantly more disadvantaged across other controls, as they were less likely to be Asian, more likely to speak English as a first language and live in disadvantaged IDACI areas. In summary, descriptive statistics have shown that the full study and survey samples are broadly comparable in terms of pupil characteristics.

[16] The table excludes a comparison in terms of follow up surveys as the methodology employed for analysis requires pupils to have completed both baseline and follow up surveys. This means the samples and mean scores are the same across both non-treatment groups.

Table 28b: **Sample characteristics – pairwise comparison between non-treatment groups (full study sample and survey sample) for where HE and AAB outcomes are observed.**

Significance levels are denoted as follows: *p <0.05, **p <0.01, ***p <0.001. The remainder of results are non-significant.

Control variable	Category	Full Sample	Sample for which HE and survey outcomes are observed	Percentage point difference
		Non-treatment group		
KS2 achieved level	Achieved level 4 or above	70.8% (1,566)***	79.0% (811)***	-8.2
	Did not achieve level 4	29.2% (645)***	21.0% (215)***	8.2
Gender	Male	52.7% (1,179)	51.9% (538)	0.8
	Female	47.3% (1,058)	48.1% (498)	-0.8
Ever FSM6	Yes	35.3% (735)***	29% (299)***	6.3
	No	64.7% (1,346)***	71.0% (732)***	-6.3
	White	58.0% (1,191)***	71.0% (697)***	-13.0
	Asian	25.6% (526)***	14.0% (137)***	11.6
Ethnicity	Black	8.0% (165)***	6.6% (65)***	-1.4
	Mixed	4.9% (100)***	5.0% (49)***	-0.1
	Other	3.5% (72)***	3.5% (34)***	0
	English 1st lang.	71.0% (1,588)***	85.0% (877)***	-13.7
First language*	English as an additional lang.	27.5% (616)***	15.0% (155)***	12.5
	Unclassified	1.5% (33)***	<1% (<5)***	1.1
SEN	Yes	17.4% (1,651)**	13.1% (134)**	4.3
	No	82.7% (586)**	86.9% (889)**	-4.2
POLARYPR	Disadvantaged	62.6% (1,333)	61.5% (634)	1.1
	Advantaged	37.4% (797)	38.5% (397)	-1.1
POLARAHE	Disadvantaged	80.5% (1,671)	78.8% (812)	1.7
	Advantaged	19.5% (406)	21.2% (219)	-1.7
IDACI	Disadvantaged	72.1% (1,486)**	66.9% (687)**	5.2
	Advantaged	27.9% (574)**	33.2% (342)**	5.3
Knowledge of HE (survey baseline)		3.64, SD 0.79 (2,014)	M 3.57, SD 0.80 (1036)	0.07
Attitudes to HE (survey baseline)		3.69, SD 0.91 (2,014)	M 3.67, SD 0.91 (1036)	0.02
HE expectations (survey baseline)	Mean score	4.23, SD 0.85 (2,006)	4.26, SD 0.83 (1034)	-0.03
Academic motivation (survey baseline)		4.21, SD 0.86 (2,006)	M 4.25, SD 0.84 (1034)	-0.04

*Some percentages have been rounded as unclassified language sample is less than 5

6.8 Logistic Regression Analyses

The next step within the analysis was to construct eight logistic regression models for each AAB (baseline and follow-up) and which brought together the non-treatment group, pupil controls and the HE entry outcome. The aim of these models was to investigate:

a) If there was an association between higher pupil AAB scores and an increased likelihood of entering HE
b) If associations were observed, were they stratified by pupil characteristics.
c) If Aimhigher ABB survey measures were reliable

Each logistic regression model was completed in three stages:

Stage 1: A raw uncontrolled model investigating the association between AABs on HE entry: This analysis investigated whether higher baseline and follow-up AAB scores were associated with pupils' having an increased likelihood of entering HE. The model did not account for observed pupil controls. This analysis supported another aim of the study in terms of testing the reliability of Aimhigher baseline and follow-up survey measures. Significance tests were conducted to establish whether non-treated pupils' scores remained consistent from baseline to follow-up.

Stage 2: A controlled model investigating the association between pupil characteristics and AABs on HE entry: This analysis investigated the extent to which the raw AAB estimated differences in HE outcomes (stage 1 of the model) could be explained by observable pupil characteristics (attainment, demographic, and socio-economic controls). Two other models are presented with the inclusion of baseline and follow-up AABs with these pupil controls. The analysis investigated if the inclusion of pupil controls and AABs improved the explanatory power of the models and whether pupil characteristics and AABs were associated with a pupil's likelihood of entering HE.

Stage 3: A controlled and interacted model investigating the association between pupil characteristics and AABs on HE entry: This analysis was completed to determine whether AABs scores and HE entry were stratified by pupil characteristics. Pupil controls were interacted with AABs. This analysis supported controlled comparisons between pupils of the same characteristic and provided the most unbiased estimates of whether AABs mediated pupils' HE entry behaviours.

6.8.1 Stage 1: A Raw Uncontrolled Model Investigating the Association Between AABs on HE Entry

This section begins with a summary of descriptive statistics to investigate if there was an association between higher mean baseline and follow-up AAB scores and an increased likelihood of pupils' entering HE. The analysis also considers the reliability of the AAB survey measures. This was followed by a logistic regression analysis to understand the extent to which AABs could explain raw differences in HE entry outcomes. Neither of these analyses considered pupil-level controls. Figures 19 to 22 summarise the baseline and follow-up mean survey scores for pupils' who did and did not enter HE. Each AAB survey measure provided an aggregate mean score of question items, measured on a 5-point Likert scale (see method chapter). These results suggest that the raw differences in the association between AAB scores and HE outcomes were consistent with expectations. The analysis clearly shows that pupils with higher survey mean scores were more likely to enter HE than those with lower scores. At baseline and follow-up this pattern of results was notable for HE attitudes, HE expectations and academic motivation measures, as pupils' entering HE had mean scores that were between 0.43 and 0.50 points higher than pupils' who did not enter HE. For the HE knowledge baseline measures, this difference was only very small (mean difference 0.06) and slightly larger for the follow-up measure (mean difference 0.15). The difference in mean follow-up scores between those who did and did not enter HE was statistically significant for each measure. One-tailed t-tests suggested that there was an association between high HE knowledge ($p < 0.01$), HE expectations ($p < 0.001$), HE attitudes ($p < 0.001$), academic motivation ($p < 0.001$) and a pupil's likelihood of entering HE.

Figure 19: Mean HE knowledge survey baseline and follow-up scores for pupils' who did and did not enter HE

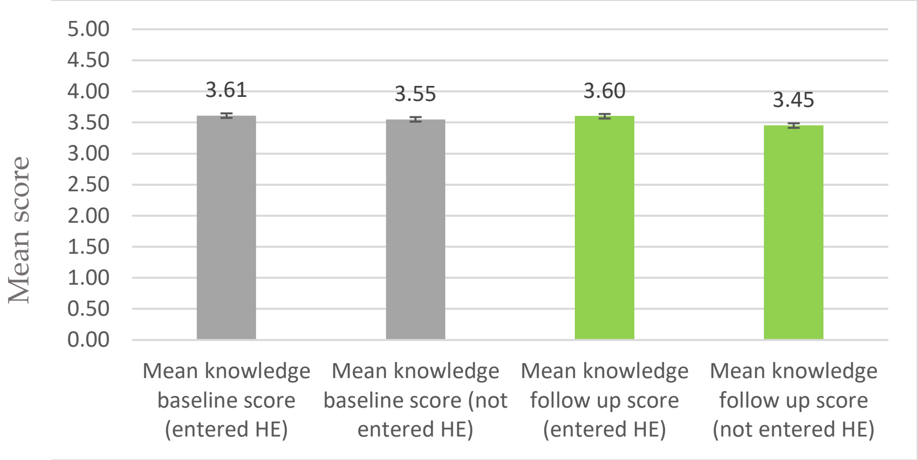


Figure 20: Mean HE attitude survey baseline and follow-up scores for pupils' who did and did not enter HE

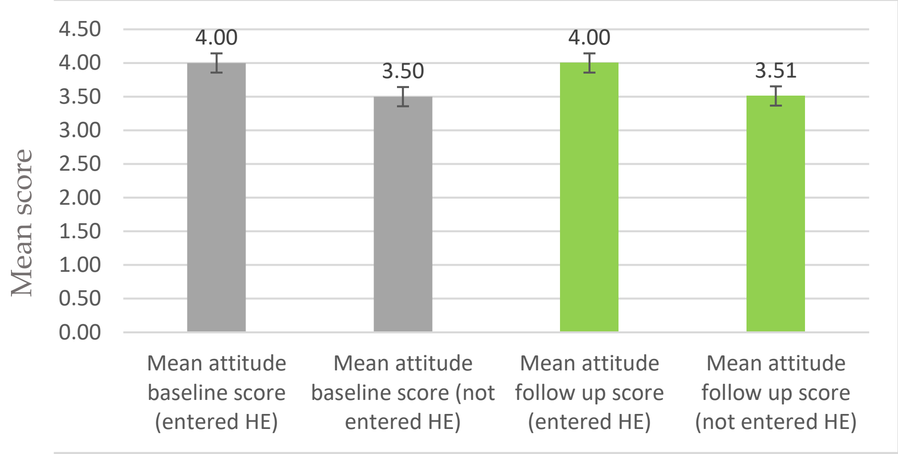


Figure 21: Mean HE expectation survey baseline and follow-up scores for pupils' who did and did not enter HE

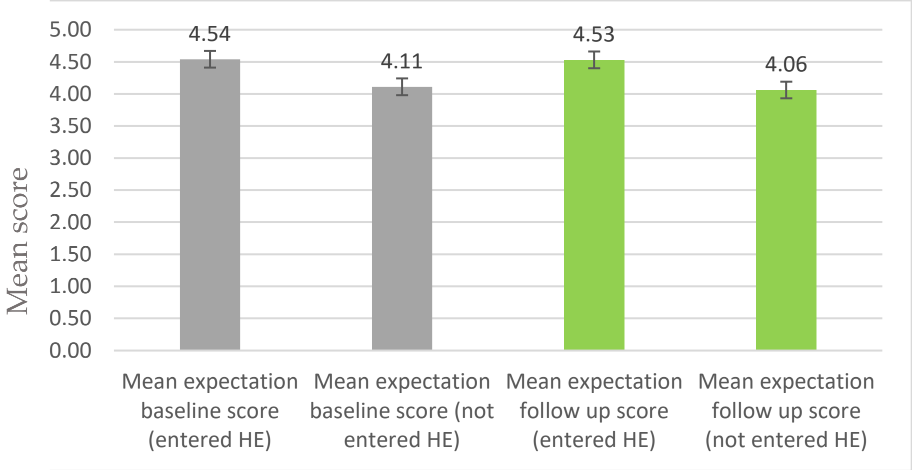
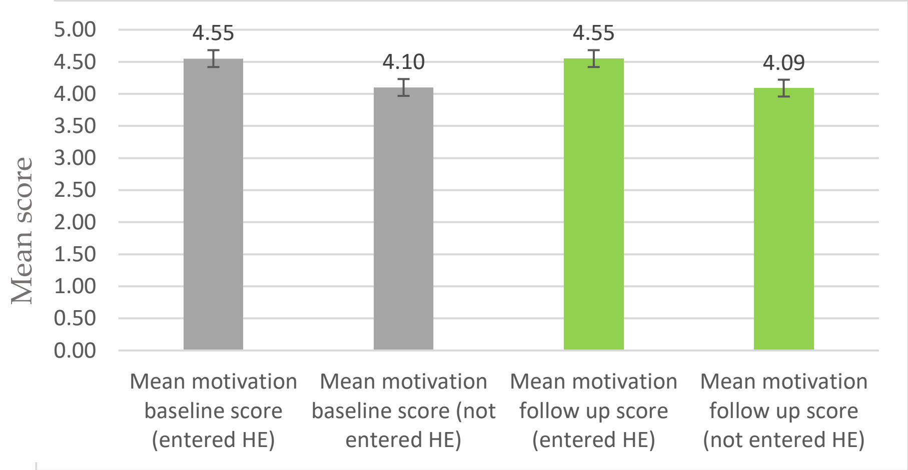


Figure 22: Mean academic motivation baseline and follow-up scores for pupils' who did and did not enter HE



The Reliability of AAB Measures

The research supported the reliability testing of survey measures as pupils completed a baseline and then a follow-up survey one year later. Spearman's rank correlation was computed to assess the monotonic relationship between non-treated pupils' baseline and follow-up scores across the four survey measures. This test enables the test-retest reliability of survey items to be evaluated. Spearman's correlation coefficients range from -1 to +1. A positive correlation would suggest that there is a relationship between high baseline survey scores and high follow-up survey scores. A negative correlation would suggest that when one survey measure increases the other measure decreases. A correlation coefficient of -1 or +1 is regarded as a perfect relationship; a coefficient between +0.70 to +0.90 is regarded as a strong positive relationship; a coefficient of +0.40 to +0.60 is a moderate relationship; a coefficient of +0.10 to +0.30 is a weak relationship and a coefficient of 0 is no relationship (Dancey and Reidy, 2012). For negative a relationship, the reverse is observed (e.g., -0.70 to -0.90 is a strong negative relationship).

The Spearman correlation coefficients are summarised in table 29. The analysis shows that there were highly significant strong and close to perfect correlations between the HE expectation (r_s 0.9901 p< 0.001), HE attitude (r_s 0.9750 p< 0.001) and academic motivation (r_s 0.9916 p< 0.001), baseline and follow-up survey scores (e.g., HE expectation baseline vs follow-up survey). For HE knowledge the was a highly significant moderate correlation between baseline and follow-up survey scores (r_s 0.4012 p< 0.001). This analysis suggests that all Aimhigher survey measures have test-retest reliability as scores were consistent and stable over time. However, the HE expectation, HE attitude, and academic motivation measures were the most robust and reliable survey measures.

Table 29: Spearman's rho correlation coefficient: test-retest reliability of survey measures

Survey measures (baseline and follow-up)	ρ (rho coefficient)	Prob > [t]
HE knowledge	0.4012	***
HE expectations	0.9901	***
HE attitudes	0.9750	***
Academic motivation	0.9916	***

Sample: HE knowledge and expectations 1,036, HE attitudes and academic motivation 1,033

Logistic Regression for the Raw Association Between AABs on HE Entry

Table 30 presents the logistic regression results for the raw uncontrolled model for non-treated pupils for whom AABs and HE outcomes were observed. The analysis investigated whether higher baseline and follow-up AAB scores were associated with an increased likelihood of entering HE. This analysis did not account for observed pupil controls. Within each analysis, the odds ratios (ORs) are presented as percentages as outlined in section 6.4 within analysis one. To recap, an OR of 1 = 0% and no association between AABs on HE entry. An OR below 1, such as 0.85 = -15% and a negative association between AABs and HE entry. An OR above 1, such as 1.30 = 30% and a positive association between AAB and HE entry.

Table 30: Logistic regressions for the raw association between AABs on HE entry

Survey	*HE knowledge*	*HE expectations*	*HE attitudes*	*Academic motivation*
	Odds ratios *P*>[z]			
Baseline	1.11, n.s.	2.08***	1.90***	2.11***
Follow-up	1.27**	2.04**	1.92***	2.13***
Sample n	*1,036*	*1,036*	*1,033*	*1,033*

All p values are based on the chi2 statistic

The results are consistent with the descriptive data presented in section 6.8.1. Highly significant associations were observed between pupils with higher AAB scores (baseline and follow-up) and an increased likelihood of entering HE. The strongest significant associations were observed between high academic motivation and HE expectation scores, where pupils had a 104% to 113% increased likelihood of entering HE. High HE attitudes scores were also significantly associated with pupils' having a 90% to 92% increased likelihood of entering HE. HE knowledge was also important but less so. Pupils obtaining high HE knowledge scores at follow-up were 27% more likely to enter HE. The HE baseline OR was positive, but non-significant. These initial raw results should not be taken at face value as they did not account for how differences in HE entry rates may have been influenced by differences in pupil characteristics. This is investigated within the analysis that follows.

6.8.2 Stage 2: A Controlled Model Investigating the Association Between Pupil Characteristics and AABs on HE Entry

The model investigates how much of the raw differences within HE outcomes summarised within the previous model, can be explained by the inclusion of pupil controls. This includes models with a) pupil controls only, b) baseline AABs and pupil controls c) follow-up AABs and pupil controls. The analysis investigated if the inclusion of AABs provided a richer set of controls by improving the explanatory power of the models. The analysis then considered how associations between AABs and HE entry differed by pupil characteristics.

The Pseudo R2 values are presented in table 31. The inclusion of pupil controls provided weak[17] predictive power as they were only able to explain 7.3% of the differences in HE participation. Once baseline and follow-up AABs were added, the models had a moderate predictive power and were able to explain much more (12.2% and 11.5%) of the differences in HE participation. In turn, the inclusion of AABs provided a notable improvement to the explanatory power of the models, suggesting they played a mediating role in HE outcomes. WP research often only includes pupil-level controls (e.g., attainment, demographic and socio-economic). These findings suggest that AABs are important in picking up differences in HE participation and in turn, should also be included in future research.

Table 31: The explanatory power of treatment (Pseudo R-squared)

Model	Pseudo R^2 p>(z)
Pupil controls	R2 0.073, LR chi2 (11) = 88.04***
Pupil controls and baselines survey AABs	R2 0.122, LR chi2 (15) = 143.36***
Pupil controls and follow-up survey AABs	R2 0.115, LR chi2 (15) = 138.72***

All p values are based on the chi2 statistic.

Does the inclusion of pupil controls reduce the association between AABs on HE entry?

The results for the controlled logistic regression with the inclusion of pupil controls and AABs are presented in Table 32. The analysis suggests that the pupil controls accounted for some of the differences in HE entry, as the observed raw uncontrolled associations between AABs and HE entry (presented in table 30) were reduced.

[17] The fit of R2 values, are interpreted in the same way as analysis one with reference to guidance set out by McFadden (1997), see section 6.4.2)

Table 32: Multiple logistic regression for the controlled association between AABs on HE entry

Survey	*HE knowledge*	*HE expectations*	*HE attitudes*	*Academic motivation*
	Odds ratios *P*>[z]			
Baseline	1.01 n.s.	1.75***	1.70**	1.79***
Follow-up	1.19 n.s.	1.74***	1.70***	1.81***
Sample n	*1,036*	*1,036*	*1,033*	*1,033*

All p values are based on the chi2 statistic.

With the inclusion of pupil controls, almost all of the observed associations between AABs and HE entry decreased. However, all associations remained positive. Pupils with high HE expectations, attitudes and academic motivations were between 70% to 81% significantly more likely to enter HE than pupils with lower scores. Notably, the HE knowledge follow-up survey association remained positive but was now non-significant. The results are in line with previous evidence presented by Croll and Attwood (2013) who found that HE aspirations were associated with HE entry behaviours. However, other studies have found that HE aspirations have little influence on HE entry behaviours when a richer set of controls were included (Siddiqui, Boliver and Gorard, 2019*).* As previously outlined, all of these studies included samples of pupils of all attainment levels, whereas the research undertaken includes a sample of high-attaining pupils' (see section 6.7.1).

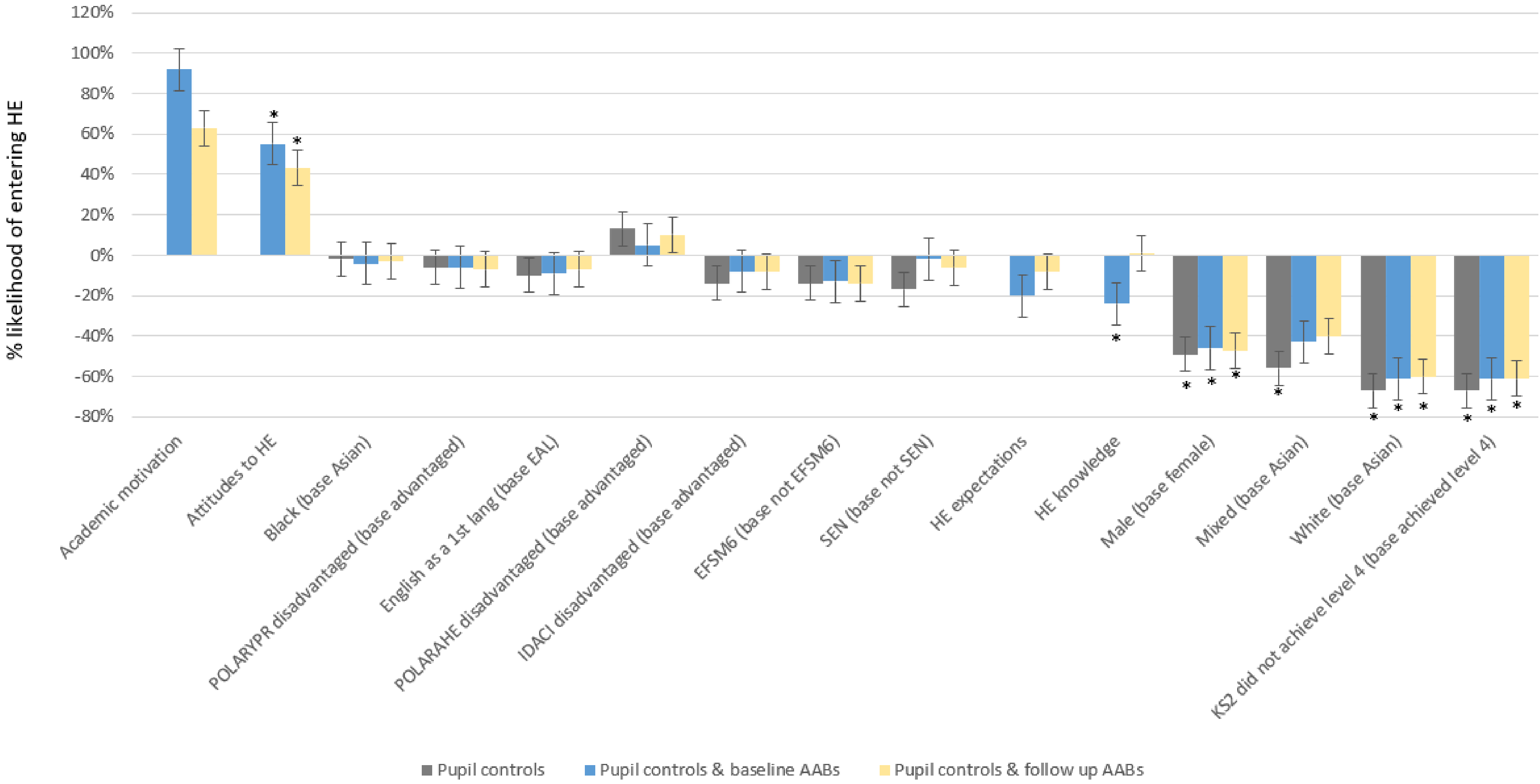
It is possible that HE knowledge scores were not found to be associated with HE entry behaviours for non-treated pupils', as their scores on this measure were quite low on both the baseline and follow-up surveys when compared to the other AABs (see section 6.7.1). To check these non-significant findings, a sub-analysis was conducted with the treatment group (engaged in mentoring or summer schools) to understand if the results were consistent. This analysis was conducted for the baseline HE knowledge only as treated pupils' follow-up scores may be impacted by their engagement within Aimhigher interventions. The analysis found that at baseline high HE knowledge scores were associated with a 44% ($p < 0.05$) increased likelihood of entering HE. This finding suggests that a pupil's HE knowledge was also important in influencing HE trajectories, but perhaps less so than other AABs.

Which Pupil Controls and AABs are the Strongest Predictors of HE Entry

Figure 23 summarises findings across the three regression analyses to understand which controls and AABs (baseline and follow-up) could explain most of the differences in HE participation. These models are the same as those described within the Pseudo R2 section. In turn, the coefficients for ABBs are lower than those described above, as all baseline and follow-up AABs were added to the respective models. Within figure 23, an asterisk denotes a statistically significant result, and the remainder are non-significant. Pupil level controls are either binary or categorical (surveys) measures and compare disadvantaged pupils' likelihood of entering HE against their more advantaged peers (base).

Both ethnicity and KS2 attainment were the most significant predictors of whether a pupil entered HE. Pupils who were White and those who did not achieve KS2 level 4, were between 61% to 67% less likely to enter HE than their more advantaged peers (e.g., Asian and those that achieved KS2 level 4). Pupils with high HE attitude scores were 43% (follow-up) and 55% (baseline) more likely to enter HE than pupils with lower scores. Pupils who were male or from a Mixed ethnicity were between 40% to 56% less likely to enter HE. All other disadvantaged pupils' (SEN, EFSM6, Black, English first language and disadvantaged neighbourhoods) tended to have a decreased likelihood of entering HE, although none of these results was statistically significant. Results across the pupil controls were in the expected direction as disadvantaged pupils' were less likely to enter HE, compared to advantaged pupils. Similar findings are reported within the wider literature and national HE administrative datasets (DfE 09/10 to 17/18; OfS 2020; OfS 2019, see chapter 4a).

Figure 23: Multiple controlled logistic regression showing the estimated % likelihood pupils will enter HE



Data omitted due to small numbers included pupils with an unclassified language and any other ethnic group.

6.8.3 Stage 3: A Controlled and Interacted Model Investigating the Association Between Pupil Characteristics and AABs on HE Entry

So far, the regression analyses have investigated the raw differences in the association between AABs and HE entry, followed by a controlled analysis to understand the influence of pupil characteristics and AABs on HE entry behaviours. The next analysis investigated the interaction between HE outcomes, pupil characteristics and AABs. It is critical to understand if ABBs are stratified and mediate pupil HE entry behaviours, as WP programmes are based on this assumption.

However, there are major gaps in evidence as such associations tend not to be investigated within WP research. Only two studies have matched survey data for aspirations to the NPD. As outlined earlier the evidence from these studies was mixed (Croll and Attwood, 2013; Siddiqui, Boliver and Gorard, 2019) and limited with a focus on aspirations only and pupils' of all attainment levels. In turn, these studies provided no understanding of whether a pupil's HE knowledge, attitudes and academic motivations were stratified and mediate HE entry behaviours. The research undertaken aimed to address this gap.

This logistic regression analysis that follows presents eight models for each AAB survey measure (baseline and follow-up). The models investigate whether non-treated pupils' of different characteristics had higher or lower ABBs scores (e.g., are scores stratified by SES) and if these scores were associated with their HE entry behaviours. The analysis compared HE outcomes, whilst controlling for and interacting all observed pupil characteristics with the eight AAB baseline and follow-up survey measures. This supported controlled comparisons in HE outcomes for pupils with the same characteristic (e.g., males) and high or low survey scores (e.g., HE knowledge). Each interaction was added separately to the model outlined within the controlled analysis (all pupil controls) and then removed and replaced with a new interaction (e.g., females' HE knowledge scores). This final analysis provided the most unbiased estimate of results by allowing more control and improving the comparability of samples. Appendices 12 to 20 include descriptive statistics of this data, showing how AAB scores and pupils' likelihood of entering HE differed by their background characteristics. This data was in line with the regression findings and referred to when relevant.

HE Knowledge

The earlier models (see section 6.8.2) showed that pupils with higher HE knowledge scores at follow-up were slightly more likely to enter HE and at baseline the association was close to zero. Neither of these results was statistically significant. Similar results were found within the current analysis (table 33). At baseline, there were a few significant associations, and more associations were observed within the follow-up survey.

Table 33: Multiple logistic regression for the controlled and interacted association between HE knowledge and pupil controls on HE entry.

	Baseline survey	Follow-up survey
	Odds ratios *P*>[z]	
Male#survey	0.92 n.s.	1.28**
Female#survey	1.09 n.s.	1.07 n.s.
EFSM6#survey	0.98 n.s.	1.15 n.s.
Not EFSM6#survey	1.02 n.s.	1.21*
Asian#survey	1.24*	1.43***
Black#survey	1.18 n.s.	1.43*
Mixed#survey	0.99 n.s.	1.22 n.s.
White#survey	0.94 n.s.	1.12 n.s.
SEN#survey	1.00 n.s.	1.20 n.s.
Not SEN#survey	1.01 n.s.	1.20 n.s.
EAL#survey	1.01 n.s.	1.48 n.s.
English as a 1st lang#survey	1.01 n.s.	1.20 n.s.
IDACI disadvantaged#survey	1.00 n.s.	1.18 n.s.
IDACI advantaged#survey	1.03 n.s.	1.22*
POLARYPR disadvantaged#survey	1.00 n.s.	1.19 n.s.
POLARYPR advantaged#survey	1.01 n.s.	1.20 n.s.
POLARAHE disadvantaged#survey	1.02 n.s.	1.19 n.s.
POLARAHE advantaged#survey	0.97 n.s.	1.18 n.s.
KS2 achieved level 4#survey	1.06 n.s.	1.24*
KS2 not achieved level 4#survey	0.81*	0.94 n.s.

*Unclassified language and any other ethnic group have been removed due to small numbers

At baseline, two significant associations were observed. Asian pupils with higher HE knowledge baseline scores were 24% more likely to enter HE than those with lower scores. A negative significant association was observed for pupils' who did not achieve KS2 level 4. For these pupils' higher HE knowledge scores were associated with a 16% decreased likelihood of entering HE. There were no other significant associations observed between pupils' characteristics, HE knowledge baseline scores and a pupils' likelihood of entering HE. Most results had a null association as the ORs were close to zero.

Interestingly most of these positive associations increased from the baseline to the follow-up survey. Asian and Black pupils with higher HE knowledge follow-up scores were 43% more likely to enter HE. A few other positive significant associations were observed for pupils' who were male, non-EFSM6, lived in advantaged IDACI areas and achieved KS2 level 4. For these pupils' high HE knowledge follow-up scores were associated with a 21% to 28% increased likelihood of entering HE. Two results just missed significance for pupils' who were non-SEN (p= 0.055) and those living in disadvantaged POLAR AHE areas (p= 0.058). Most other results were in a positive direction, although non-significant.

Findings suggested that for most pupil characteristics there was evidence that the association between HE knowledge and HE entry was stratified. Advantaged pupils' with higher HE knowledge scores (baseline and follow-up) tended to have an increased likelihood of entering HE (higher ORs) compared to disadvantaged pupils. However, many of these results were non-significant. These findings are in the direction expected[18] as found within previous studies (see literature review chapter 3).

HE Attitudes

The findings presented earlier (section 6.8.2) suggested that higher HE attitude scores at baseline and follow-up were significantly associated with pupils' having an increased likelihood of entering HE. Similar results were found within the current analysis (table 34) as all results by pupil characteristic were statistically significant.

Table 34: Multiple logistic regression for the controlled and interacted association between HE attitudes and pupil controls on HE entry.

	Baseline survey	Follow-up survey
	Odds ratios P>[z]	
Male#survey	1.55***	1.56***
Female#survey	1.83***	1.84***
EFSM6#survey	1.66***	1.67***
Not EFSM6#survey	1.71***	1.72***
Asian#survey	1.97***	1.98***
Black#survey	1.97***	1.97***
Mixed#survey	1.77***	1.79***
White#survey	1.63***	1.64***
SEN#survey	1.65***	1.65***
Not SEN#survey	1.70***	1.71***
EAL#survey	1.68***	1.68***
English as a 1st lang#survey	1.70***	1.71***
IDACI disadvantaged#survey	1.68***	1.69***
IDACI advantaged#survey	1.73***	1.74***
POLARYPR disadvantaged#survey	1.68***	1.69***
POLARYPR advantaged#survey	1.72***	1.73***
POLARAHE disadvantaged#survey	1.70**	1.70***
POLARAHE advantaged#survey	1.67***	1.68***
KS2 achieved level 4#survey	1.77***	1.77***
KS2 not achieved level 4#survey	1.37**	1.38**

*Unclassified language and any other ethnic group have been removed due to small numbers

Results are very similar across the baseline and follow-up surveys. Higher HE attitude scores were associated with pupils' having a 37% to 98% increased likelihood of entering HE. Across all pupil characteristics results were statistically significant. The largest positive associations were observed for Asian (98%) and Black (97%) pupils' and the smallest association was observed for pupils' who had not achieved KS2 level 4 (37%).

Findings suggested that for most pupil characteristics there was evidence that the association between HE attitudes, and HE entry was stratified. Advantaged pupils with higher HE attitude scores (baseline and follow-up) tended to have a slightly increased likelihood of entering HE compared to disadvantaged pupils. These findings are in the direction expected as found within previous studies (see literature review chapter 3).

HE Expectations

The findings presented earlier (section 6.8.2) suggested that higher HE expectation scores at baseline and follow-up were significantly associated with pupils' having an increased likelihood of entering HE. Similar results were found within the current analysis (table 35) as all results by pupil characteristic were statistically significant.

Table 35: Multiple logistic regression for the controlled and interacted associations between HE expectations and pupil controls on HE entry.

	Baseline survey	Follow-up survey
	Odds ratios P>[z]	
Male#survey	1.63***	1.62***
Female#survey	1.86***	1.84***
EFSM6#survey	1.72***	1.69***
Not EFSM6#survey	1.77***	1.75***
Asian#survey	2.06***	2.04***
Black#survey	2.05***	2.03***
Mixed#survey	1.79***	1.77***
White#survey	1.67***	1.65***
SEN#survey	1.73***	1.71***
Not SEN#survey	1.75***	1.74***
EAL#survey	1.79***	1.73***
English as a 1st lang#survey	1.75***	1.78***
IDACI disadvantaged#survey	1.75***	1.73***
IDACI advantaged#survey	1.77***	1.75***
POLARYPR disadvantaged#survey	1.75***	1.73***
POLARYPR advantaged#survey	1.75***	1.74***
POLARAHE disadvantaged#survey	1.76***	1.74***
POLARAHE advantaged#survey	1.73***	1.71***
KS2 achieved level 4#survey	1.83***	1.81***
KS2 not achieved level 4#survey	1.46***	1.44**

*Unclassified language and any other ethnic group have been removed due to small numbers

Higher HE expectation scores at baseline were associated with pupils having a 46% to 106% increased likelihood of entering HE. Across all pupil characteristics results were statistically significant. The largest positive associations were observed for Asian (106%) and Black pupils' (105%) and the smallest was observed for pupils' who did not achieve KS2 level 4 (46%). Similar results were observed for the follow-up survey, although the coefficients (ORs) tended to be slightly smaller.

Findings suggested that for almost all pupil characteristics there was evidence that the association between HE expectations and HE entry was stratified. Advantaged pupils' with higher HE expectation scores (baseline and follow-up) tended to have a slightly increased likelihood of entering HE compared to disadvantaged pupils. These findings are in the direction expected as found within previous studies (see literature review chapter 3).

Academic Motivation

The findings presented earlier (section 6.8.2) suggested that higher academic motivation scores at baseline and follow-up were significantly associated with pupils' having an increased likelihood of entering HE. Similar results were found within the current analysis (table 36) as all results by pupil characteristic were statistically significant.

Table 36: Multiple logistic regression for the controlled and interacted association between academic motivations and pupil controls on HE entry.

	Baseline survey	Follow-up survey
	Odds ratios P>[z]	
Male#survey	1.67***	1.70***
Female#survey	1.90***	1.92***
EFSM6#survey	1.74***	1.76***
Not EFSM6#survey	1.80***	1.83***
Asian#survey	2.10***	2.12***
Black#survey	2.10***	2.13***
Mixed#survey	1.82***	1.85***
White#survey	1.71***	1.73***
SEN#survey	1.76***	1.78***
Not SEN#survey	1.79***	1.81***
EAL#survey	1.83***	1.85***
English as a 1st lang#survey	1.78***	1.80***
IDACI disadvantaged#survey	1.78***	1.81***
IDACI advantaged#survey	1.80***	1.82***
POLARYPR disadvantaged#survey	1.79***	1.81***
POLARYPR advantaged#survey	1.79***	1.82***
POLARAHE disadvantaged#survey	1.80***	1.82***
POLARAHE advantaged#survey	1.76***	1.78***
KS2 achieved level 4#survey	1.86***	1.88***
KS2 not achieved level 4#survey	1.48***	1.50***

*Unclassified language and any other ethnic group have been removed due to small numbers

Higher academic motivation scores at baseline and follow-up were associated with pupils' having a 48% to 113% increased likelihood of entering HE. Across all pupil characteristics results were statistically significant. At baseline the largest positive associations were observed for Asian and Black pupils (110%) and the smallest were observed for pupils' who did not achieve KS2 level 4 (48%). Similar results were observed for the follow-up survey, although the coefficients (ORs) tended to be slightly higher.

Findings suggested that for almost all pupil characteristics there was evidence that the association between academic motivations and HE entry was stratified. Advantaged pupils with higher academic motivation scores (baseline and follow-up) tended to have a slightly increased likelihood of entering HE compared to disadvantaged pupils. These findings are in the direction expected as found within previous studies (see literature review chapter 3).

6.9 Summary

There is a tendency for WP programmes to target disadvantaged pupils with relatively good levels of attainment and the potential to progress to HE. It is widely perceived that these cohorts are less likely to enter HE as they have lower AABs than their more advantaged peers. Widening participation programmes allocate a considerable amount of resource to improve these AABs. However, there is a void of robust research that has investigated if AABs play an important mediating role in pupils' HE entry behaviours. Published research has focused on HE aspirations only with contrasting findings on the extent to which they determine HE entry behaviours (Croll and Attwood, 2013; Siddiqui, Boliver and Gorard, 2019). These studies are limited in that they focus on cohorts of pupils of all attainment levels and not the types of pupils often targeted by WP programmes (e.g., higher-attaining disadvantaged pupils'). The research undertaken addressed these gaps by investigating the extent to which a wider set of AABs and important controls influence the HE entry behaviours of pupils with good attainment levels.

The analysis found significant associations between high HE expectation, HE attitude and academic motivation scores and non-treated pupils' likelihood of entering HE. No significant associations between non-treated pupils' HE knowledge and HE entry behaviours were observed. However, a sub-analysis with the treatment group found that high baseline HE knowledge scores were associated with HE entry behaviours, although this association was weaker than the other AABs. To draw robust inferences from these findings it is important to consider the extent of missing data and how comparable the non-treatment groups were in terms of pupil characteristics. The survey sample was relatively comparable to the full study sample in terms of observed pupil characteristics. However, missing data levels were high. Samples may have differed in terms of unobserved pupil characteristics. This makes it difficult to infer that the estimated associations between AABs on HE entry behaviours observed are applicable to all participants within the study that did not complete surveys.

The final analysis that interacted AABs with pupil characteristics provided much more control and support for the associations observed. These findings suggested that regardless of their background characteristics, almost all pupils' who had higher AAB scores were significantly more likely to enter HE. However, the association between higher AABs and the likelihood of entering HE was stratified across most pupil characteristics. This association was stronger for advantaged than disadvantaged pupils.

Further, the research undertaken addressed another gap within the literature, as no evidence has been presented in terms of the test-retest reliability of AAB survey measures. The analysis found that all AAB survey measures were highly reliable with strong (HE expectations, HE attitudes and academic motivation) to moderate (HE knowledge) significant correlations between baseline and follow-up survey scores.

The research contributes to the field by providing an understanding of the importance of AABs in influencing HE entry behaviours for the cohorts of pupil' often targeted by WP programmes (higher-attaining disadvantaged pupils'). These findings have important practical and policy implications for the Aimhigher programme and WP sector in terms of how programmes are resourced, delivered, targeted, and evaluated. These implications are considered in detail within the discussion chapter.

6.10: Analysis Three: Does Engaging in Aimhigher Interventions Improve Pupils' AABs

6.10.1 Introduction

Findings within analysis one (section 6.1) suggested that mentoring (above 10 engagements) and summer school interventions increased most pupils' likelihood of entering higher education (HE). Analysis two (section 6.6) provided evidence to suggest that some of these differences in HE entry could be accounted for by pupils' AABs. The analysis that follows investigated whether Aimhigher summer school and mentoring programmes improved pupils' HE knowledge, expectations, attitudes, and academic motivation (AABs). Widening participation (WP) programmes often aim to improve disadvantaged pupils' participation in HE, through interventions focusing on these AABs.

Evidence within the literature review outlined that HE participation is stratified by pupil SES (see chapter 4a) and that differences in pupil AABs seem to be stratified by SES and may lead to inequalities in attainment in compulsory schooling and HE entry (see chapter 3). Robust evidence is lacking in terms of the effectiveness of WP interventions on improving pupil AABs (see chapter 3). This is often due to a lack of experimental methods, controls, comparison groups and attrition (see chapter 3). In addition to the limitations outlined, WP studies tend to overlook treatment effect heterogeneity. Previous research has also tended to focus on one or two types of AABs and not the full range often addressed with intensive interventions or multi-intervention programmes. The research undertaken aimed to address these gaps which have important implications for WP policy and practice.

Analysis Aims and Research Questions

To following research questions were investigated to address these gaps within the literature:

- *RQ 3 (a): Is engagement in Aimhigher (summer schools or mentoring) associated with an increase in pupils' knowledge of HE and HE expectations; attitudes to HE and academic motivation?*
- *RQ 3 (b): Is there heterogeneity in the treatment effect?*

The research undertaken aimed to address the gaps in evidence by including a comparison group and important controls, to investigate if improvements across four AABs were driven by pupils' engagement in Aimhigher interventions. The large number of controls employed enabled the investigation of the comparability of pupils' and their characteristics within the treatment and non-treatment groups, and treatment effect heterogeneity. The analysis includes the same pupil level controls as those employed within analyses 2 (e.g., attainment, socio-economic, demographic and baseline AABs). Measurements of pupils' engagement in mentoring were based on programme records and not pupils' self-reports (e.g., O'Sullivan *et al.*, 2017). The analysis is based on a sub-sample of participants who completed both surveys[19] (see method).

The first two sections of this chapter focus on the robustness and completeness of the data for estimating the effects of pupil controls and treatments on AAB outcomes. To support this descriptive data is presented to compare the survey sub-sample to the full study sample (analysis 1) in terms of missing data and pupil characteristics. Low levels of missing data and more comparable samples enable more robust inferences to be drawn as to whether these findings (e.g., the importance of AABs) are applicable to the full study sample.

After assessing this data, the analysis estimated the effects across twelve linear regression models that included the HE knowledge, attitudes, expectations, and academic motivation outcomes and the treatment (mentoring, mentoring frequency, summer schools) and non-treatment groups. Each model was completed in three stages starting with a raw analysis of treatment estimated effects on pupil AABs. This was followed by a controlled analysis, to investigate the extent to which the raw estimated treatment differences in AAB outcomes could be explained by differences in observable pupil characteristics. The final analysis investigated treatment effect heterogeneity, where treatments were interacted with the controls to establish the impact of Aimhigher interventions. A detailed description of the aims of each analysis is provided in section 6.12. The final section of the chapter presented a summary of the key findings.

[19] For the treatment group, this includes pupils who engaged in between the baseline and follow-up surveys. As outlined within the method section, the confidence in academic ability survey measures has been dropped due to low response rates.

6.11 Missing Data

Within analysis one (e.g., where the HE outcome was observed) data were available for at least 85% of pupils across all controls and treatment types. Surveys were completed by a sub-sample of pupils' and in turn, missing data rates are higher. Attrition rates increased as pupils' were excluded from the analysis if they had not completed both surveys or were not treated in between each survey. This data is summarised in table 37. The summer school sample was small (n32) and had the largest amount of missing data. Survey outcomes were observed for only 5% of these pupils. Survey outcomes were available for just over 11% of mentored[20] pupils' and just over 45% of non-treatment group pupils. Across each treatment type missing data was at similar levels across most control variables.

These high levels of missing data may reduce the ability to control for differences between the treatment and comparison groups. Moreover, where there are differing rates and items of missingness, this suggests that other unobserved differences are also more likely. This may impact on the inferences that can be drawn from the results that follow and there applicability to the full study sample.

[20] The later regression analysis also includes a measure of how frequently (dosage effect) pupils' have engaged in mentoring.

Table 37: Treatment and non-treatment group **sample sizes** and **missing data** for pupils' where AAB outcomes and control variables are observed.
Key: M = mentoring, SS = Summer school, NT = non-treatment group

Variable	*Full Sample*			*Sample HE knowledge outcome*			*Sample HE expectation outcome*			*Sample HE attitudes outcome*			*Sample HE academic motivation outcome*		
	M	SS	NT	M	SS	NT	M	SS	NT	M	SS	NT	M	SS	NT
N sample	1,696	602	2,321	194 (11.4%)	32 (5.3%)	1,049 (45.2%)	191 (11.3%)	32 (5.3%)	1,046 (45.1%)	194 (11.4%)	32 (5.3%)	1,049 (45.2%)	191 (11.3%)	32 (5.3%)	1,046 (45.1%)
Mentoring total with engagement records	1,688 (99.5%)	Na	Na	192 (11.3%)	Na	Na	189 (11.1%)	Na	Na	192 (11.3%)	Na	Na	189 (11.1%)	Na	Na
Pupil controls															
KS2 above or below level 4	1,556 (91.7%)	565 (93.9%)	2,211 (95.3%)	189 (11.1%)	32 (5.3%)	1026 (44.2%)	187 (11.0%)	32 (5.3%)	1023 (44.1%)	189 (11.1%)	32 (5.3%)	1026 (44.2%)	187 (11.0%)	32 (5.3%)	1023 (44.1%)
Gender	1,641 (96.8%)	586 (97.3%)	2,305 (99.3%)	191 (11.3%)	32 (5.3%)	1036 (44.6%)	189 (11.1%)	32 (5.3%)	1033 (44.5%)	191 (11.3%)	32 (5.3%)	1036 (44.6%)	191 (11.3%)	32 (5.3%)	1033 (44.5%)
Ever FSM6	1,610 (94.9%)	602 (100%)	2,111 (91.0%)	190 (11.2%)	32 (5.3%)	1031 (44.4%)	188 (11.1%)	32 (5.3%)	1028 (44.3%)	190 (11.2%)	32 (5.3%)	1031 (44.4%)	188 (11.1%)	32 (5.3%)	1028 (44.3%)
Ethnicity	1,543 (91.0%)	594 (98.7%)	2,078 (89.5%)	182 (10.7%)	32 (5.3%)	982 (42.3%)	180 (10.7%)	32 (5.3%)	979 (42.2%)	182 (10.7%)	32 (5.3%)	982 (42.3%)	180 (10.6%)	32 (5.3%)	979 (42.2%)
First Language	1,584 (93.4%)	577 (95.9%)	2,237 (96.4%)	191 (11.3%)	32 (5.3%)	1036 (44.6%)	189 (11.1%)	32 (5.3%)	1036 (44.6%)	191 (11.3%)	32 (5.3%)	1036 (44.6%)	189 (11.1%)	32 (5.3%)	1033 (44.5%)
SEN	1,568 (92.5%)	602 (100%)	2,020 (87.0%)	190 (11.2%)	32 (5.3%)	1023 (44%)	188 (11.1%)	32 (5.3%)	1020 (43.9%)	154 (11.1%)	28 (4.7%)	889 (38.3%)	153 (9.0%)	28 (4.7%)	887 (38.2%)
POLARYPR	1,516 (89.4%)	599 (99.5%)	2,158 (93.0%)	189 (11.1%)	32 (5.3%)	1031 (44.4%)	187 (11.0%)	32 (5.3%)	1028 (44.3%)	189 (11.1%)	32 (5.3%)	1031 (44.4%)	187 (11.0%)	32 (5.3%)	1028 (44.3%)
POLARAHE	1,546 (91.2%)	600 (99.7%)	2,100 (90.5%)	190 (11.2%)	32 (5.3%)	1031 (44.4%)	188 (11.1%)	32 (5.3%)	1028 (44.3%)	190 (11.2%)	32 (5.3%)	1031 (44.4%)	188 (11.1%)	32 (5.3%)	1028 (44.3%)
IDACI	1,503 (88.6%)	600 (99.7%)	2,088 (90.0%)	190 (11.2%)	32 (5.3%)	1029 (44.3%)	188 (11.1%)	32 (5.3%)	1026 (44.2%)	190 (11.2%)	32 (5.3%)	1029 (44.3%)	188 (11.1%)	32 (5.3%)	1026 (44.2%)
Knowledge of HE (survey baseline)	383 (22.6%)	83 (13.8%)	2,074 (89.4%)	194 (11.4%)	32 (5.3%)	1049 (45.2%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)	194 (11.4%)	32 (5.3%)	1049 (45.2%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)
Attitudes to HE (survey baseline)	383 (22.6%)	83 (13.8%)	2,074 (89.4%)	194 (11.4%)	32 (5.3%)	1049 (45.2%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)	194 (11.4%)	32 (5.3%)	1049 (45.2%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)
HE Expectations (survey baseline)	382 (22.5%)	82 (13.6%)	2,066 (89.0%)	193 (11.4%)	32 (5.3%)	1047 (45.1%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)	193 (11.4%)	32 (5.3%)	1047 (45.1%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)
Academic Motivation (survey baseline)	382 (11.8%)	82 (13.6%)	2066 (89.0%)	193 (11.4%)	32 (5.3%)	1047 (45.1%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)	193 (11.4%)	32 (5.3%)	1047 (45.1%)	191 (11.3%)	32 (5.3%)	1046 (45.1%)

6.11.1 How Comparable are the Non-Treatment Group in Terms of Observed Pupil Characteristics?

Tables 38 and 39 provide a summary of descriptive statistics and t-tests[21] to understand how comparable the survey and full study (analysis one) treatment and not-treatment groups were across each AAB outcome and observable pupil characteristics[22] (the full t-test results are presented within Appendices 19 to 22). Drawing valid conclusions about the findings may be problematic if the characteristics of pupils differ widely across these samples.

[21] t-test results (two-tailed) compare the treatment groups (e.g., Mentoring or Summer school with the non-treatment group). Significance levels are denoted as follows: *p <0.05, **p <0.01, ***p <0.001. The remainder of results are non-significant.

[22] Pupils are compared in terms of their level of disadvantage and advantage. These terms refer to whether pupils with particular characteristics are less or more likely to enter HE, as evidenced within the literature review.

Table 38: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **HE knowledge** and **expectations outcomes** are observed.

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	*HE knowledge outcome*			*HE expectation outcome*		
		M	SS	NT	M	SS	NT
Mentoring engagements	Mean	M 9.5 (194), SD 4.0	Na	Na	M 9.4 (191), SD 4.0	Na	Na
	1-5	31 (16%)	Na	Na	31 (16.2%)	Na	Na
	6 to 10	93 (47.9%)	Na	Na	92 (48.2%)	Na	Na
	11 to 15	54 (27.8%)	Na	Na	53 (27.7%)	Na	Na
	15+	14 (7.2%)	Na	Na	13 (6.8%)	Na	Na
KS2 level 4	Achieved	65.6% (124)***	68.8% (22)	79.0% (811)	65.8% (123)***	68.8% (22)	79.2% (810)
	Did not achieve	34.4% (65)***	31.2% (10)	21.0% (215)	34.2% (64)***	31.2% (10)	20.8% (213)
Gender	Male	52.4% (100)	46.9% (15)	51.9% (538)	51.9% (98)	46.6% (15)	51.9% (536)
	Female	47.6% (91)	53.1% (17)	48.1% (498)	48.1% (91)	53.1% (17)	48.1% (497)
Ever FSM6	Yes	63.2% (120)***	68.8% (22)***	29.0% (299)	63.8% (120)	68.8% 22)	29.0% (298)
	No	36.8% (70)***	31.3% (10)***	71.0% (732)	36.2% (68)	31.3% (10)	71.0% (730)
Ethnicity	White	69.8% (127)	21.9% (7)**	71.0% (697)	69.4% (125)	21.9% (7)**	71.0% (695)
	Asian	12.1% (22)	37.5% (12)**	14.0% (137)	12.2% (22)	37.5% (12)**	13.9% (136)
	Black	7.7% (14)	21.9% (7)**	6.6% (65)	7.8% (14)	21.9% (7)***	6.6% (65)
	Mixed	5.5% (10)	18.8% (6)**	5% (49)	5.6% (10)	18.8% (6)***	5.0% (49)
	Other	4.9% (9)	0% (0)	3.5% (34)	5.0% (9)	0% (0)	3.5% (34)
First language*	English 1st lang.	82.0% (157)	59.4% (19)***	85.0% (877)	82.0% (155)	59.4% (19)***	85.0% (875)
	English add. lang.	17.0% (31)	40.6% (13)***	15% (155)	16.0% (31)	40.6% (13)***	15.0% (154)
	Unclassified	<2.0% (<5)	0% (0)	<1.0% (<5)	<2.0% (<5)	0% (0)	<1.0% (<5)
SEN*	Yes	18.9% (36)*	<13.0% (<5)	13.1% (134)	18.6% (35)*	<13.0% (<5)	13.0% (133)
	No	81.1% (154)*	88.0% (28)	86.9% (889)	81.4% (153)*	88.0% (28)	87.0% (887)
POLARYPR	Disadvantaged	75.7% (143)***	84.4% (27)**	61.5% (634)	75.4% (141)***	84.4% (27)***	61.6% (633)
	Advantaged	24.3% (46)***	15.6% (5)**	38.5% (397)	24.6% (46)***	15.6% (5)***	38.4% (395)
POLARAHE*	Disadvantaged	85.8% (163)*	90.0% (29)	78.8% (812)	85.6% 161)*	91.0% (29)	78.8% (810)
	Advantaged	14.2% (27)*	<10.0% (<5%)	21.2% (219)	14.4% (27)*	<10.0% (<5)	21.2% (218)
IDACI	Disadvantaged	87.9% (1670***	100% (32)***	66.8% (687)	87.8% (165)***	100% (32)***	66.7% (684)
	Advantaged	12.1% (23)***	0% (0)***	33.2% (342)	12.2% (23)***	0% (0)***	33.3% (342)
HE Knowledge	Baseline mean scores	M 3.59 (194), SD 0.8	M 3.91 (32), SD 0.8*	M 3.57 (1049), SD 0.8	M 3.60 (191), SD 0.8	M 3.90 (32), SD 0.8*	M 3.57 (1046), SD 0.8
HE attitudes		M 3.62 (194), SD 0.9	M 4.34 (32), SD 0.9***	M 3.67 (1049), SD 0.9	M 3.63 (191), SD 0.9	M 4.34 (32), SD 0.9***	M 3.67 (1046), SD 0.9
HE expectations		M 4.04 (193), SD 0.9***	M 4.73 (32), SD 0.5**	M 4.26 (1047), SD 0.8	4.04 (191), SD 0.9***	M 4.72 (32), SD 0.5**	M 4.26 (1046), SD 0.8
Academic motivation		M 4.0 (193), SD 0.9***	M 4.69 (32), SD 0.5**	M 4.25 (1047), SD 0.8	M 4.0 (191), SD 0.8***	M 4.69 (32), SD 0.5**	M 4.25 (1046), SD 0.8

*Some percentages have been rounded as samples were less than 5

Table 39: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **HE attitudes,** and **academic motivation outcomes** are observed.

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	*HE attitudes outcome*			*Academic motivation outcome*		
		M	SS	NT	M	SS	NT
Mentoring engagements	Mean	M 9.5 (194), SD 4.0	Na	Na	M 9.4 (191), SD 4.0	Na	Na
	1-5	31 (16%)	Na	Na	31 (16.2%)	Na	Na
	6 to 10	93 (47.9%)	Na	Na	92 (48.2%)	Na	Na
	11 to 15	54 (27.8%)	Na	Na	53 (27.7%)	Na	Na
	15+	14 (7.2%)	Na	Na	13 (6.8%)	Na	Na
KS2 level 4	Achieved	65.6% (124)***	68.8% (22)	79.0% (811)	65.8% (123)***	68.8% (22)	79.2% (810)
	Did not achieve	34.4% (65)***	31.2% (10)	21.0 (215)	34.2% (64)***	31.2% (10)	20.8% (213)
Gender	Male	52.4% (100)	46.6% (15)	51.9% (538)	47.6% (91)	46.9% (15)	51.9% (536)
	Female	47.6% (91)	53.1% (17)	48.1% (498)	52.4% (100)	53.1% (17)	48.1% (497)
Ever FSM6	Yes	63.2% (120)***	68.8% (22)***	29.0% (299)	63.8% (120)***	68.8% (22)***	29.0% (298)
	No	36.8% (70)***	31.3% (10)***	71.0% (732)	36.2% (68)***	31.3% (10)***	71.0% (730)
Ethnicity	White	69.8% (127)	21.9% (7)**	71.0% (697)	69.4% (125)	21.9% (7)**	71.0% (695)
	Asian	12.1% (22)	37.5% (12)**	14.0% (137)	12.2% (22)	37.5% (12)**	13.9% (136)
	Black	7.7% (14)	21.9% (7)***	6.6% (65)	7.8% (14)	21.9% (7)**	6.6% (65)
	Mixed	5.5% (10)	18.8% (6)*	5.0% (49)	5.6% (10)	18.8% (6)***	5.0% (49)
	Other	4.9% (9)	0% (0)	3.5% (34)	5.0% (9)	0% (0)	3.5% (34)
First language*	English 1st lang.	82.0% (157)	59.4% (19)***	85.0% (877)	82.0% (155)	59.4% (19)***	85.0% (875)
	English add. lang.	16.0% (31)	40.6% (13)***	15.0% (155)	16.0% (31)	40.6% (13)***	15.0% (154)
	Unclassified	<2.0% (<5)	0% (0)	<1.0% (<5)	<2.0% (<5)	0% (0)	<1.0% (<5)
SEN*	Yes	18.9% (36)*	<13.0% (<5)	13.1% (134)	18.6% (35)*	<13.0% (<5)	13.0% (133)
	No	81.1% (154)*	88.0% (28)	86.9% (889)	81.4% (153)*	87.5% (28)	87.0% (887)
POLARYPR	Disadvantaged	75.7% (143)***	84.4% (27)**	61.5% (634)	75.4% (141)***	84.4% (27)**	61.6% (633)
	Advantaged	24.3% (46)***	15.6% (5)**	38.5% (397)	24.6% (46)***	15.6% (5)**	38.4% (395)
POLARAHE*	Disadvantaged	85.8% 163)*	91.0% (29)	78.8% (812)	85.6% (161)*	91.0% (29)	78.8% (810)
	Advantaged	14.2% (27)*	<10% (<5)	21.2% (219)	14.4% (27)*	<10% (<5)	21.2 (218)
IDACI	Disadvantaged	87.9% (167)***	100% (32)**	66.8% (687)	87.8% (165)***	100% (32)***	66.7% (684)
	Advantaged	12.1% (23)***	0% (0)**	33.2% (342)	12.2% (23)***	0% (0)***	33.3% (342)
HE Knowledge	Baseline mean scores	M 3.59 (194), SD 0.8	M 3.90 (32), SD 0.8*	M 3.56 (1049), SD 0.8	M 3.60 (191), SD 0.8	M 3.91 (32), SD 0.8*	M 3.57 (1046), SD 0.8
HE attitudes		M 3.62 (194), SD 0.9	M 4.34 (32), SD 0.9***	M 3.67 (1049), SD 0.9	M 3.63 (191), SD 0.9	M 4.34 (32), SD 0.9***	M 3.67 (1046), SD 0.9
HE expectations		M 4.04 (193), SD 0.9***	M 4.72 (32), SD 0.5**	M 4.26 (1047), SD 0.8	M 4.04 (191), SD 0.9***	M 4.72 (32), SD 0.5**	M 4.26 (1046), SD 0.8
Academic motivation		M 4.0 (193), SD 0.9***	M 4.69 (32), SD 0.5**	M 4.25 (1047), SD 0.8	M 4.0 (191), SD 0.9***	M 4.69 (32), SD 0.5**	M 4.25 (1046), SD 0.8

*Some percentages have been rounded as samples were less than 5

Comparability in Pupil Characteristics Between the Mentoring Treatment and Non-Treatment Groups

Mentored pupils were significantly more disadvantaged than the non-treatment group across over half of the pupil characteristics (7 out of 13). Mentored pupils' were more likely to have an EFSM6, SEN status, live in a disadvantaged area (POLAR YPR, AHE and IDACI), have lower KS2 attainment and lower HE expectation and academic motivation baseline mean scores. Across the remaining six characteristics there was a much better match between the treatment and non-treatment groups (gender, ethnicity, first language, HE attitudes and knowledge). Therefore, some of the baseline survey measures (attitudes and knowledge) improved the comparability between the mentoring and non-treatment groups. When comparing the survey sample to the mentoring sample within analysis one (where the HE outcome is observed, see section 6.2.1) mentored pupils' were more disadvantaged[23] in terms of eight of the pupil control variables (including attainment) and only similar in terms of pupils' SEN status.

Comparability in Pupil Characteristics Between the Summer School Treatment and Non-Treatment Groups

Summer School pupils were significantly more advantaged than the non-treatment group across just under half of the pupil characteristics (6 out of 13). The summer school cohort was characterised by higher proportions of EAL pupils', fewer White pupils', and higher mean baseline scores across all four survey measures. Summer school pupils' were more disadvantaged than the non-treatment group as they were more likely to live in a disadvantaged neighbourhood (POLAR YPR and IDACI) and have an EFSM6 status. Summer school pupils' and the non-treatment group were better matched in terms of four of the characteristics (KS2 level 4 attainment, gender, SEN status and POLAR AHE). Although non-significant summer school pupils' did have smaller proportions of pupils' achieving KS2 level 4. When comparing the survey sample to the summer school sample within analysis one (where the HE outcome is observed, see section 6.2.1) summer school pupils' who completed the survey were far more disadvantaged in terms of five of the pupil

[23] The criteria used for similarity is that proportions within each group / mean scores were within 5%.

characteristics (including attainment), were similar in terms of gender, first language and SEN status and were more advantaged in terms of ethnicity.

6.12 Linear Regression Analyses

The next stage in this analysis was to construct twelve linear regression models across the four AAB outcomes, that bought together the comparison and treatment groups (mentoring, mentoring frequency, summer schools), and pupil controls for observable group differences to produce an estimate of the treatment effect. The aim of these models was to investigate:

a) if mentoring and summer schools improved pupils' AABs
b) if such associations were observed, were they stratified by pupil characteristics
c) if there was heterogeneity in the treatment effect

The models for each outcome and treatment were created in three stages, as described below:

Stage 1: ***A raw uncontrolled model investigating the estimated effects of treatments on AABs:*** This analysis investigated the raw estimated effects of the treatment and non-treatment group on pupils' AABs. This analysis did not account for observed pupil controls.

Stage 2: ***A controlled model investigating the estimated effects of pupil characteristics and treatments on AABs***: This analysis investigated the extent to which the raw AAB estimated treatment effects (stage 1 of the model) could be explained by observable differences in pupil characteristics (attainment, demographic, and socio-economic controls) and baseline AABs. In turn, the analysis investigated whether the inclusion of pupil controls, then followed by baseline AABs improved the explanatory power of the models. The analysis also investigated how estimated effects differed by each pupil characteristics and baseline AABs.

Stage 3: ***A heterogeneity in the treatment effect model:*** This analysis compared AAB outcomes between the treatment and non-treatment groups, whilst controlling for and interacting with all observed pupil characteristics. This model investigated heterogeneity in the treatment by making controlled comparisons in AAB outcomes. For example, comparisons were made between treated males vs non-treated males. This model helped to understand if different treatments varied in effectiveness for pupils with different characteristics. This final model provided the most unbiased estimate of results. Such effects are important to understand as they may have important practical and policy implications for WP programmes.

The Coding of Variables and Interpretation of Coefficients

Linear regression presents treatment effect estimates in the form of coefficients. Coefficients represent the difference in the predicted value of the survey outcome (score range -4 to +4, see method section 5.2.8) between the category for which the predictor variable is 0 (e.g., advantaged IDACI area) and the category for which the predictor variable is 1 (e.g., disadvantaged IDACI area). Within the three stages of the analysis data was coded and coefficients were interpreted as follows:

Stage 1 - the raw model: Treatments were coded as binary dummy variables. A value of 1 represented summer schools or mentoring and a value of 0 represented the non-treatment group. For mentoring, frequency engagement levels were coded into categorical variables. A value of 0 (no engagement) represented the non-treatment group, and values of 1 (1-5 engagements), 2 (6-10 engagements), 3 (11-15 engagements) and 4 (more than 15 engagements). The raw model compared the average changes in survey outcome scores between the treatment and non-treatment groups only. For, example if a coefficient of 0.500 was observed for the HE knowledge outcome for mentored pupils', this would suggest that a one-unit increase in mentoring (one engagement) is associated with a pupils HE knowledge increasing by 0.5 units (e.g., as measured by the survey scale). In turn, the coefficients show the difference between the two group means (the average change in baseline to follow-up survey outcome scores) and whether this increases or decreases by treatment type.

Stage 2 – the controlled model: This model was more concerned with identifying which pupil characteristics were the strongest predictors of high and low pupil AABs. Again, these predictors were coded into dummy variables, where for example pupils from disadvantaged IDACI areas were coded as 1 and those from advantaged IDACI areas were coded as 0 (base).

Stage 3 – heterogeneity in the treatment effect model: This model provided controlled comparisons between pupils of the same characteristic within the treatment and non-treatment groups. To support this analysis predictors were coded into dummy variables. For, example AAB outcomes were compared between treated male pupils (coded as 1) against non-treated males (coded as 0).

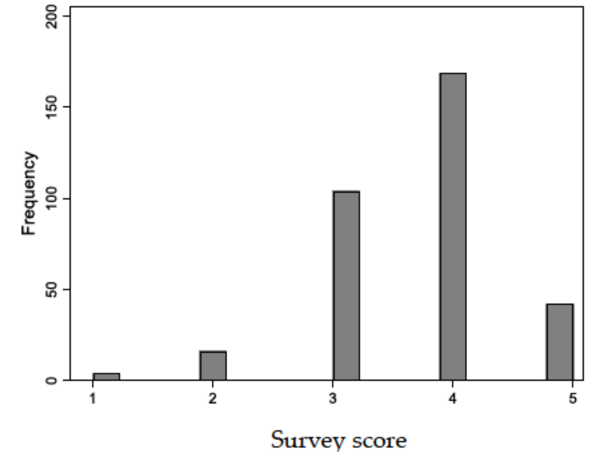
6.12.1 Stage 1: A Raw Uncontrolled Model Investigating the Estimated Effects of Mentoring and Summer Schools on Pupils' AABs

This section begins with summarising raw descriptive data for the treatment and non-treatment groups' baseline, follow-up and survey outcome mean scores. This was followed by a linear regression analysis, to understand the raw estimated effects of treatments on pupils' AAB outcomes. All survey responses were measured on a Likert scale. Baseline and follow-up survey AAB scores ranged from 0-5 and AAB outcome scores ranged from a positive change (+4) to a negative change (-4). Neither of these analyses consider the influence of pupil-level controls.

The histograms presented on the following pages summarise the AAB baseline (figures 24a to 24l) and outcome (figures 24m to 24x) survey score frequency distributions across the treatment types. Below each figure, the analysis provides the skewness and kurtosis values for each AAB measure. A normal distribution is considered to have a kurtosis level of 3.00 and for skewness, this should fall within the ranges of +2.00 to -2.00 (Acock, 2018[24]). Even though at first sight some of the histograms do not look to be normally distributed, most kurtosis and skewness values are within acceptable levels. However, the HE expectation and academic motivation outcome scores for summer school pupils' were slightly skewed (-2.94 and -2.82) with the tail trailing off to the left. Both of these measures also had high kurtosis values (14.63 and 13.47) as scores peaked towards the middle. However, these issues are not a major concern, as they may be pointing to a treatment effect. It would be more concerning if high kurtosis and skewness were observed at baseline, as this would suggest that the treatment and non-treatment groups' AAB scores were due to pre-existing differences.

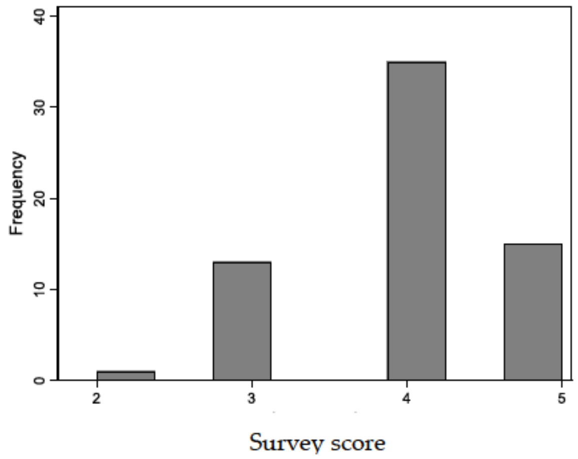
[24] Acock (2018) also outlines a kurtosis greater than 10 is problematic and above 20 is more serious.

Figure 24a: Mentoring knowledge baseline scores by the number of pupils'



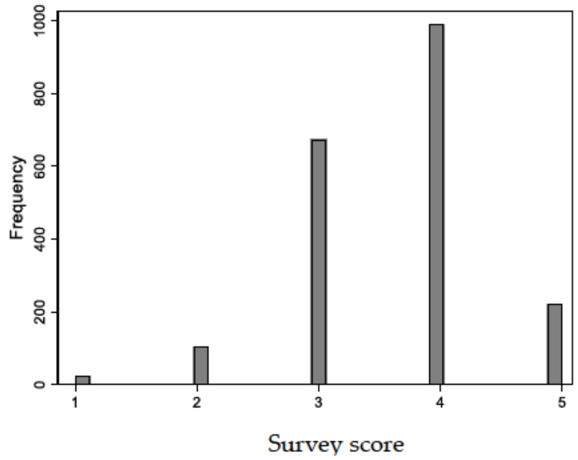
Skewness -0.49. Kurtosis 3.67

Figure 24b: Summer School knowledge baseline scores by the number of pupils'



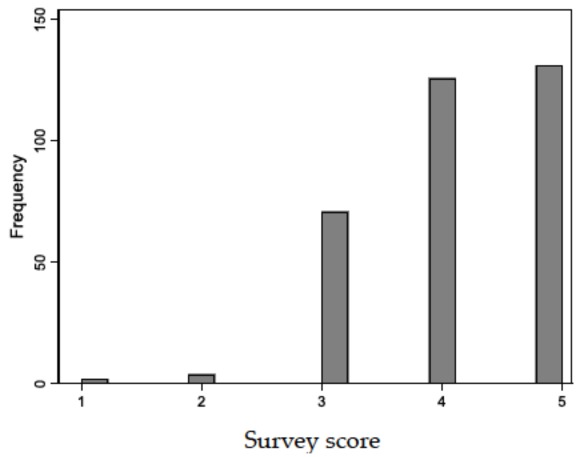
Skewness -0.26. Kurtosis 2.61

Figure 24c: non-treatment knowledge baseline scores by the number of pupils'



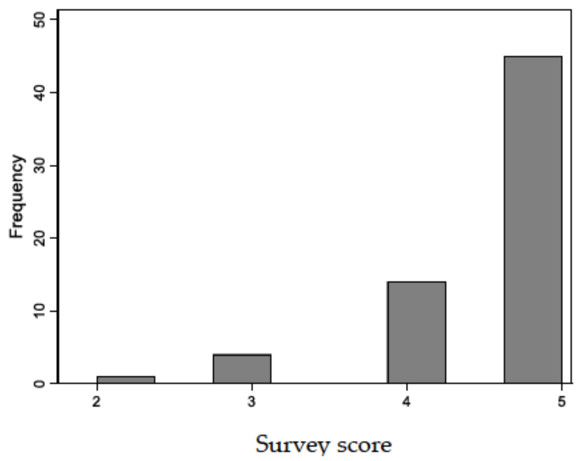
Skewness -0.42. Kurtosis 3.50

Figure 24d: Mentoring expectation baseline scores by the number of pupils'



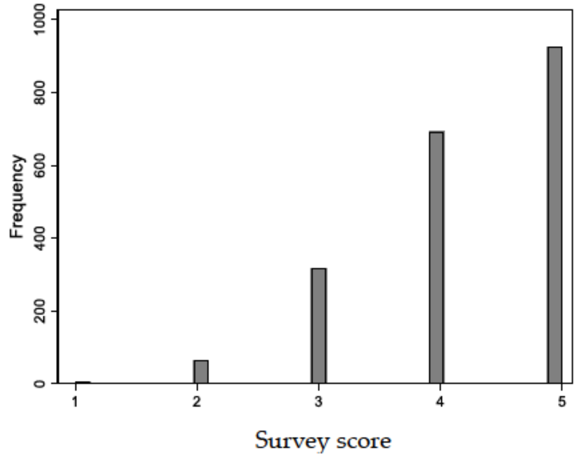
Skewness -0.62. Kurtosis 3.20

Figure 24e: Summer School expectation baseline scores by the number of pupils'



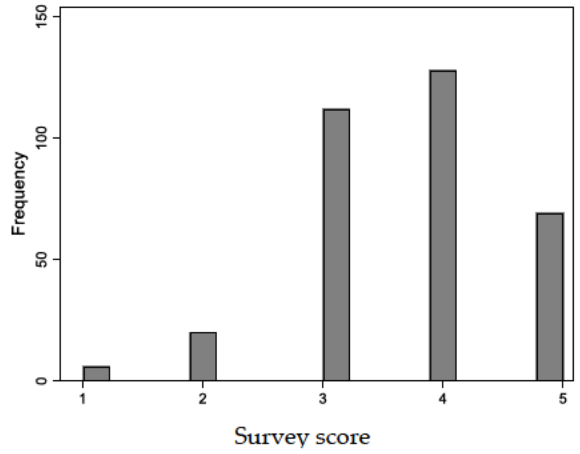
Skewness -1.64. Kurtosis 4.79

Figure 24f: non-treatment expectation baseline scores by the number of pupils'



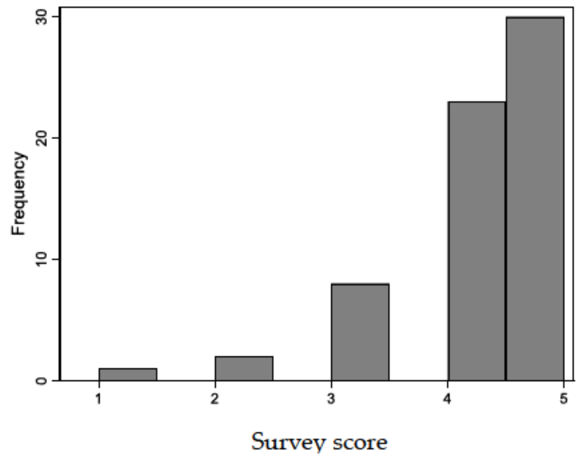
Skewness -0.90. Kurtosis 3.21

Figure 24g: Mentoring attitude baseline scores by the number of pupils'



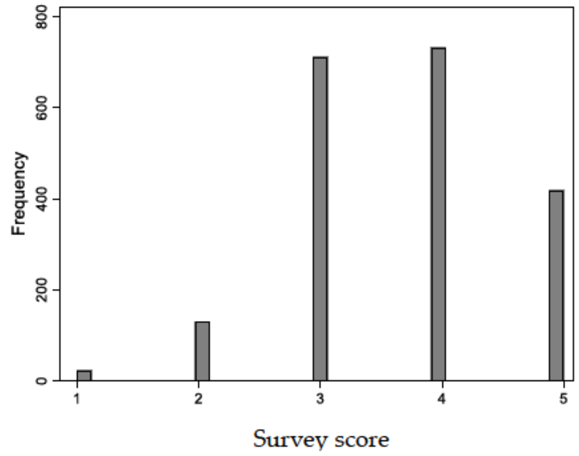
Skewness -0.40. Kurtosis 3.09

Figure 24h: Summer School attitude baseline scores by the number of pupils'



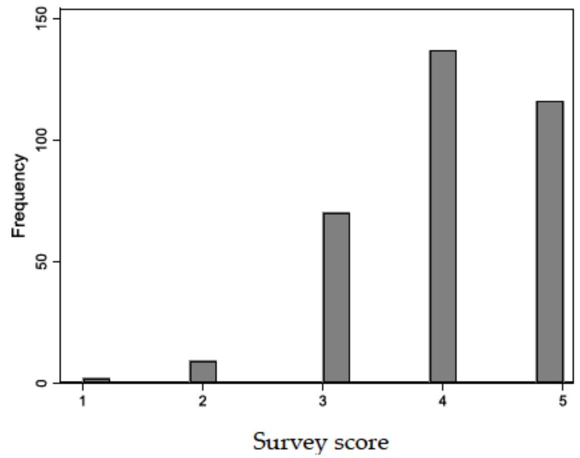
Skewness -1.93. Kurtosis 7.99

Figure 24i: non-treatment attitude baseline scores by the number of pupils'



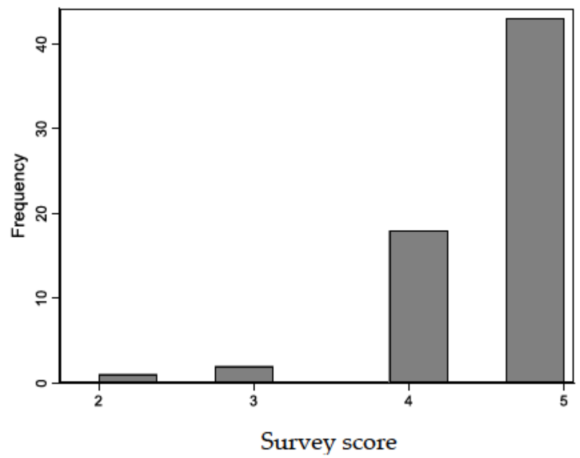
Skewness -0.13. Kurtosis 2.48

Figure 24j: Mentoring academic motivation baseline scores by the number of pupils'



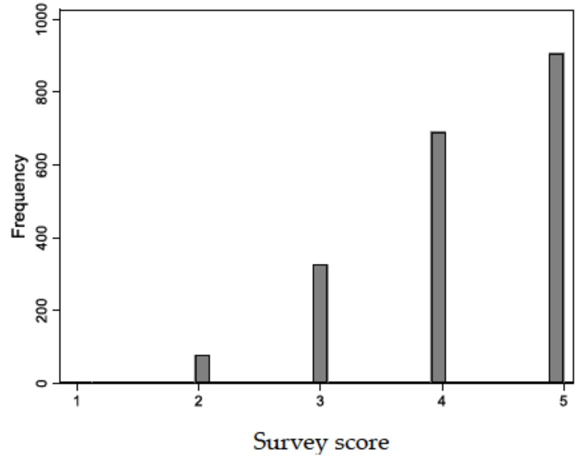
Skewness -0.69. 3.43 Kurtosis

Figure 24k: Summer School academic motivation baseline scores by the number of pupils'



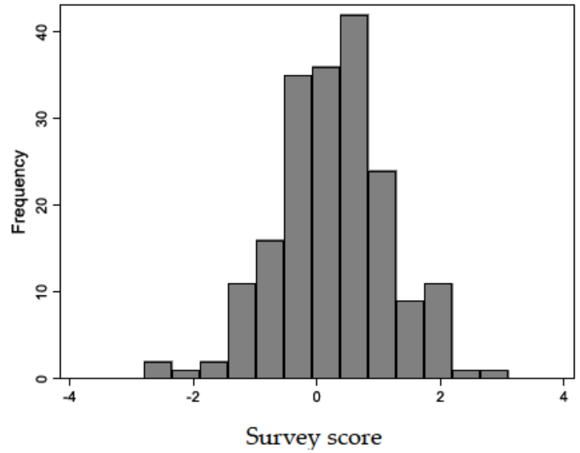
Skewness -0.81. Kurtosis 1.65

Figure 24l: non-treatment academic motivation baseline scores by the number of pupils'



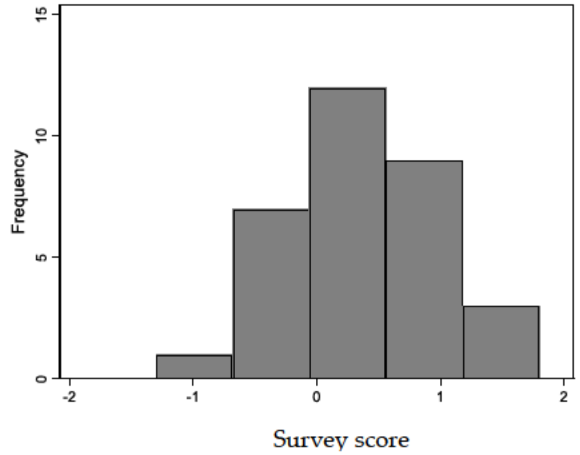
Skewness -0.90. Kurtosis 3.08

Figure 24m: Mentoring knowledge outcome scores by the number of pupils'



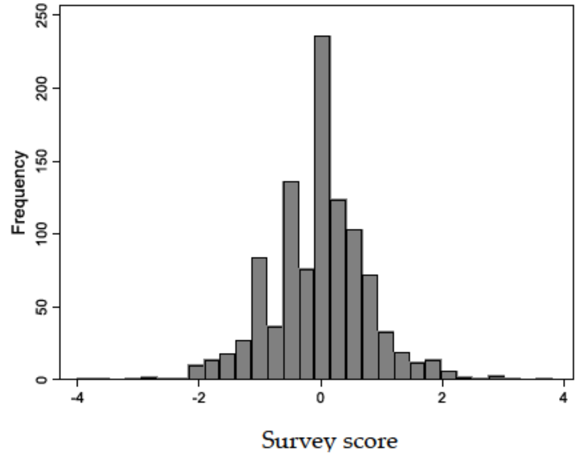
Skewness -0.93. Kurtosis 3.71

Figure 24n: Summer School knowledge outcome scores by the number of pupils'



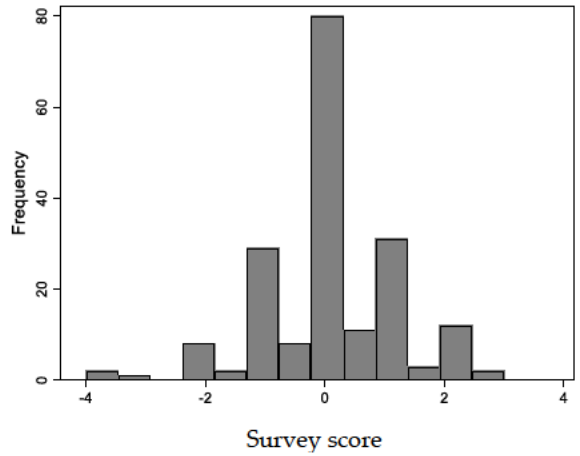
Skewness 0.49. Kurtosis 3.14

Figure 24o: non-treatment knowledge outcome scores by the number of pupils'



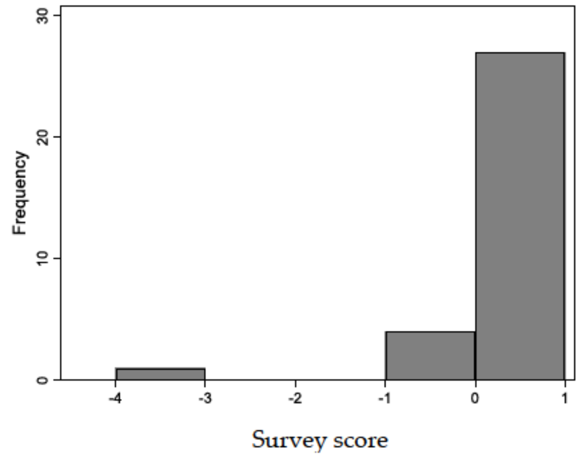
Skewness -0.61. Kurtosis 4.73

Figure 24p: Mentoring expectation outcome scores by the number of pupils'



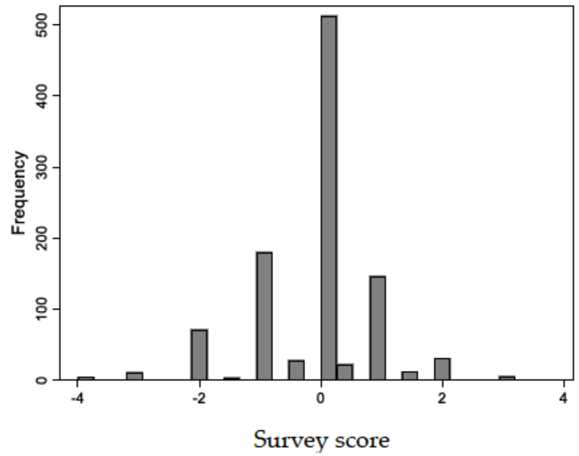
Skewness -0.44. Kurtosis 4.74

Figure 24q: Summer School expectation outcome scores by the number of pupils'



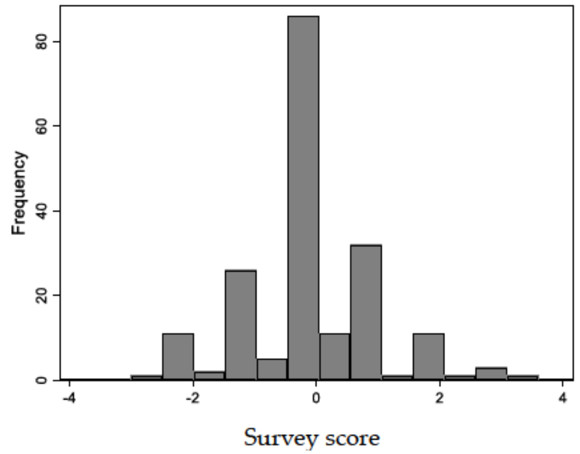
Skewness -2.94. Kurtosis 14.63

Figure 24r: non-treatment expectation outcome scores by the number of pupils'



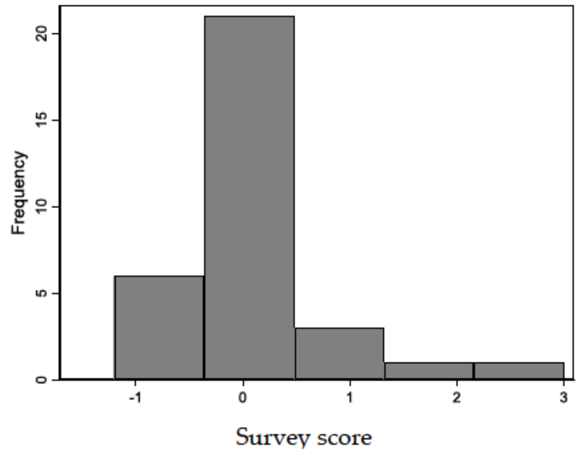
Skewness -0.31. Kurtosis 4.73

Figure 24s: Mentoring attitude outcome scores by the number of pupils'



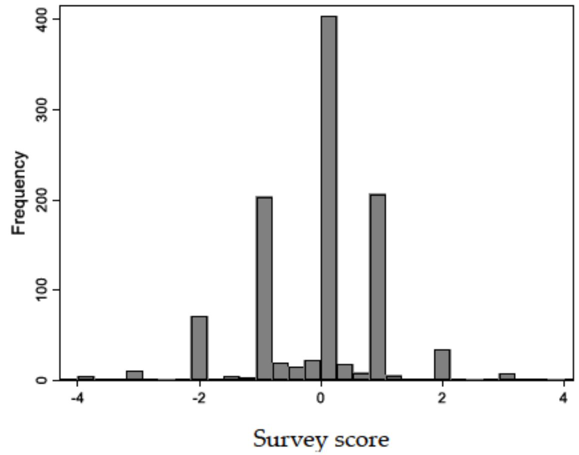
Skewness 0.34. Kurtosis 4.01

Figure 24t: Summer School attitude outcome scores by the number of pupils'



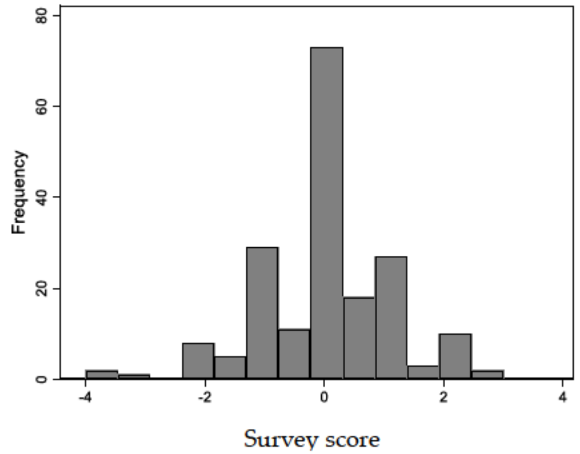
Skewness 1.50. Kurtosis 6.52

Figure 24u: non-treatment attitude outcome scores by the number of pupils'



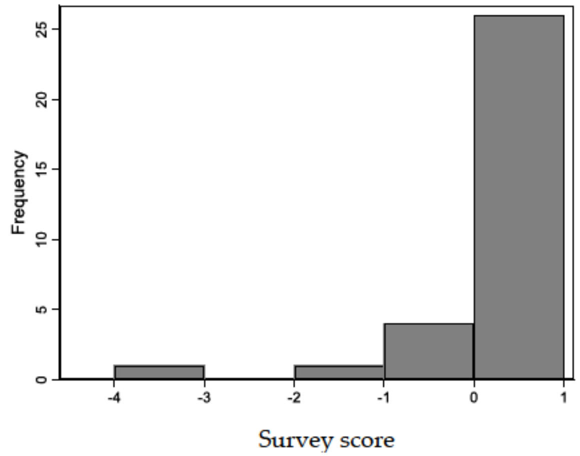
Skewness -0.20. Kurtosis 4.03

Figure 24v: Mentoring academic motivation outcome scores by the number of pupils'



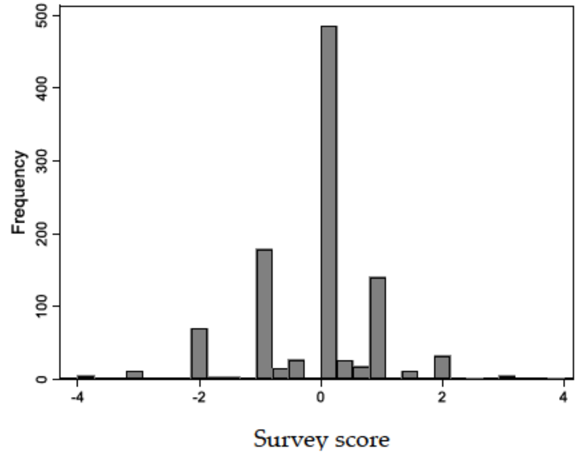
Skewness -0.36. Kurtosis 4.76

Figure 24w: Summer School academic motivation outcome scores by the number of pupils'



Skewness -2.82. Kurtosis 13.47

Figure 24x: non-treatment academic motivation outcome scores by the number of pupils'



Skewness -0.34. Kurtosis 4.74

Figures 25a to 25b provide a summary of baseline and follow-up scores for the treatment and non-treatment groups. The survey outcome scores (changes in mean scores) are more clearly illustrated in figure 26). Figure 26 illustrates that post-treatment pupils' engaging in mentoring experienced larger positive improvements in HE knowledge (M = 0.23), little change in HE attitudes and expectations (M = 0.04) and academic motivation scores (M = -0.01). Post treatment summer school pupils' experienced larger improvements in HE knowledge (M = 0.34) a small increase in HE attitudes (M = 0.07) and a decrease in HE expectations (M = -0.16) and academic motivation scores (M = -0.17). The changes in the non-treatment groups outcome scores were all negative. HE knowledge scores decreased the most (-0.31), with smaller decreases in HE attitudes (-0.10) and academic motivations (-0.13) and little change in HE expectations scores (-0.04). A one-tailed t-test was conducted on this data to compare mean changes in outcome scores between the treatment and non-treatment groups'. Significant differences in mentoring mean outcome scores were observed for HE knowledge ($p < 0.001$), expectations ($p < 0.05$) and attitudes ($p < 0.05$). The latter results just met significance ($p = 0.041$). For summer schools only HE knowledge outcomes were found to be significantly higher than the non-treatment group ($p < 0.05$).

Figure 25a: Mean survey baseline and follow-up scores for mentoring and the non-treatment groups

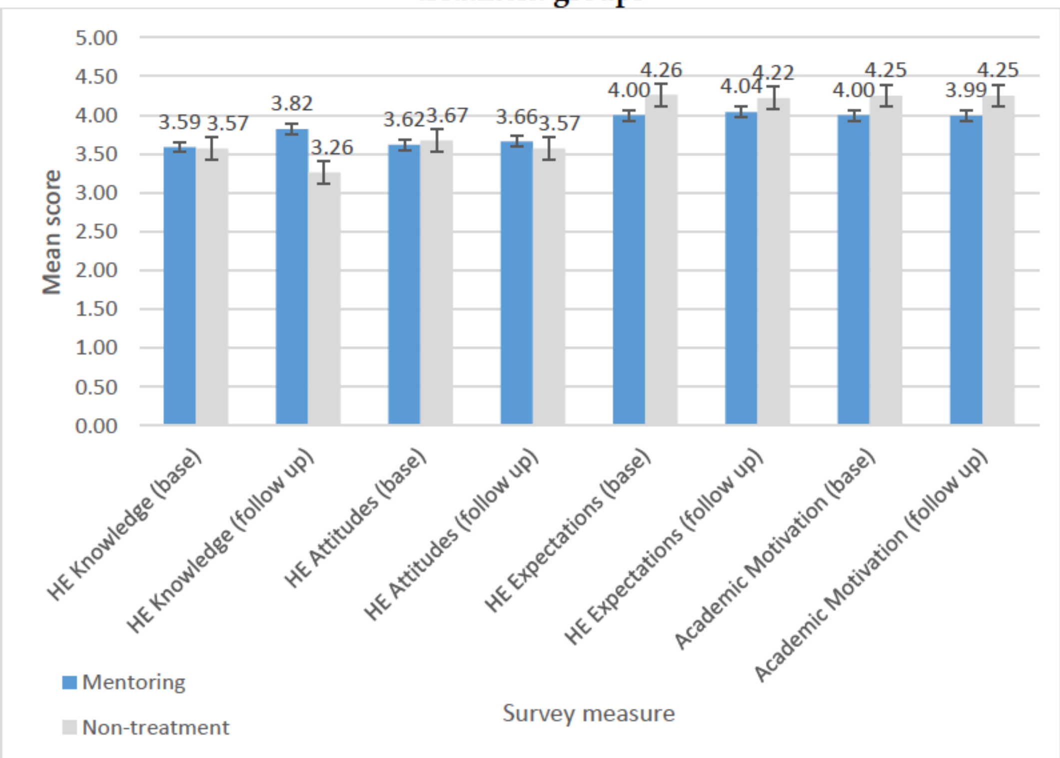


Figure 25b: Mean survey baseline and follow-up scores for summer school and the non-treatment groups

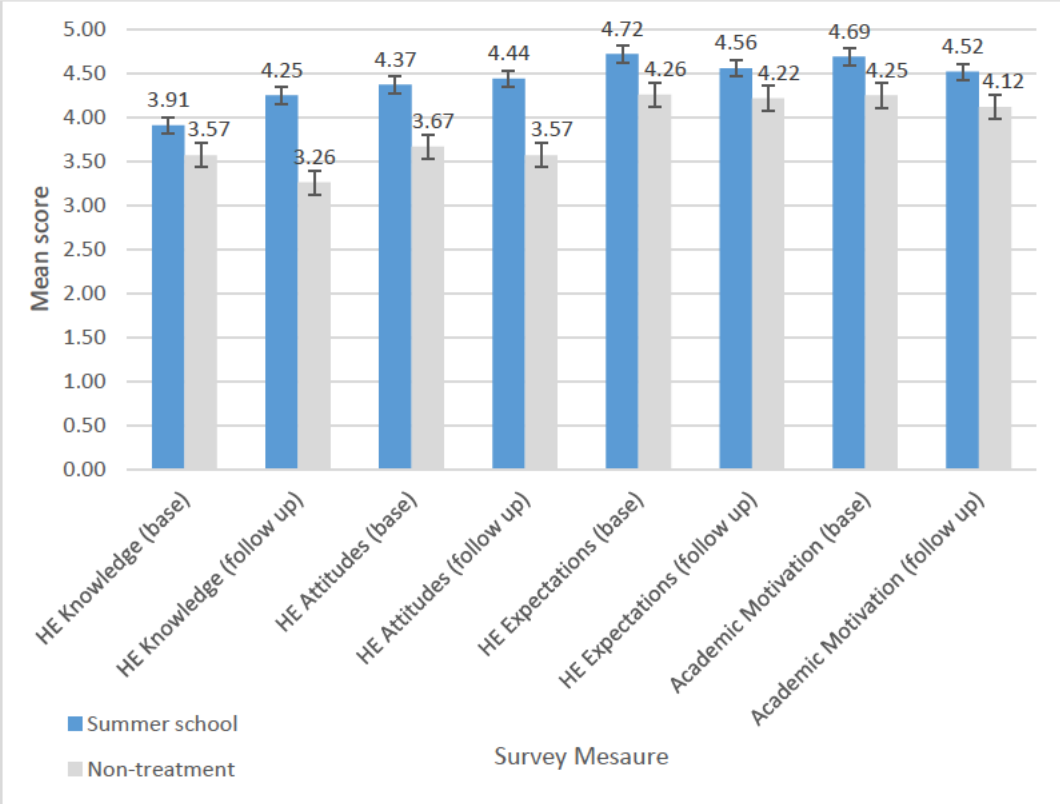
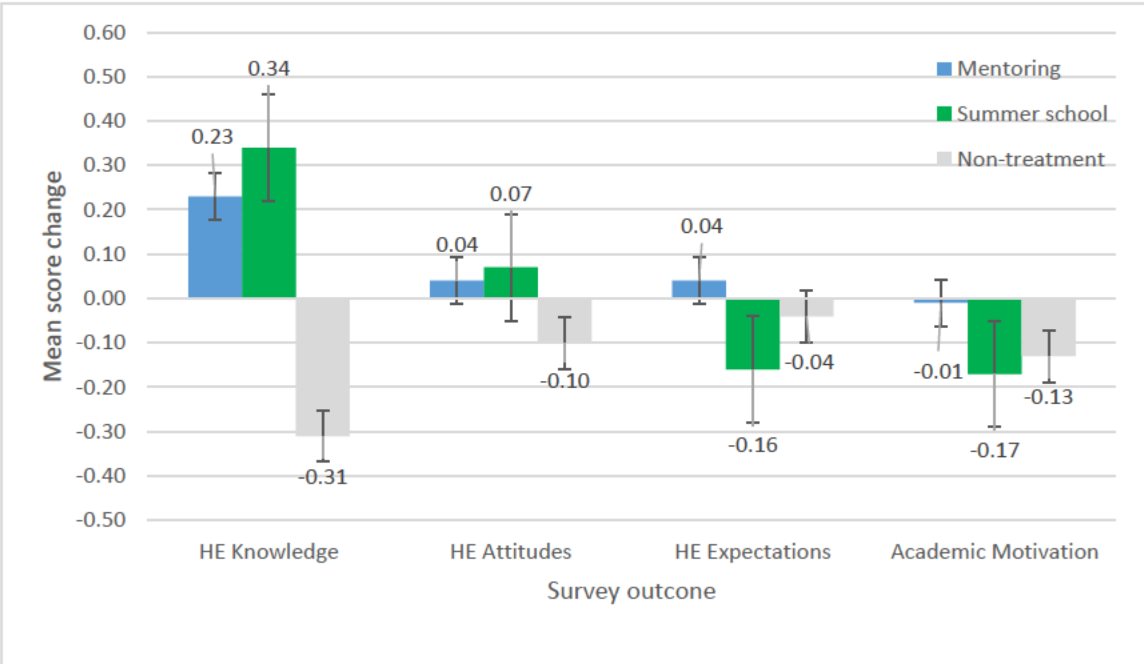


Figure 26: Changes in mean scores for treatment and non-treatment groups



Linear Regression for the Raw Estimated Effects of AABs on HE Entry

Table 40 presents the raw uncontrolled linear regression model for where the AAB survey outcomes were observed. The analysis investigated the estimated effects of the Aimhigher mentoring and summer school programmes (compared against the base: non-treatment group) on improving pupils' AABs. This analysis did not account for observed pupil controls.

Table 40: The raw effect of mentoring and summer schools on AABs

Survey outcome	Mentoring (Model 1a)	Summer School (Model 1b)	Mentoring engagements (dosage) (Model 1c)			
			1-5	6-10	11-15	15+
			Coef. *P*>|t|			
HE knowledge	0.260***	0.369*	0.327*	0.240**	0.304**	0.093 n.s.
HE expectations	0.163 n.s.	-0.032 n.s.	0.491**	0.072 n.s.	0.158 n.s.	0.235 n.s.
HE attitudes	0.132 n.s.	0.166 n.s.	0.382*	0.135 n.s.	0.044 n.s.	0.171 n.s.
Academic motivation	0.122 n.s.	-0.040 n.s.	0.480**	0.034 n.s.	0.117 n.s.	0.196 n.s.
*Sample n**	*191-194*	*32*	*31*	*92-93*	*53-54*	*13—14*

**Sample sizes vary slightly for each survey measure. Base: non-treatment n 1046-1049*

The results presented in table 40 are generally consistent with the descriptive data presented earlier. The first two models (1a and 1b) suggest that mentoring (M = 0.23, SD = 0.91, coefficient 0.260, $p < 0.001$) and summer school treatments (M = 0.34, SD = 0.67, coefficient 0.369, $p < 0.05$) had a statistically significant effect on increasing pupils' HE knowledge compared to the non-treatment group (M = -0.31, SD = 0.84). The estimated effects were larger for summer school pupils. There were no significant raw effects of either treatment on improving pupils' HE expectations, HE attitudes or academic motivations. However, most of these coefficients were positive and improvements in mentored pupils' HE expectations just missed significance ($p = 0.055$)

The third model (1c) investigated if estimated effects increased with higher levels of engagement within the mentoring programme. The analysis showed that across all engagement levels, there were small to large improvements within pupils' AABs. These improvements were not linear. Most of the largest and significant improvements across all AABs were found to be at lower levels (1-5) of engagement (coefficients 0.327 to 0.491). In terms of the HE knowledge outcome, significant improvements were observed up to 11-15 engagements. The analysis suggests that it is useful to investigate the frequency of engagement within mentoring, as some of these effects (HE attitudes and academic motivation) were suppressed in the standalone mentoring model. However, these initial raw results should not be taken at face value as they did not explain how differences in AABs may be accounted for by differences in pupil characteristics. This was investigated within the analysis that follows.

6.12.2 Stage 2: A Controlled Model Investigating the Estimated Effects of Pupil Characteristics on AABs

This linear regression analysis investigated the extent to which the raw estimated treatment effects on AAB outcomes could be explained by the inclusion of pupil characteristics (attainment, demographic, and socio-economic controls) and baseline AABs. The first analysis presents the linear regression coefficients to understand how the inclusion of these variables improved the explanatory power of the models. This was followed by a consideration of how the raw estimated treatment effects changed with the inclusion of pupil characteristics and baseline AABs. The analysis then investigated which variables were the strongest predictors of high and low pupil AABs.

Tables 41 to 44 summarise the explanatory power (R-squared) of each model on pupils' AABs. First, all pupil controls were included within each model without treatments. This was then followed by the inclusion of treatments, baseline AABs and pupil controls. Across all models, the inclusion of pupil controls had weak[25] predictive power and could only explain between 2.4% to 4.2% of the differences in AAB outcome scores. Only the HE knowledge and academic motivation outcomes were significant. Once treatments and baseline AABs were added the model had a moderate fit to the data, as between 23.3% to 27.3% of the differences in AAB outcome scores could be explained. These results were statistically significant.

[25]Acock (2018) suggests that in an exploratory area R2 less than 0.1 is weak, 0.1-0.2 is moderate and above 0.3 is strong.

Table 41: Model: HE knowledge outcome (R-squared)

Model variation	R^2 p>(F)
Pupil controls	*R2 0.042, F(20, 1,033) = 2.51****
Pupil controls, baselines surveys and mentoring treatment	*R2 0.240, F(24, 1,079) = 14.21****
Pupil controls, baselines surveys and summer school treatment	*R2 0.233, F(24, 942) = 11.93****

Table 42: Model: HE expectation outcome (R-squared)

Model variation	R^2 p>(F)
Pupil controls	*R2 0.025, F(20, 1,128) = 1.47, n.s.*
Pupil controls, baselines surveys and mentoring treatment	*R2 0.273, F(24, 1,077) = 16.88****
Pupil controls, baselines surveys and summer school treatment	*R2 0.268, F(24, 941) = 14.32****

Table 43: Model: HE attitudes outcome (R-squared)

Model variation	R^2 p>(F)
Pupil controls	*R2 0.024, F(20, 1,133) = 1.40, n.s*
Pupil controls, baselines surveys and mentoring treatment	*R2 0.248, F(24, 1,079) = 14.82****
Pupil controls, baselines surveys and summer school treatment	*R2 0.256, F(24, 942) = 13.63****

Table 44: Model: academic motivation outcome (R-squared)

Model variation	R^2 p>(F)
Pupil controls	*R2 0.028, F(20, 1,128) = 1.62**
Pupil controls, baselines surveys and mentoring treatment	*R2 0.266, F(24, 1,077) = 16.29****
Pupil controls, baselines surveys and summer school treatment	*R2 0.265, F(24, 941) = 14.13****

Does the Inclusion of Pupil Controls Reduce the Estimated Effects of Treatments on Pupil AABs

This analysis investigated the extent to which the raw uncontrolled estimated effects of treatments on pupil AAB outcomes, could be explained by the inclusion of observable pre-existing differences in pupil characteristics (attainment, demographic and socio-economic) and baseline AABs.

Table 45 provides a summary of the treatment coefficients with the inclusion of controls. Notably just under half (10 out of 24) of the coefficients increased with the inclusion of pupil controls and baseline AABs, when compared to the raw model (see table 40). However, many of these increases were not statistically significant. The significant mentoring treatment effects at 1-5 engagements across all four AABs observed within the raw model disappeared. However, within the controlled model significantly improved HE knowledge outcome scores continued to be observed for summer schools (0.389, $p < 0.01$) mentoring

(0.248, p< 0.001) and at 6-10 (2.36, p< 0.01) and 11-15 (0.333, p< 0.01) engagements within the mentoring programme. The analysis suggests that pupils' HE knowledge improved with increased engagement in mentoring, up to an optimal point of 11-15 engagements. Evidence presented by O'Sullivan *et al.,* (2017) reports similar findings for a school mentoring programme where associations between increased engagement and improved HE knowledge were observed. One new treatment effect was observed for summer schools and improvements in pupils' HE attitudes (0.355, p< 0.05). Neither summer schools nor mentoring was found to significantly improve pupils' HE expectations or academic motivations.

Table 45: The controlled effect of mentoring and summer schools on AABs

Survey outcome	*Mentoring (Model 1a)*	*Summer School (Model 1b)*	Mentoring engagements (dosage - Model 1c)			
			1-5	6-10	11-15	15 +
	Coef. P>[t]					
HE knowledge	0.248***	0.389**	0.208 n.s.	0.236**	0.333**	0.164 n.s.
HE Expectations	0.030 n.s.	-0.007 n.s.	0.197 n.s.	-0.018 n.s.	-0.032 n.s.	0.278 n.s.
HE attitudes	0.117 n.s.	0.355*	0.158 n.s.	0.079 n.s.	0.142 n.s.	0.291 n.s.
Academic motivation	-0.039 n.s.	0.043 n.s.	0.172 n.s.	-0.067 n.s.	-0.052 n.s.	0.239 n.s.
Sample n	*194-194*	*32*	*31*	*92-93*	*53-54*	*13-14*

**Sample sizes vary slightly for each survey measure. Base: non-treatment n 1046-1049*

Which Pupil Controls are the Strongest Predictors of AABs

The previous section presented estimates of treatment effects after controlling for a range of pupil background variables. It is also of value to this study to examine which of these variables are driving differences in AAB outcomes. This section presents results based on the coefficient estimates to investigate the direction and strength of association between the AAB outcomes and control variables (pupil characteristics and baseline AABs) within the multivariate model. The regression compares AAB outcome scores between pupils' who are deemed to be disadvantaged and advantaged in terms of their likelihood of progressing to HE as outlined within the literature review (e.g., pupils' who did not achieve KS2 level 4 attainment are compared to those who did achieve level 4). The analyses are summarised in tables 46 (mentoring) and 47 (summer school).

Table 46: Multiple controlled linear regression showing the effect of Mentoring on AAB outcomes by pupil characteristics.

	Mentoring (model 1a)			
	HE knowledge	*HE expectations*	*HE attitudes*	*Academic motivation*
	Coef. P>[t]			
Mentoring	0.248***	0.010, n.s.	0.122, n.s.	-0.035, n.s.
Pupil level controls (baseline surveys)				
HE knowledge	-0.506***	-0.036, n.s.	-0.002, n.s.	-0.030, n.s.
HE expectations	-0.065, n.s.	-0.418***	0.008, n.s.	-0.218, n.s.
HE attitudes	0.037, n.s.	0.235***	-0.582***	0.222***
Academic motivation	0.090, n.s.	-0.285*	0.077, n.s.	-0.468***
Pupil level controls (socio-economic, demographic and attainment)				
Male (*base female*)	0.105*	-0.061, n.s.	0.065, n.s.	-0.065, n.s.
EFSM6 (base not EFSM6)	-0.036, n.s.	-0.003, n.s.	-0.020, n.s.	-0.015, n.s.
Black (base Asian)	-0.074, n.s.	0.0003, n.s.	0.053, n.s.	0.032, n.s.
Mixed (base Asian)	-0.105, n.s.	-0.279, n.s.	-0.180, n.s.	-0.239, n.s.
White (base Asian)	-0.118, n.s.	-0.228, n.s.*	-0.194, n.s.	-0.196, n.s.
SEN (base not SEN)	-0.005, n.s.	-0.036, n.s.	-0.145, n.s.	-0.013, n.s.
English as a 1st lang (base EAL)	-0.119, n.s.	-0.030, n.s.	-0.316*	-0.071, n.s.
IDACI disadvantaged (base advantaged)	0.092, n.s.	0.077, n.s.	0.149, n.s.	0.092, n.s.
POLAR YPR disadvantaged (base advantaged)	0.018, n.s.	-0.031, n.s.	0.053, n.s.	-0.015, n.s.
POLAR AHE disadvantaged (base advantaged)	0.019, n.s.	0.044, n.s.	-0.156, n.s.	0.056, n.s.
KS2 did not achieve level 4 (base KS2 achieved level 4)	0.058, n.s.	-0.180*	-0.284***	0.189**
Cons_	1.560***	2.303***	2.124***	2.274***

The following factors have been excluded as the sample sizes were 0: any other ethnic group and unclassified first language. *HE attitudes for White pupils just missed statistical significance (p< 0.052)

Table 47: Multiple controlled linear regression showing the effect of Summer School on AAB outcomes by pupil characteristics.

	Summer School (model 1b)			
	HE knowledge	*HE expectations*	*HE attitudes*	*Academic motivation*
	Coef. P>[t]			
Summer School	0.38**	-0.007, n.s.	0.355*.	0.043. n.s.
Pupil level controls (baseline surveys)				
HE knowledge	-0.486***	-0.057. n.s.	-0.006, n.s.	-0.055, n.s.
HE expectations	-0.010 n.s.	-0.198, n.s.	-0.07, n.s.	-0.033, n.s.
HE attitudes	0.032, n.s.	0.230***	-0.584***	0.227***
Academic motivation	0.029, n.s.	-0.485**	0.130, n.s.	-0.635***
Pupil level controls (socio-economic, demographic and attainment)				
Male (*base female*)	0.085, n.s.	-0.071, n.s.	0.077, n.s.	-0.077, n.s..
EFSM6 (base not EFSM6)	0.025, n.s.	-0.069, n.s.	-0.063, n.s.	-0.082, n.s.
Black (base Asian)	0.033, n.s.	0.069, n.s.	0.105, n.s.	0.126, n.s.
Mixed (base Asian)	-0.112, n.s.	-0.365*	-0.170, n.s.	-0.347*
White (base Asian)	-0.103, n.s.	-0.234*	-0.145, n.s.	-0.223, n.s.*
SEN (base not SEN)	-0.047, n.s.	-0.023, n.s.	-0.221*	0.007, n.s.
English as a 1st lang (base EAL)	-0.156, n.s.	-0067, n.s.	-0.238, n.s.	-0.085, n.s.
POLAR YPR disadvantaged (base advantaged)	-0.053, n.s.	-0.004 n.s.	0.024, n.s.	0.024, n.s.
POLAR AHE disadvantaged (base advantaged)	0.081, n.s.	0.053, n.s.	-0.134, n.s.	0.048, n.s.
KS2 did not achieve level 4 (base KS2 achieved level 4)	-0.012, n.s.	-0.163*	-0.281***	-0.188*
Cons_	1.552**	1.65***	2.386***	2.350***

The following factors have been excluded as the sample sizes were 0: any other ethnic group, unclassified first language and advantaged IDACI. *Academic motivations for White pupils just missed statistical significance (*p*= 0.056).

Within both the mentoring and summer school models the strongest predictor of a pupil's AAB outcome score, was a pupil's score at baseline on the same measure (e.g., HE knowledge baseline and HE knowledge outcome). The only exception to this was the summer school HE expectation outcome, where the strongest predictor was the academic motivation baseline. In all cases, low baseline survey scores were significantly associated with higher outcome scores.

As would be expected other strong significant predictors of lower AAB outcome scores were a pupil's ethnicity (White and Mixed ethnicity) and lower KS2 attainment (did not achieve KS2 level 4). This later finding is in line with the published literature which has shown that there is an association between higher levels of attainment and higher AABs (Morris and Rutt, 2005; 2006; Goodman *et al.*, 2010; Chowdry, Crawford, and Goodman, 2011). Across both models, most of the largest coefficients pointed to that, pupils from advantaged backgrounds were more likely to have higher AAB outcomes than those from disadvantaged backgrounds. The findings are supported by the wider research literature that has reported that parent and child HE knowledge, attitudes and aspirations/expectations are stratified by socio-economic and family background (Connor *et al*., 2001; Plank and Jordan, 2001; Avery and Kane, 2004; Morris and Rutt, 2005; 2006; DCSF, 2009; Goodman and Gregg 2010; Chowdry, Crawford, and Goodman, 2011; Callender and Jackson, 2017; Ipsos MORI, 2019). However, within the current analysis, there were many results that were in the opposite direction to what was expected, although many of the coefficients were non-significant, very small or close to zero. These results suggest that the estimated treatment effects observed within the earlier analysis (see table 45) in part may have been driven by more advantaged pupils' having higher AAB outcomes. This issue will be investigated in more detail in the next section.

6.12.3 Stage 3: Heterogeneity in the Treatment Effect

To this point, the regression analyses have investigated the raw differences in estimated treatment effects, followed by how AABs differed by pupil characteristics. The next linear regression analysis investigated the interaction between the two and helped to understand if mentoring or summer school programmes varied in their impact on pupils' AABs. Although there is widespread evidence within the literature of pupil AABs being stratified by pupil characteristics (see previous section), no evidence exists in terms of whether specific WP interventions are more or less effective in improving AABs for pupils' holding different characteristics. This evidence has important practical and policy implications for how WP programmes are targeted and delivered. The research aimed to address this gap.

This analysis summarised a linear regression model that compared AAB outcomes between the treatment and non-treatment groups, whilst controlling for and interacting with all observed pupil characteristics (see controlled model)[26]. The analysis provides some control by comparing coefficients (changes in survey mean scores) for pupils of the same characteristic, across the treatment and non-treatment groups. For example, comparisons in AAB outcomes were made between treated males vs non-treated males. One interaction

[26] The analysis excluded some groups where samples are zero, including any other ethnic group and those with an unclassified first language.

at a time was added to the controlled model with all pupil controls (outlined in stage 2) and then removed. This final model provided the most controlled and unbiased estimate of results by improving the comparability between the treatment and non-treatment groups. To support this analysis data was coded into dummy variables (e.g., treated males were coded as "0" and non-treated males were coded as "1"). All data are presented within charts, where significant results are denoted with an asterisk. All of the remaining results are non-significant. For the mentoring analysis data was not presented for different frequencies of engagement as many of the samples became too small to provide meaningful findings (this analysis has been completed and is available in Appendix 25 for reference). The full regression analysis for summer schools and mentoring (non-frequency model) is presented in Appendix 24. Appendices 26 to 34 include descriptive statistics for the linear regression models presented. This data shows how AAB survey outcome scores varied by treatment types and pupils' background characteristics. These data were in line with the regression findings.

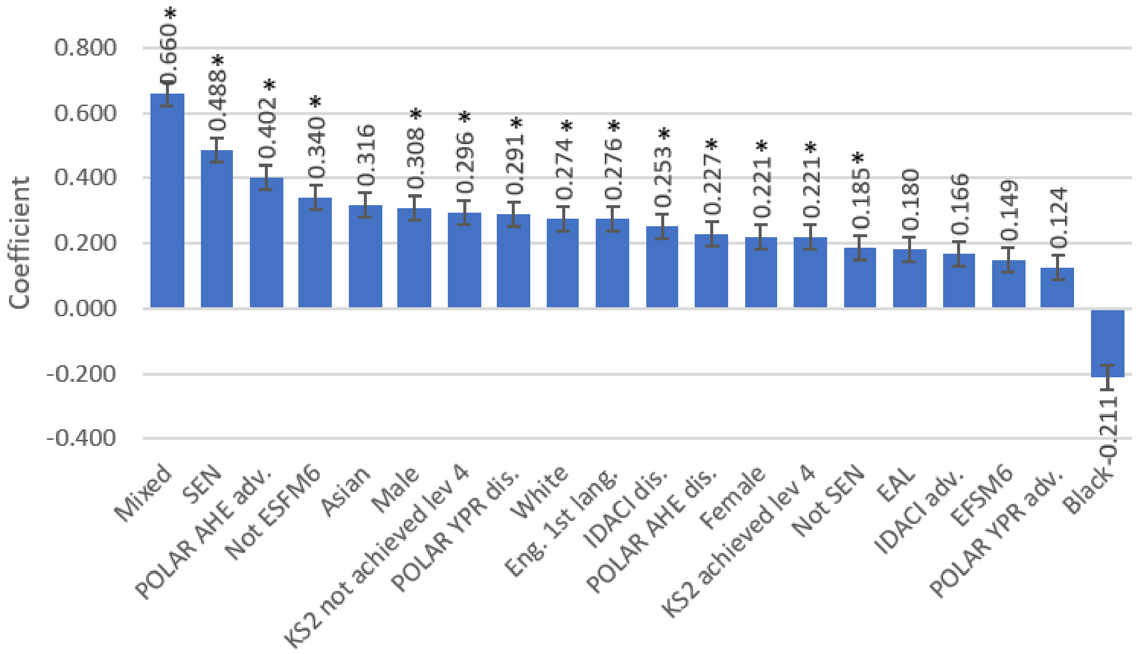
Mentoring Treatment Effects

The mentoring analysis is presented within figures 27 to 30. All significant results are denoted with an asterisk and the remainder are non-significant. The findings for each analysis are consistent with those presented in the controlled model (see section 6.12.2).

HE Knowledge

Figure 27 summarises the estimated effects (coefficients) of mentoring on pupils' HE knowledge. Almost all treated pupils experienced positive improvements in their HE knowledge and many of the results were statistically significant. In general, disadvantaged pupils' experienced larger and more positive treatment effects than advantaged pupils. The most positive treatment effects on HE knowledge scores were experienced by Mixed ethnicity pupils ($M = 0.67$, $SD = 0.60$, coefficient 0.660, $p< 0.001$). Treated pupils' who were EFM6, EAL, Black, not SEN and those living in advantaged areas (IDACI and POLAR YPR) did not experience significant improvements in their HE knowledge scores when compared to the non-treatment group. The coefficient for Asian pupils just missed significance ($p= 0.057$).

Figure 27: Multiple controlled interacted linear regression showing the effect of mentoring on HE knowledge by pupil characteristics.

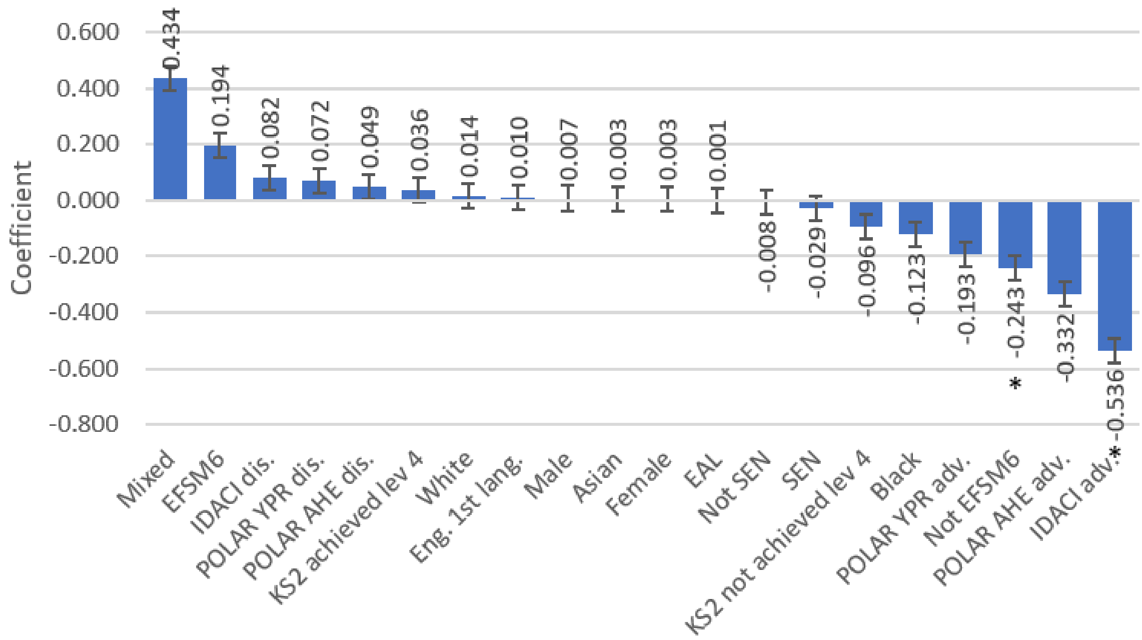


HE Expectations

Figure 28 summarises the estimated effects of mentoring on pupils' HE expectations. Pupils either experienced negative effects (5 characteristics), positive effects (2 characteristics) or null effects (13 characteristics) where there was little [27]change in their HE expectation scores. In general, disadvantaged pupils' experienced larger and more positive treatment effects than advantaged pupils. However, only two results were statistically significant, and these were in a negative direction. Pupils' of a non-EFSM6 status (M = -0.15, SD = 1.12, coefficient -0.243 p <0.05) and those from advantage IDACI areas (M = -0.31, SD = 1.24, coefficient -0.536 p <0.05) experienced significant decreases in their HE expectations post-intervention, compared to non-treated pupils'. Large positive treatment effects on HE expectation scores were observed for pupils' from a Mixed ethnic background (M = 0.40, SD = 0.88). However, this result just missed significance (coefficient 0.434, p= 0.057). None of the other results reached statistical significance.

[27] Throughout the analysis little change or a null effect refers to smaller coefficients in the range of -0.100 to 0.100)

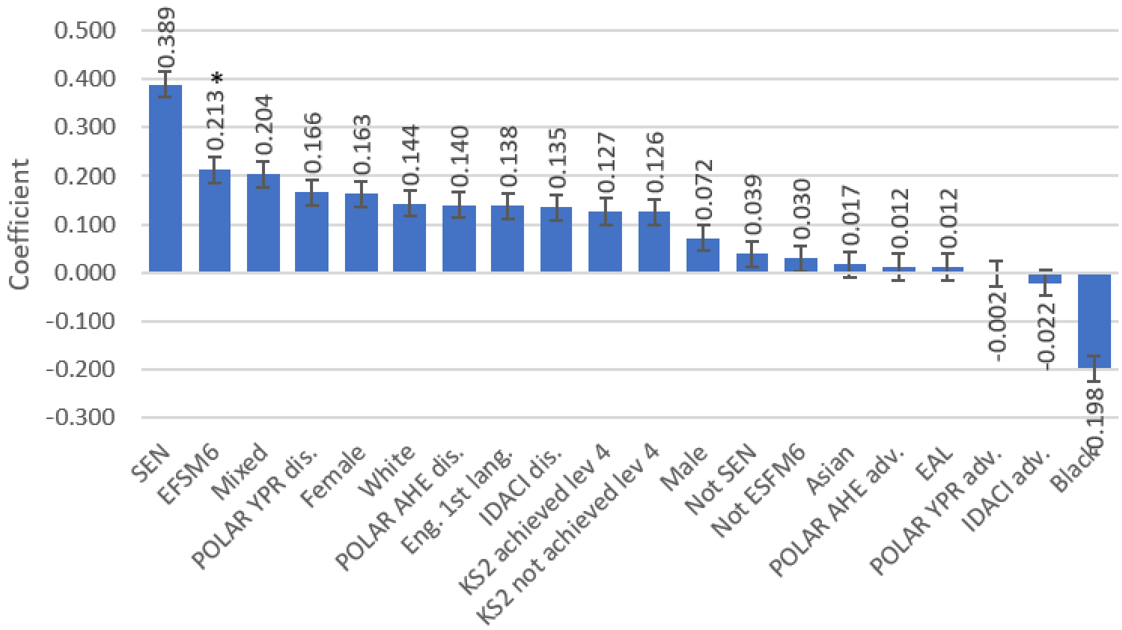
Figure 28: Multiple controlled interacted linear regression showing the effect of mentoring on HE expectations by pupil characteristics.



HE Attitudes

Figure 29 summarises the estimated effects of mentoring on pupils' HE attitudes. Most mentored pupils experienced either positive (11 characteristics) or no improvement (8 characteristics) as there was little change in their HE attitude scores. Where larger positive treatment effects were observed, these tended to be for disadvantaged pupils', although few were significant. The only significant and positive treatment effect on HE attitudes scores was experienced by EFSM6 pupils (M = 0.06, SD = 0.94, coefficient 0.237, p <0.05). Black pupils experienced the largest decrease in their HE expectations post-treatment (M = -0.37, SD = 0.78). However, this result was not statistically significant (coefficient 0.198, n.s.).

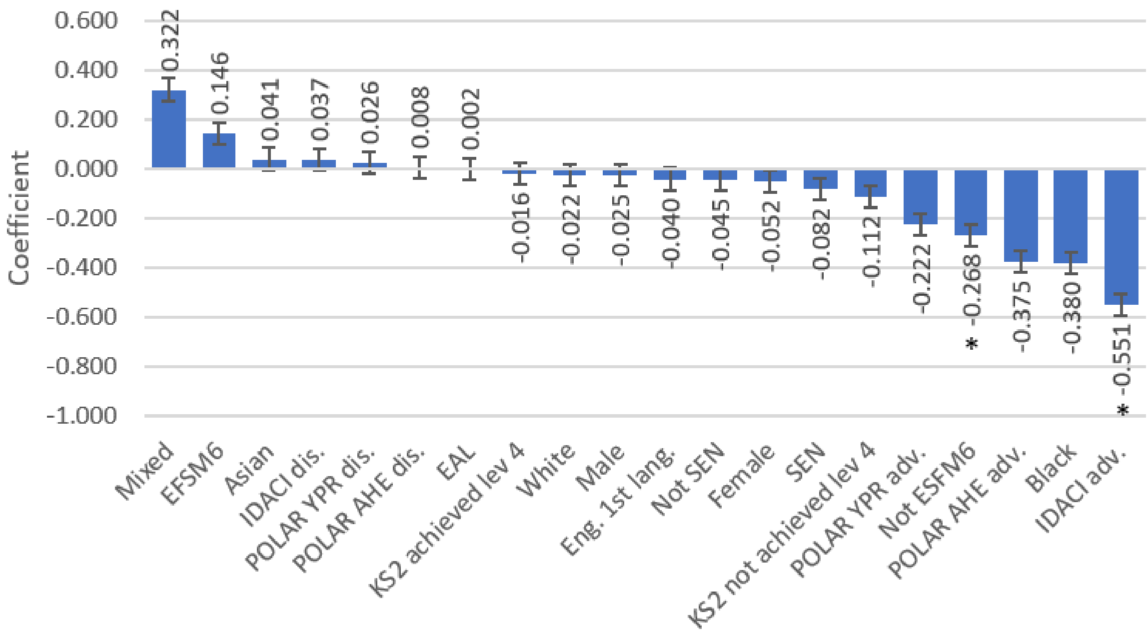
Figure 29: Multiple controlled interacted linear regression showing the effect of mentoring on HE attitudes by pupil characteristics



Academic Motivation

Figure 30 summarises the estimated effects of mentoring on pupils' academic motivation. Most pupils experienced no improvement (12 characteristics) from mentoring as there was little change in their HE academic motivation scores. Only a few results showed positive associations (2 characteristics) and more were negative (5 characteristics). Where larger positive treatment effects were observed, these tended to be for disadvantaged pupils', although none were significant. Only two results were significant and suggest that mentoring decreased pupils' academic motivations if they were non-EFSM6 (M = -0.16, SD = 1.15, coefficient -0.268, $p< 0.05$) or lived in advantaged IDACI areas (M = -0.36, SD = 1.38, coefficient -0.551, $p< 0.05$).

Figure 30: Multiple controlled interacted linear regression showing the effect of mentoring on academic motivations by pupil characteristics



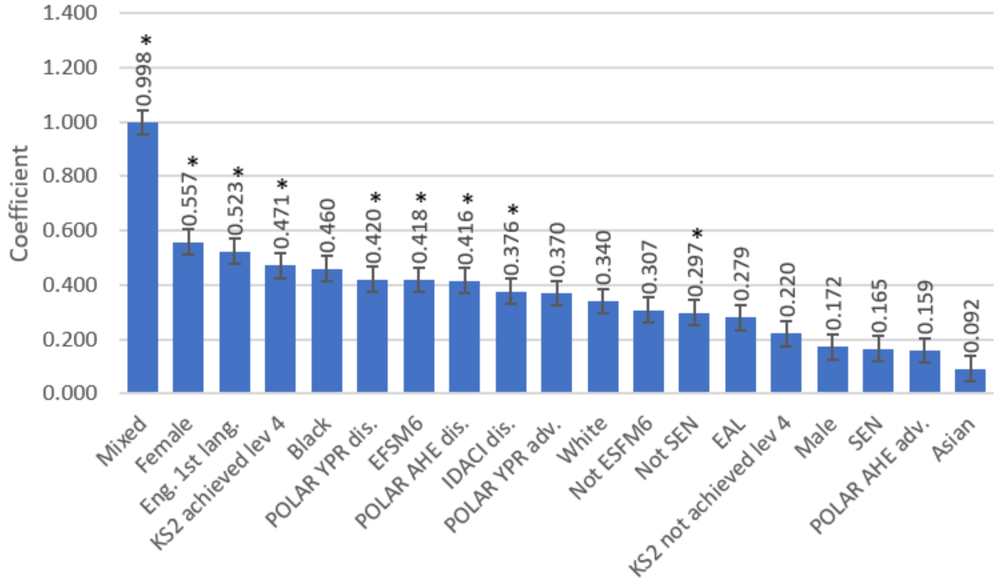
Summer School Treatment Effects

The summer school analysis is presented within figures 31 to 34. All significant results are denoted with an asterisk and the remainder are non-significant. The findings for each analysis are consistent with those presented in the controlled model (see section 6.12.2).

HE Knowledge

Figure 31 presents the coefficients for the HE knowledge outcome. All coefficients were positive and almost half were significant. Where larger positive treatment effects were observed, these tended to be for disadvantaged pupils', although few were significant. Improvements in HE knowledge scores were by far larger for pupils from a Mixed ethnic group (M = 0.78, SD = 0.63, coefficient 0.988, p< 0.01). Although coefficients were positive, no significant improvements in HE knowledge scores were observed for pupils from a Black, White or Asian ethnic group, males, SEN, non-EFSM6, EAL, those that did not achieve KS2 level 4 and those living in advantaged neighbourhoods (POLAR YPR and AHE).

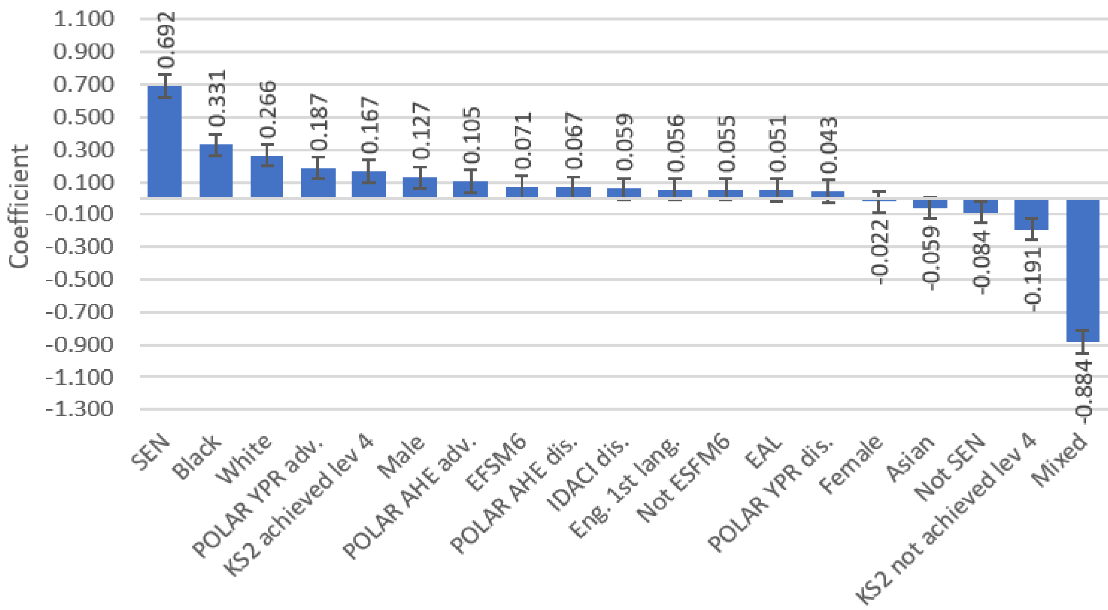
Figure 31: Multiple controlled interacted linear regression showing the effect of summer schools on HE knowledge by pupil characteristics



HE Expectations

Figure 32 presents the coefficients for the HE expectations outcome. Pupils either experienced treatment effects that were negative (2 characteristics), positive (7 characteristics) or null (10 characteristics). Where larger positive treatment effects were observed, these tended to be for disadvantaged pupils. Findings show that summer schools did not improve pupils' HE expectations, as all results were non-significant.

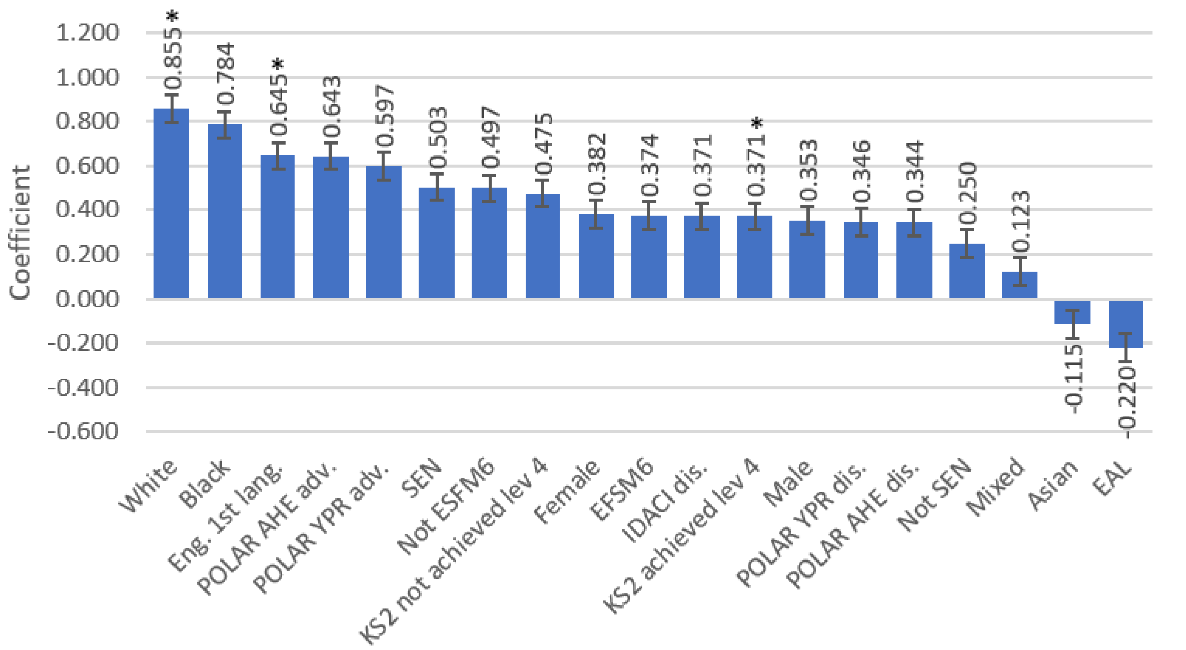
Figure 32: Multiple controlled interacted linear regression showing the effect of summer schools on HE expectations by pupil characteristics



HE Attitudes

Figure 33 presents the coefficients for the HE attitudes outcome. Almost all pupils experienced positive improvements in HE attitudes and the largest effects were observed for disadvantaged pupils. However, few of these results reached significance. White pupils experienced by far the largest improvements in their HE attitudes (M = 0.14, SD = 0.38, coefficient 0.855, $p < 0.05$). Positive improvements in pupils' HE attitudes were also observed for those who spoke English as a first language (coefficient 0.371, $p < 0.05$) and those who lived in advantaged IDACI areas (coefficient 0.371, $p < 0.05$). A number of results were close to significance for pupils' who were Black ($p = 0.058$), those that achieved KS2 level 4 ($p = 0.058$) and those living in disadvantaged POLAR YPR areas ($p = 0.056$).

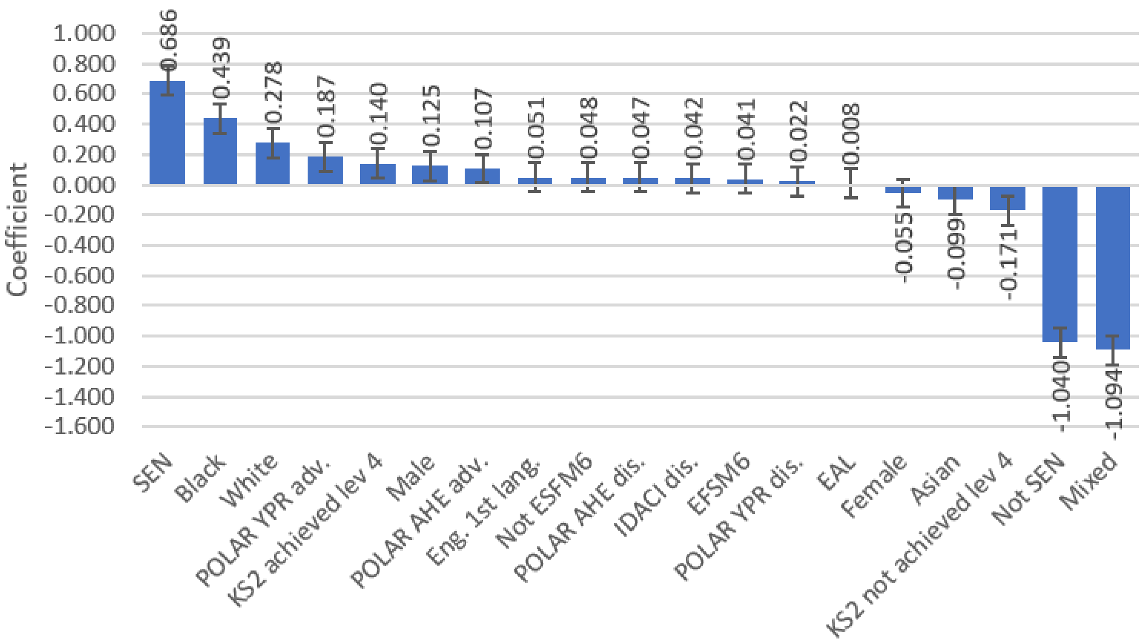
Figure 33: Multiple controlled interacted linear regression showing the effect of summer schools on HE attitudes by pupil characteristics.



Academic Motivations

Figure 34 presents the coefficients for the academic motivation outcome. Pupils either experienced effects that were negative (3 characteristics), positive (7 characteristics) or null (9 characteristics). Where larger positive effects were observed, these tended to be for disadvantaged pupils. Findings show that summer schools did not improve pupils' academic motivations, as all results were non-significant.

Figure 34: Multiple controlled interacted linear regression showing the effect of summer schools on academic motivation by pupil characteristics.



6.13 Summary

The first analysis (section 6.1) provided evidence of an association between the Aimhigher summer school and mentoring programmes and improvements in pupils' likelihood of entering HE. Importantly the second analysis (section 6.6) found that HE entry behaviours may be mediated by pupils' HE knowledge, expectations, attitudes, and academic motivations. This final analysis has closed the circle by investigating if Aimhigher interventions supported improvements in pupils' AABs. Establishing robust evidence is critical as WP programmes are largely based on the premise that improving pupils' AABs will increase their likelihood of entering HE. Both mentoring and summer school programmes serve as key initiatives delivered by HEIs to address these aims. However, limited robust experimental evidence is available on programme effectiveness in improving pupils' AABs (Gorard *et al.*, 2006; Gorard, See and Davies, 2012; Younger *et al.*, 2019; Robinson and Salvestrini, 2020).

The descriptive analysis (section 6.12.1) showed that the non-treatment group tended to experience negative changes in AAB outcomes scores. For the treatment group, these patterns were more mixed with positive, negative and no changes in AAB outcome scores. The evidence presented suggests that mentoring supported statistically significant improvements in pupils' HE knowledge when they engaged between 6-10 and 11-15 times. Higher levels of engagement (11-15) were associated with higher HE knowledge scores (see section 6.12.2). Summer schools were also found to improve pupils' HE knowledge and significant improvements were observed in terms of some pupils' HE attitudes. Neither Aimhigher summer schools nor mentoring were found to significantly impact on pupils' HE expectations or academic motivations until heterogenous treatment effects were investigated. The controlled analysis found that although differences were not all significant, pupils' AABs tended to be stratified and higher for advantaged pupils' compared to their more disadvantaged peers.

These findings are indicative as unobserved differences in pupils' characteristics between the treatment and non-treatment groups may have impacted on results. The comparability of samples was more encouraging. The mentoring sample was far more disadvantaged than the non-treatment group meaning that they would be expected to have lower AABs (see section 6.11.1). Importantly mentored pupils' had lower attainment and were well-matched to the non-treatment group in terms of baseline HE knowledge and attitude scores. Conversely, the summer school sample was more advantaged than the non-treatment group (although attainment levels were similar). Summer school results are indicative as data is likely to be skewed due to small samples.

Despite these limitations the associations between higher levels of engagement within mentoring provided more promising findings of an Aimhigher effect. Further, the heterogenous treatment effects provided far more control and comparability across the samples, meaning the estimated effects were more robust. These results showed that improvements in AABs varied widely across pupil characteristics, although disadvantaged pupils tended to experience larger improvements. Most of these significant effects were positive (87%), suggesting that Aimhigher interventions improved some pupils' AABs. Most mentored pupils' and just under half of summer school pupils' experienced significant improvements in their HE knowledge. Very few significant treatment effects were observed across the other AABs. Significant improvements in summer school pupils' HE attitudes were observed if they were White, spoke English as a first language or lived in advantaged IDACI areas. Mentoring also significantly improved EFSM6 pupils' HE attitudes. However, mentored pupils' HE expectations and academic motivations decreased if they were non-EFSM6 or lived in advantaged IDACI areas. Summer schools were not found to improve pupils' HE expectations or academic motivations. It is likely that the summer school analysis was underpowered as the sample was small (n32) and decreased even further when controls were broken down into subgroups (e.g., ethnicity). This could explain why many of the heterogeneity in the treatment effects and resulting coefficients were large but non-significant.

The wider implications of these findings are important as analysis two provided evidence to suggest that HE expectations, attitudes and academic motivations were the strongest predictors of pupils' HE entry behaviours. HE knowledge was also found to be important but less so. In turn, the current analysis has shown that Aimhigher interventions are more likely to improve pupils' HE knowledge and have less of an impact on improving AABs that are more likely to influence HE entry behaviours. The policy and practical implications of these findings are considered in more detail within the discussion chapter.

Across the 20 pupil characteristics with the heterogeneity analysis most (70%) pupils experienced at least an improvement across one of the AABs. However, no significant improvements in Black pupils' AABs were observed. More advantaged pupils were more likely to experience null and significant negative treatment effects. No significant improvements in AABs were observed for pupils' who were Asian, EAL or lived in a disadvantaged area (POLARYPR). As outlined above, pupils from advantage IDACI areas only experienced negative treatment effects across their HE expectations and academic motivations. For non-EFSM6 pupils', improvements were observed in their HE knowledge scores although negative effects were observed for their HE expectations and academic motivations. It is important to note advantaged pupils' were likely to be disadvantaged across other measures, due to the nature of the Aimhigher composite targeting model (see chapter 4b, section 4.2.3). The implications of these findings are considered within the discussion section.

The research approach and associated analysis addressed a number of gaps within the WP literature for high-cost summer school and mentoring programmes that are widely employed across the sector. The research undertaken has demonstrated that when evaluating WP programmes, it is important to include a comparison group, investigate treatment effect heterogeneity and the frequency of engagement within specific interventions. As outlined without this analysis many of the positive, negative, and null estimated effects would have remained hidden and thus, suppressed without such analyses. This analysis addresses a major gap within the evidence as such effects have not been robustly investigated. These findings have important practical and policy implications for the Aimhigher programme and the wider WP sector in terms of how programmes are resourced, delivered, targeted, and evaluated. These implications are considered within the discussion chapter.

Chapter 7: Discussion

7.1 Introduction

This chapter begins with a summary of the thesis, outlining how the key aims of the research were addressed with reference to the critical literature. This is followed by a detailed discussion of the findings across the seven key research questions (sections 7.2 to 7.4). Findings are considered in terms of their alignment with previously published evidence and theoretical understandings. The reliability and validity of findings are considered in terms of how attrition, comparability of samples and missing data and mediators that may impact on the inferences that can be made (section 7.5). Section 7.6 provides a consideration of the implications of the findings in terms of policy, practice, and future WP research. The final section (7.7) provides a recap of the contributions of the research undertaken.

The research presented in this thesis investigated the effectiveness of the Amihigher summer school and mentoring programmes on improving pupils' likelihood of entering HE; AABs[28]; and whether AABs mediated pupils' HE entry behaviours. The Aimhigher programme aimed to address the widely reported SES inequalities in HE participation (see Chapter 4a). Over the past two decades, successive governments within England have made a concerted effort to reduce these inequalities. This has been supported by government policy and statutory commitments (Access and Participation Plans) focused on HE providers (Chapter 2). This work has been supported through WP programmes, which often consist of summer school and mentoring schemes (Chapter 3).

By establishing which interventions are most effective will enable programmes to reduce gaps in HE participation. However, despite two decades of delivery and hundreds of millions of pounds spent per annum, there is very little robust evidence of programme effectiveness. Much of the evidence for WP programmes is based on post-16 students on level 3 courses (Robinson and Salvestrini, 2020). This focus has been critiqued as there are only small SES differences in HE participation rates for such students, as inequalities are largely determined by prior levels of attainment (Gorard 2018). The research undertaken

[28] AABs refer to pupils' higher education knowledge, attitudes, expectations, and academic motivation.

addressed this limitation, by evaluating the impact of Aimhigher interventions targeted at a wider group of pupils aged 13 to 18 years of age (year groups 9-13).

There is limited robust evidence for the effectiveness of widening participation (WP) programmes on improving disadvantaged pupils' non-cognitive functions (AABs) and the likelihood of entering HE. Systematic literature reviews have outlined that this is due to a lack of experimental design, a lack of comparison groups, controls and sampling bias (Gorard *et al.*, 2006; Gorard, See and Davies 2012; Younger *et al.*, 2019, Robinson and Salvestrini, 2020, see chapter 3). The research undertaken provided a major contribution to the literature by addressing these limitations via the employment of a quasi-experiment design, a comparison group, and important pupil controls (attainment socio-economic, demographic and AABs) associated with educational achievement and HE participation (see chapters 3 and 4a). The research provided other important contributions by investigating issues that remain largely unexplored for the cohorts targeted by WP programmes (pupils with good attainment). This included investigating whether a) frequency of engagement in mentoring was associated with pupil outcomes, b) whether there were heterogeneous treatment effects (e.g., did some pupils benefit more from treatment than others) and most importantly c) were a wider range of AABs valid predictors of pupils' likelihood of entering HE d) and how reliable were the AAB survey measures (see chapters 5 and 6). The research provided a step forward in improving the methodology and evidence in terms of the effectiveness of WP programmes that target pupils with the potential to progress to HE.

7.2 RQ 1a: Is Engagement in Aimhigher (Summer Schools or Mentoring) Associated with an Increased likelihood of Entering Higher Education?

Several studies within the UK provide more robust evidence of WP programmes improving pupils' likelihood of applying, being accepted to, and entering HE (Morris, Rutt, and Mehta, 2009; Chilosi *et al.*, 2010; Pharis-ciurej, Herting and Hirschman, 2012; Le, Mariano and Faxon-Mills, 2016; Bowman *et al.*, 2018). Burgess, Horton and Moores (2021) found an association between how frequently pupils participated in interventions and their likelihood of being accepted into HE. However, the inferences made from these studies are restricted by the limited number of controls that were employed, meaning it is possible that significant differences may have been due to pre-existing differences in the characteristics of pupils' within the treatment and non-treatment groups. RCT and quasi-experimental studies in the US have presented less promising evidence in terms of whether interventions improved college enrolment rates (Bergin, *et al.*, 2007; Page *et al.*, 2019). Notably widening participation research has not robustly investigated the impact of the quantity of engagement with mentoring programmes or treatment effect heterogeneity across specific treatment interventions. The research undertaken addressed these limitations.

Findings from the research (see section 6.4.2., table 26) outlined that pupils' accessing Aimhigher summer schools were significantly and 115% more likely to enter HE than non-treated pupils'. The research found that mentored pupils' who engaged 11-15, or more than 15 times, were significantly and respectively 34% and 54% more likely to enter HE than non-treated pupils'. Pupils engaging within 1-5 or 6-10 mentoring sessions were found to experience no discernible benefit. Therefore, above ten mentoring sessions, increasing levels of engagement was associated with an increased likelihood of entering HE. Burgess, Horton and Moores (2021) study reported similar findings as mentoring was also found to be effective, but less so than summer schools. The study reported an association between higher levels of engagement (five to six) within the Aimhigher Uni Connect Programme and an increased likelihood of pupils' being accepted to HE. However, no analysis was provided in terms of whether the frequency of engagement within mentoring was associated with pupils' HE participation. These findings within this thesis contribute to the research literature and WP practice for high-cost mentoring programmes that are widely employed across programmes.

It is important to consider how the comparability of samples and missing data may have impacted on these findings. Missing data levels (see section 6.2, table 22) were relatively low across the treatment and non-treatment groups, meaning that differences in unobserved variables were of less concern. Before treatments were added to the regression models' pupils' likelihood of entering HE (section 6.4.2) was stratified and broadly in line with patterns observed across the national administrative datasets (DfE 09/10 to 17/18; OfS 2020; UCAS 2020). However, findings must be treated with caution as the treatment groups were more advantaged than the non-treatment group across many of the pupil characteristics, including KS2 attainment (see section 6.2.1, table 23). Therefore, these results may have occurred as samples were not well balanced, as treated pupils may have already been on a HE trajectory before they even engaged in Aimhigher. Despite this, the mentoring frequency (dosage) findings do point to a positive Aimhigher effect. The next section summarises treatment effect heterogeneity, which addressed some of the concerns regarding the comparability of samples.

7.2.1 RQ 1b: Is There Heterogeneity in the Treatment Effect?

There were some promising results for summer schools and mentoring pupils when heterogeneity in the treatment effects were investigated (see section 6.4.3., figure 17). The analysis provided the most controlled and unbiased estimate of results by improving the comparability between the treatment and non-treatment groups (e.g., outcomes for pupils of the same characteristics were compared, such as treated males' vs non-treated males). The literature review found no evidence of WP evaluations investigating treatment effect heterogeneity, for specific WP interventions. This evidence is important, as interventions may have positive, negative, and null impacts on pupils, depending on their characteristics. Such findings would have important practical implications for Aimhigher and the wider sector in terms of how interventions are designed to support equity of outcome.

Most estimated treatment effects were observed for summer school pupils' and were positive regardless of their characteristics. Summer school pupils' were between 133% and 231% significantly more likely to enter HE if they were White, male or spoke English as a first language, or lived in advantaged areas (POLAR AHE or IDACI), did not achieve KS2 level 4 or were non-EFSM6. Smaller but significant estimated effects of an 59% to 116% increased likelihood of entering HE was observed for pupils' who were female, non-SEN, EFSM6, EAL, Asian, those living in advantaged areas (POLAR YPR) or disadvantaged areas (POLAR AHE and IDACI) and pupils' who achieved KS2 level 4. Interestingly summer schools were more beneficial for disadvantaged pupils as they tended to have a higher likelihood of entering, HE than their more advantaged peers. However, Black, and Mixed ethnicity students and those that were SEN did not significantly benefit in their likelihood of entering HE (SEN just missed significance). It is important to note that the way Aimhigher pupils were targeted means that some pupils' may be advantaged across some measures and disadvantaged in terms of others (see chapter 4b).

A number of heterogeneous estimated treatment effects were observed for mentoring and increases in pupils' likelihood of progressing to HE (see section 6.4.3., figure 18). All but one of these significant estimated treatment effects were observed at 11-15 and 15 or more engagements, with a tendency for higher levels of engagement to be associated with an increased likelihood of mentored pupils' entering HE. Significant and larger estimated effects were observed for pupils from advantaged POLAR AHE areas who engaged 15 or more times and were 200% and 6-10 times were 88% more likely to enter HE than the non-treatment group. Pupils who engaged more than 15 times and who achieved KS2 level 4, were non-EFSM6, male, spoke English as a First language were between 69% to 104% significantly more likely to enter HE. Many pupils' who engaged 11-15 times had a significant increased likelihood of entering HE. Pupils were between 51% to 78% significantly more likely to enter HE compared to non-treated pupils' (of the same characteristic) if they were White, non-EFM6, male, and those that spoke English as a first language (KS2 achieved level 4 just missed significance). No significant treatment effects were observed for the remaining pupil controls. This included pupils' who were from a Black or Mixed ethnic group, SEN or EFSM6 status, did not achieve KS2 level 4 or those from disadvantaged areas (POLAR YPR. POLARAHE and IDACI) and advantaged areas (IDACI).

7.3 The Importance of AABs

The last two analyses investigated whether Aimhigher interventions led to improvements in pupils' AABs (analysis three), and if pupils' AABs played an important mediating role in predicting future HE entry behaviours (analysis two). The purpose of these analyses was twofold in terms of understanding how worthwhile WP programmes' attempts to improve AABs are and to determine if AABs provide a richer set of mediators (than pupil controls commonly employed e.g., via the NPD) that can account for differences in pupil outcomes. Mentoring and summer school programmes serve as key initiatives delivered by HEIs to address these aims. Both analyses presented results on a subsample of pupils from the studies population, who completed baseline and follow-up surveys. In turn, these results can only be treated as indicative.

7.3.1 RQ 3a: Is Engagement in Aimhigher (Summer School or Mentoring) Associated with an Increase in Pupils' Knowledge of HE and HE Expectations; Attitudes to HE; Academic Motivation?

Evidence suggests that inequalities in HE outcomes are mainly accounted for by the stratification of prior attainment by SES and demographic characteristics (see chapter 3 and chapter 4a). However, others have suggested that non-cognitive skills may also play an important role in influencing HE trajectories (Chowdry, 2013). Such links have been observed between pupils' AABs and attainment in secondary schools (see chapter 3). Research has reported significant effects of WP interventions on improving pupils' AABs (see chapter 3). However, much of this evidence is limited due to a lack of comparison or control groups. More robust studies employing comparison groups and a wider range of controls have found that engagement within multi-intervention WP programmes seems to be associated with pupils' having more positive attitudes and improved aspirations to HE (Morris, Rutt, and Yeshanew, 2005; Morris and Golden, 2005; Morris and Rutt, 2006). However, these studies can be criticised for a lack of controls. As WP programmes often target pupils with high levels of attainment, it is likely they will be more academically motivated and interested in engaging in such interventions. Within the delivery of programmes and research, this can lead to 'deadweight' as some pupils may intend to participate in HE, regardless of their engagement within a given intervention (Harrison and Waller, 2015). In turn, this can bias samples. More robust RCT approaches (that randomise such issues) have found no significant impact of various interventions on pupils' AABs (Go Higher West Yorkshire LiNCHigher and FORCE areas, 2018; SUN and BIT, 2019). However, these studies suffered from high attrition and did not investigate heterogeneity or dosage effects. Few studies have investigated whether increased engagement within mentoring programmes improves pupil AABs. One such study presented by O'Sullivan *et al.,* (2017) found that increased levels of engagement led to higher levels of HE knowledge and aspirations. However, this study was limited as engagement levels were based on pupils' self-reports, which may lack accuracy.

The research undertaken aimed to address these gaps in evidence by including a comparison group and important controls, to investigate if improvements in AABs were driven by pupils' engagement in Aimhigher interventions and if estimated effects varied by pupil characteristics (treatment effect heterogeneity) and frequency (dosage) of engagement.

Within the research, the strongest predictors of pupils' AAB outcome scores were scores on the same measure at baseline (e.g., baseline and outcome knowledge scores, see section 6.12.2, tables 46 and 47). If AABs play a mediating role in influencing pupils' HE entry behaviours, we would expect them to be stratified and higher for pupils from advantaged backgrounds. As would be expected strong significant predictors of lower AAB outcome scores were a pupil's ethnicity (White and Mixed ethnicity) and lower KS2 attainment (did not achieve KS2 level 4). This later finding is in line with the published literature (see chapter 3) which supported an association between higher levels of attainment and higher AABs (Morris and Rutt, 2005; 2006; Goodman *et al.,* 2010; Chowdry, Crawford, and Goodman, 2011). Other strong predictors pointed to that pupils from advantaged backgrounds were more likely to have higher AAB outcomes than those from disadvantaged backgrounds. The findings are supported by the wider research literature that has reported that parent and child HE knowledge, attitudes and aspirations/expectations are stratified by socio-economic and family background (Morris and Rutt, 2005; 2006; Goodman and Gregg 2010; Chowdry, Crawford, and Goodman, 2011; Häs *et al.,* 2021). These results suggested that the estimated treatment effects (outlined below) in part may be driven by some more advantaged pupils' having higher HE knowledge and HE attitude outcome scores. This issue will be considered in more detail within section 7.3.2.

The descriptive data (section 6.12.1) showed that non-treated pupils' mean outcome scores tended to be negative (e.g., scores decreased from the baseline to the follow-up survey). For treated pupils' the pattern of results was more mixed across AABs with positive, negative, and null changes in outcome scores. When considering treatment effects (section 6.12.2) summer schools were found to significantly improve pupils' HE knowledge and HE attitudes. Summer schools were slightly more effective in improving pupils' HE knowledge than mentoring. For mentoring significant improvements in pupils', HE knowledge scores were observed when they engaged 6-10 or 11-15 times. Higher levels of engagement (11-15) were associated with higher HE knowledge scores. Evidence presented by O'Sullivan *et al.*, (2017) reports similar findings for a school mentoring programme where associations between increased engagement and improved HE knowledge were observed. Neither summer schools nor mentoring was found to significantly improve pupils' HE expectations or academic motivations (see section 6.12.3). Some of these coefficients were positive, although most were close to zero showing no overall effect. However, some significant treatment effects was observed when heterogeneity in the treatment effects were investigated (see section 7.3.2).

An explanation of why few effects were observed for pupils' HE expectations and academic motivations is provided by Nash (2000) who suggested that aspirations are deeply rooted within the family environment and social context. To improve aspirations, interventions will need to change the existing frames of reference within the family and peer environment. The implication of this explanation is that for WP programmes to impact on disadvantaged pupils' aspirations and the likelihood of entering HE, interventions need to take a holistic approach by focusing on both pupils and their parents/carers.

It is important to consider how the comparability of samples and missing data may have impacted on these findings and the inferences that can be drawn. The mentoring cohort was far more disadvantaged than the non-treatment group (see section 6.11.1, tables 38 and 39) across many of the controls (including attainment, academic motivations, and HE expectations). Therefore, this means that the findings are more robust, as these pupils would be expected to have lower AABs than the non-treatment group. The sample of summer school pupils was only very small (n32) and far more advantaged than the non-treatment group (see section 6.11.1, tables 38 and 39). The summer school analysis is likely to be underpowered. In turn, results are indicative. Missing data levels were very high across both treatment types (see section 6.11, table 37), as not all pupils completed surveys. High levels of missing data may reduce the ability to control for differences between the treatment and comparison groups. Moreover, where there are differing rates and items of missingness, this suggests that other unobserved differences are also more likely. Despite these limitations, the associations between higher levels of engagement within mentoring discussed provided more promising findings of an Aimhigher effect. Further, the heterogenous treatment effects (discussed below) provided far more control and comparability across the samples, meaning the estimated effects were more robust.

7.3.2 RQ 3b: Is There Heterogeneity in the Treatment Effect?

Although there is widespread evidence within the literature of pupil AABs being stratified by pupil characteristics (see previous section), no evidence exists in terms of whether specific WP interventions are more or less effective in improving AABs for pupils' holding different characteristics. This evidence has important practical and policy implications for how WP programmes are targeted and delivered. The treatment effect heterogeneity analysis provided the most controlled and unbiased estimate of results by improving the comparability between the treatment and non-treatment groups. The analysis was only presented for the standalone mentoring model, as when modelling results by frequency of engagement, sample sizes became far too small to provide robust insights.

These results showed that improvements in AABs varied widely across pupil characteristics (see section 6.12.3), although disadvantaged pupils tended to experience larger improvements. Most of these significant effects were positive (87%), suggesting that Aimhigher interventions improved some pupils' AABs. Most mentored pupils' and just under half of summer school pupils experienced significant improvements in their HE knowledge. Very few significant treatment effects were observed across the other AABs. Significant improvements in summer school pupils' HE attitudes (see section 6.12.3, figure 33) were observed if they were White, spoke English as a first language or lived in advantaged IDACI areas. Mentoring also significantly improved EFSM6 pupils' HE attitudes (see section 6.12.3, figure 29). However, mentored pupils' academic motivations and expectations (see section 6.12.3, figure 30 and 28) decreased if they were non-EFSM6 or lived in advantaged IDACI areas. Summer schools were not found to improve pupils' HE expectations or academic motivations. It is likely that the summer school analysis is underpowered as the sample was small (n32) and decreased even further when controls were broken down into subgroups (e.g., ethnicity). This could explain why many of the heterogeneity in the treatment effects and resulting coefficients were large but non-significant.

Across the pupil characteristics within the mentoring and summer school heterogeneity analysis (see section 6.12.3), most (70%) pupils experienced at least an improvement across one of the AABs. However, no significant improvements in Black pupils' AABs were observed. More advantaged pupils were more likely to experience null and significant negative treatment effects. No significant improvements in pupils' AABs were observed for pupils' who were Asian, EAL or lived in a disadvantaged area (POLARYPR). As outlined above, mentored pupils from advantaged IDACI areas only experienced negative treatment effects across their HE expectations and academic motivations. For non-EFSM6 pupils', some improvements were observed in their HE knowledge and attitude scores although negative effects were observed for mentored pupils' HE expectations and academic motivations. It is important to note advantaged pupils' were likely to be disadvantaged across other measures, due to the nature of the Aimhigher composite targeting model (see chapter 4b, section 4.2.3). This analysis has demonstrated that the treatment effect heterogeneity analysis is useful to identify which pupils experienced positive, negative, and null benefits from the intervention. Until this analysis was completed only treatment effects were observed for mentored pupils' HE knowledge. Significant negative heterogeneous effects were observed for some mentored pupils' HE expectations and academic motivations and positive effects for HE attitudes. The practical, policy and research implications of these findings are discussed in more detail within section 7.6.

7.4 RQ 2a: Is There an Association Between AABs (HE Knowledge; HE Expectations; Academic Motivations; and more Positive Attitudes to HE) and a Pupil's Likelihood of Entering HE?

No published evidence has thoroughly investigated if AABs addressed by WP programmes are associated with HE entry. This is surprising, considering the significant amounts of resource allocated by HEIs to improve pupil AABs. The research presented in this thesis investigated the mediating power of four AABs (HE knowledge, attitudes, expectations, and academic motivation) on pupils' HE entry behaviours and whether these were stratified by pupil characteristics (e.g., advantaged vs disadvantaged). These research questions have important policy and practical implications for WP programmes in terms of how resources can be more effectively deployed and targeted. If AABs are found to be stratified and important mediators for HE entry, then this would suggest that programmes are focusing on important mechanisms that can reduce inequalities in HE participation. Alternatively, if no associations are observed, this would suggest that WP interventions may need to direct resources elsewhere.

Within the literature review evidence was reviewed to ascertain which pupils were under-represented in HE (Chapters 3 and 4a). The evidence tended to focus on a) national administrative datasets (DfE, UCAS and OfS) and SES inequalities in HE; b) and how these inequalities were largely determined by prior attainment[29] (Crawford and Greaves, 2015; Gorard *et al.,* 2018); c) and more recent studies that matched the national pupil database (NPD) to national survey data to determine if pupils' HE aspirations were important predictors of HE entry (Siddiqui, Boliver and Gorard, 2019; Croll and Attwood, 2013). The evidence presented here was mixed. Croll and Atwood (2013) reported that aspirations influenced pupils' HE entry behaviours. Whereas, when a richer set of controls were employed via the NPD, Siddiqui, Boliver and Gorard (2019) found that aspirations accounted for only 3% of the variance in HE entry. This evidence largely supports the view that WP programmes should focus efforts on improving disadvantaged pupils' attainment as this is the main factor that reduces their likelihood of entering HE (Crawford and Greaves, 2015; Gorard 2018).

However, this evidence was limited as it overlooked AABs or focused on a limited number (e.g., aspirations). It is possible that these factors (HE knowledge, attitudes, and academic motivation) could explain more of the differences in HE participation. More importantly, this evidence focused on pupils of all SES backgrounds and attainment levels and not the cohorts of pupils commonly targeted by WP programmes. WP programmes including Aimhigher tend to target disadvantaged pupils who have the potential to progress to HE (5 A*-C GCSE's or equivalent including English and maths)[30]. Two critical studies suggest that disadvantaged pupils' are still less likely to participate in HE even when they obtain similar GCSE scores to their more advantaged peers (Chowdry, Crawford, and Goodman, 2010; HEFCE 2016). As attainment is not a barrier to their HE participation, it is possible that this is due to pre-existing differences in AABs (Chowdry *et al.,* 2013).

The research undertaken addressed these gaps and provided a better understanding of whether the inclusion of four types of AABs (measured via baseline and follow-up surveys)

[29] This is a highly topical debate in terms of who WP programmes should be targeting, as these studies would suggest that more progress could be made in addressing HE inequalities by improving disadvantaged pupils' attainment. However, it is debated whether HEIs should be using current student tuition fees to support this work and if all HEIs have the capacity, resource, and expertise to support this work. This debate is beyond the scope of this study.

[30] Under the reformed GCSE qualification framework this is equivalent to a grade of 4 or 5.

could account for more of the differences in pupils' HE entry behaviours than controls commonly employed in research relating to pupils' attainment, socio-economic and demographic characteristics. The analysis was based on the non-treatment group only, as it provided a larger and more valid sample that had not engaged in Aimhigher interventions. Forty-five per cent of the non-treatment group completed both the baseline and follow-up surveys.

The analysis investigated the predictive power of pupil controls and AABs in influencing pupils' HE trajectories. The analysis (see section 6.8.2, table 31) found that the model had weak predictive power (7.3%) with the inclusion of pupil controls (attainment, socio-economic and demographic). The predictive power increased to moderate (baseline 12.2% and follow-up surveys 11.5%) once AABs were included. This suggests that AABs accounted for some of the differences in HE entry than can be explained by most controls commonly employed within WP research (via the NPD) and measures employed by WP programmes to target pupils'. The practical and policy implications of these results are discussed in section 7.6.

Further, the analysis found that pupils with high HE expectations, attitudes and academic motivations were between 70% to 81% significantly more likely to enter HE than pupils with lower scores (see section 6.8.2, table 32). No significant associations were observed for the HE knowledge survey. A plausible explanation for this result was that HE knowledge mean scores for non-treated pupils' were low and much lower than those observed for other AABs (see section 6.7.1). This means that pupils' did not actually have high levels of HE knowledge and were not necessarily well informed about student finances, life in university, or how to apply. A sub-analysis conducted (see section 6.8.2) with the treatment group found that high baseline HE knowledge scores were associated with a 44% increased likelihood of pupils' entering HE, although this association was weaker than the other AABs.

Previous studies have also reported an association between pupils' HE attitudes and their likelihood of applying to HE (Dumais and Ward, 2010; DCSF, LYPSE study, 2009, Goodman *et al.*, 2010, Chowdry, Crawford, and Goodman, 2010; Davies, Qiu, and Davies, 2014). Studies have also found that higher levels of HE knowledge are associated with an increased likelihood of pupils' aspiring or applying to HE (Dumais and Ward, 2010; Davies and Qiu, 2012). The results are in line with previous evidence presented by Croll and Attwood (2013) who found that HE aspirations were associated with HE entry behaviours. However, other studies have found that HE aspirations have little influence on HE entry behaviours when a richer set of controls are included (Siddiqui, Boliver and Gorard, 2019). As previously outlined, all of these studies included samples of pupils of all attainment levels whereas the research undertaken includes a sample of high-attaining pupils' (see section 6.7.1). Crawford and Goodman (2011) argued that raising disadvantaged pupils' aspirations was likely to have a limited impact in closing SES differences in HE participation. Findings within the research undertaken do not support this claim and instead suggest that WP programmes should continue to place significant emphasis on increasing disadvantaged pupils' aspirations / expectations to address inequalities in HE participation.

The research presented in this thesis contributes to the field by providing an understanding of the importance of a wider set of AABs on influencing HE entry behaviours for the cohorts of pupils often targeted by WP programmes (higher-attaining disadvantaged pupils').

7.4.1 RQ 2b: Is this Association Stratified by Pupil Characteristics (Attainment, Demographic, Socio-Economic and AABs)?

Evidence has also found that parental and child HE attitudes, and HE knowledge are stratified by socio-economic class and other characteristics (Connor *et al.*, 2001; Gabaix and Laibson, 2006; Morris and Rutt, 2005; 2006; Bowes *et al.*, 2015; Callender and Jackson, 2017). In terms of the stratification of HE expectations/aspirations, the evidence is more mixed, with some studies reporting an association (St Clair, Kintrea and Houston, 2013; Archer and Kane, 2014; Baker *et al.*, 2014; Häs *et al.*, 2021) and other studies finding no evidence for such an association (Marjoribanks, 2005; Goodman, Gregg and Washbrook, 2011; Gorard, See and Davies, 2011). Many of these studies have tended to focus on HE aspirations or, at best, the influence of AABs up to the stage of HE application. While there is a strong field of evidence to suggest some AABs are stratified by pupil characteristics, evidence is lacking in terms of the influence of AABs on actual HE entry behaviours. The research undertaken addressed this gap.

As outlined all AABs were significant predictors of pupils' HE entry behaviours, although HE expectations, attitudes and academic motivations were the strongest predictors. The final analysis interacted the baseline and follow-up AABs with each pupil characteristic. This enabled the analysis to understand if AABs were stratified by pupils' characteristics. The analysis provided much more control by comparing the association between HE entry outcomes by high and low AAB scores for pupils of the same characteristic (e.g., males with low and high HE knowledge scores). The findings suggested that regardless of their background characteristics, almost all pupils' who had higher AAB scores were significantly more likely to enter HE (section 6.8.3). The association between higher AABs and the likelihood of entering HE was stratified across most pupil characteristics. This association was stronger for advantaged than disadvantaged pupils. These results are in line with administrative datasets which show how HE participation is stratified by pupil background characteristics (see chapter 4a).

The findings suggest that the significant observations within analysis one between Aimhigher treatments and an increased likelihood of pupils' entering HE (see section 6.10.1), may not be valid as the analysis did not include pupil AABs. This analysis has shown some AABs may play a more important mediating role in pupils' likelihood of entering HE, than those commonly employed (pupil characteristics) within research via the NPD (Crawford and Greaves, 2015; Gorard 2018). However, to draw robust inferences between both analyses, it is important to understand how similar the samples were. The sample was well matched to the non-treatment group in analysis one in terms of observed characteristics (see section 6.7.1, figure 28b) and both samples were similar in terms of pupils' HE entry rates (analysis one, 30.1% and this analysis, 34.8%). However, the survey sub-sample had large amounts of missing data (varying from 55% to 58% across controls). In turn, findings are indicative, as making inferences and linkages between each analysis must be treated with caution as it is not possible to say the AAB treatment effects (e.g., mainly HE knowledge) observed within analysis three, accounted for most of the differences in pupils' increased likelihood of entering HE (analysis one).

The wider implications of these findings are important, as analysis two provided evidence to suggest that HE expectations, attitudes and academic motivations were the strongest predictors of pupils' HE entry behaviours. HE knowledge was also found to be important but less so. In turn, the current analysis has shown that Aimhigher interventions are more likely to improve pupils' HE knowledge and have less of an impact on improving AABs that are more likely to influence HE entry behaviours. These findings contribute to the literature by providing evidence that HE entry is associated with pupils' AABs and that this association is stratified by their background characteristics. In turn, these findings suggest that placing more emphasis on improving pupils' HE expectations, attitudes and academic motivations may be more helpful in closing gaps in HE participation. Improving pupils' knowledge may also be helpful in meeting these aims, but less so than improving other pupil AABs. This evidence suggests that improving pupil AABs may support the OfS policy requirement for HEIs to focus more WP resource on improving pupil attainment. The practical and policy implications of these findings are picked up in more detail within section 7.6.

7.4.2 RQ 2c: Are Aimhigher Survey Measures Reliable?

The measurement of the impact of WP programmes via surveys is widespread across the sector. Surveys tend to be employed to measure whether engagement within a given intervention has improved a pupil's short-term outcomes (e.g., HE knowledge, aspirations/expectations, attitudes, academic motivation, and confidence). Despite widespread use, there is no published evidence in terms of the reliability and validity of these evaluation toolkits. The validity of such measures was discussed in the previous section. The study also investigated the reliability of survey items by determining if survey scores for each AAB measure were stable over time (one-year) when re-tested with the same pupils' (see section 6.8.1, table 29). This involved comparing non-treatment pupils' scores from the baseline to follow-up surveys. The analysis found that all measures were highly reliable with strong (HE expectations, HE attitudes and academic motivation) to moderate (HE knowledge) significant correlations between baseline and follow-up survey scores.

The findings summarised within this section address a significant gap within the academic literature and suggests that the HE knowledge, expectations, HE attitude, and academic motivation survey items were reliable and valid measures of HE entry behaviours. The practical implications of these findings are discussed in more detail within section 7.6.2, with reference to how these measures can support programme targeting and the identification of pupils' needs.

7.5 Reliability and Validity of Findings

This section considers some of the wider issues surrounding the reliability and validity of findings in terms of constructs that were not measured, the recruitment and selection of schools, pupils' and the strength and weaknesses of the survey measures employed.

7.5.1 Missing Control, Mediator and Outcome Data

As outlined within the method chapter (section, 5.1.1a), the research undertaken controlled for most of the factors that the literature has shown to influence pupil educational attainment and HE participation (e.g., pupil attainment, SES, demographics and AABs). Chapter 4a provided a review of these controls and outlined that individual-level controls tend to be more valid indicators of disadvantage than aggregate level measures (e.g., neighbourhood measures of disadvantaged). Due to restrictions and delays in accessing the NPD data, it was not possible to include or control for all factors which may have influenced pupils' intentions / expectations, attainment, or HE participation. In turn, no measures were included for pupils' who were in care (Joseph Rowntree Foundation 2007), or pupils' KS4 attainment or level 3 progression data. However, KS2 attainment was employed as a control. The use of this control is supported as evidence suggests that KS4 attainment is mainly determined by prior attainment (Goodman and Gregg, 2010).

The research employed a non-randomised design for both practical and ethical reasons (see section 7.6.5). As participants were not randomised into the treatment and non-treatment groups, they could have differed in terms of unobserved variables that are associated with attainment and HE participation. These include school attendance (Taylor 2012), parental education (Connor *et al*., 2001; Sutton Trust, 2010), parental involvement in their children's education (Gorard, See and Davies, 2012), parenting style, parenting expectations/aspirations (Goodman and Gregg, 2010), parents' attitudes and behaviours (Strand, 2007; Goodman and Gregg, 2010), pupil/parent behaviours (DCSF, 2009) and school environment (Bandura, 1994; Newmann, 2001). Further, the research did not measure whether pupils engaged within other non-Aimhigher WP interventions. In particular, this is likely to have suppressed the treatment effects observed (e.g., as non-treated pupils may have actually accessed other interventions). It is important to note that HE treatment effects may have differed depending on the time that had elapsed between when pupils' engaged in the programme. It is possible that pupils' likelihood of entering HE was lower if they only engaged in an Aimhigher intervention within year 9 or 10 compared to those engaging closer to the point of HE entry (e.g., years 11-13). The research undertaken did not control for this factor within the analysis.

This main impact measure of the research was whether or not pupils entered HE, by the age of 18. Tracking participation into HE for older students was beyond the scope of the research undertaken. However, if students were tracked into their twenties, HE entry rates would be expected to be higher. Data suggests that in 2017/18, the HE participation rate of 18-year-olds was 28.6% compared to 50.2% for 17–30-year-olds (DfE, 2019). Another important point includes the wider impact of the Aimhigher mentoring scheme, which was not measured. If pupils were not at all interested in participating in HE, often mentors provided support and advice on other pathways into work and training. Therefore, the programme could have led to other positive post-16 destinations for some pupils.

7.5.2 School and Pupil Sampling

This section considers how the opportunistic sampling approach employed within the study and attrition may have led to sampling bias. These are important issues to consider as the schools and pupils that participated in the study may have differed in terms of their characteristics from those that did not participate. Such factors may have impacted on the findings reported. Of those pupils' engaging in the programme, three-quarters were tracked in terms of HE outcomes and just over one-quarter of these pupils (and 7.1% of schools) completed the surveys (see method section 5.4.3). In terms of this attrition (missing data and no consent), it is not possible to identify if these pupils' differed from those being tracked as either their data was destroyed due to non-consent or background data was missing.

As outlined earlier within the literature review (chapter 3) and method (section 5.1.1a), evaluations that do not employ randomised controlled trials are more likely to suffer from selection bias (Gorard *et al.*, 2006; Gorard, 2012; Robinson and Salvestrini, 2020). Further, participants who do not volunteer (Silverman, 1997) and those that drop out (attrition) (Torgerson *et al*., 2008) are likely to differ in terms of characteristics from those who participate, and this can affect findings (e.g., the outcome being measured). For example, Harrisson and Waller (2015) suggest that pupils' who engage in WP interventions are likely to be more academically motivated and already on a HE trajectory, compared to those that do not engage.

Within the research undertaken it was possible to compare the characteristics of pupils that did (treatment group) and (a sample) of pupils' who did not engage (non-treatment group). Analysis three (AAB outcomes, see section 6.1.1) found that mentored pupils' were significantly more disadvantaged than the non-treatment group across over half (7 out of 13) of the characteristics including attainment and academic motivation. Conversely, pupils' who engaged in summer schools were significantly more advantaged than the non-treatment group across just under half (6 out of 13) of the controls, including motivation but were well matched across several other characteristics including attainment (KS2). However, within analysis one (HE entry outcome, section 6.2.1) both the summer school and mentored cohorts were overall more advantaged than the non-treatment group. This bias can affect the outcome and findings in two ways. Where treatment groups are more advantaged than the non-treatment group, they could be expected to have higher AABs and an increased likelihood of entering HE than the non-treatment group irrespective of whether or not they access an Aimhigher intervention. Conversely, where the treatment group is more disadvantaged than the non-treatment group the opposite relationship could be expected (see literature review).

Pupils who completed surveys had lower levels of engagement within the programme (M = 6.34) compared to pupils that did not complete the surveys (M = 8.71). Further, schools that participated in the surveys were more disadvantaged (including attainment) than those that did not take part (see method section 5.4.3). In turn, this sample was more disadvantaged than the pupils' included within analysis one (HE entry outcome) and it would be expected that the pupils' within analysis three would have lower AABs and a decreased likelihood of entering HE (see literature review).

Surveys were completed with 20 cohorts of pupils across year groups 9-13 (see method section 5.4.3). The method (section 5.4.3) summarised data to show that baseline and follow-up surveys were completed by 27.1% of pupils within the study (1,275 out of 4,700 pupils'). Response rates were highest for the non-treatment group (45.1%) and lower for mentoring (11.4%) and summer school pupils (5.3%). The summer school sample was very small (n32). As outlined within analysis three, this may have suppressed the significance of some of the large summer school treatment coefficients observed. Schafer and Graham, (2002) outlined how missing data can bias results and limit generalisations that can be made to wider populations. Siddiqui, Boliver and Gorard (2019) suggest that the inferences that can be drawn from surveys are often limited, due to missing data emanating from item non-response and attrition. Their analysis of the DFE Next Steps longitudinal survey suggested that cohorts with more missing data were more likely to be from disadvantaged low-income households and less likely to enter HE. In turn, this can inflate reported outcomes within a study as full data (e.g., on SES) is more likely to be available for the advantaged cohorts. The authors conclude that this impacts on the reliability of findings. However, it is important to note that in the research undertaken, more treatment group pupils completed baseline and follow-up surveys but were excluded from the analysis as they had not engaged in an Aimhigher intervention between the baseline and follow-up survey. The next section discusses the validity and reliability of the survey measures.

7.5.3 The Validity of Surveys

Online surveys were deemed the most efficient way to collect data on pupils' AABs, due to the size of the cohorts being tracked. The method (see section 5.1.1a) outlined some of the main benefits of employing surveys. However, it is important to consider that there are inherent limitations within the use of surveys which could impact on the reliability of findings. It is well reported within the literature that surveys may suffer from demand characteristics (Orne, 1962) and social desirability (Nederhof, 1985) and reported HE intentions and expectations may not always reflect actual HE entry behaviours (Goodman *et al.*, 2010). Further, surveys may suffer from acquiescence where participants answer questions affirmatively, regardless of what the question is asking (Cronbach, 1942). As the researcher was not present when participants completed the survey, it is possible there was some level of misunderstanding of question items. However, this is also a strength as this could reduce the effects of researcher contamination (Labov, 1973) and some effects of social desirability[31] (Brace, 2004). As outlined within the method (section 5.2.2) to improve participants' understanding of question items definitions were provided, questions were piloted on pupils' and all survey items were tested for age appropriateness/reading age via the SMOG calculator (McLaughlin, 1969).

Evidence suggests that Likert scales are valid and reliable ways of measuring attitudes (Hasson, Bengt and Arnetz, 2005) and children find them easier to understand (Van Laerhoven and van der Zaag-Loonen, 2004). Within the survey, all response formats were measured on a five-point ordinal Likert scale (e.g., *'strongly Agree'* to *'strongly disagree'* and *'definitely'* to *'definitely not'*). This provided a more sensitive measure to gather differences or changes in perceptions and attitudes than would be elicited by closed binary response formats ('yes'/ 'no'). Diamantopoulos, Marko, and Fuchs (2012) argue that four or more Likert items are required for internal consistency and Hinkin (1995) outlines that the reliability of the scale decreases above five items.

Within the current study data for analysis, three was transformed into interval scores to allow linear regression tests to be performed. Descriptive statistics showed that the data met the assumption of the test as it was normally distributed (see section 6.12.1). It has been argued that Likert scales are ordinal as the distance between each point is not equal; and does not meet the assumptions of parametric statistical tests (Stevens, 1946). However, others have found that these assumptions are not violated (Carifio and Perla 2007; Norman 2010) and that aggregating data from items into sub-scales (as within the current study) is widely accepted as providing interval data (Allen and Seaman 2007; Carifio and Perla 2007). The analysis showed that mean survey scores across both treatments (mentoring $M = 3.59$ to $M = 4.04$ and summer school $M = 3.91$ to $M = 4.72$) and the non-treatment group ($M= 3.26$ to $M = 4.26$) were high at baseline leaving little room for improvement in scores within the follow-up survey. HE expectations and academic motivation mean baseline scores were above 4.0 for the treatment and non-treatment groups. Evidence suggests that 7-point scales can provide a more sensitive and accurate measure of responses (Finstad, 2010) although as previously outlined Hinkin (1995) suggests this may impact on reliability. Further, West (2014) found that pupils' self-reporting on non-cognitive skills lacked validity due to

[31]Participants may try to please the interviewer by answering in a particular way. Questions were not particularly emotive / sensitive, but students that engaged in Aimhigher activities may have answered in such a way.

reference bias. This is where responses are influenced by comparison standards, and this may differ by the school attended.

Another important point to consider is that baseline and follow-up surveys were completed over an academic year and only encompassed pupils' engagement within Aimhigher during the short-time period. It is possible that more significant differences would have been observed if pupils' were provided with more opportunities to engage within interventions and if surveys were conducted over a longer period of time.

7.6 Policy and Practical Implications for Widening Participation Programmes

This section discusses the policy and practical implications of findings in terms of the Aimhigher programme and the wider WP sector. This includes a consideration of how findings can inform improvements in programme effectiveness in terms of design, delivery, targeting and evaluation / research.

7.6.1 The Impact of Changes in Educational Policy on Young Peoples' AABs and Likelihood of Entering HE

It is important to consider the wider context and external factors that could have influenced the impact of Aimhigher interventions on pupils' AABs and the likelihood of entering HE. The research tracked pupils in year groups 9-13 through their secondary education to the point of HE entry. Pupils were tracked across the 2011/2012 to 2018/2019 academic years. Therefore, it is important to note that none of the pupils' educational outcomes would have been adversely impacted by the COVID-19 pandemic. As outlined within the literature review (chapter 2, section 2.1.4) during this time there were significant changes to Government policy across compulsory schooling and HE. The ending of Educational Maintenance Allowance (financial support) for disadvantaged pupils' may have reduced their progression to sixth form, FE colleges or HE. The literature review outlined that there is evidence to support this claim (The Institute of Fiscal Studies, 2011; Horton and Thompson, 2011). Further, in 2012 tuition fees increased from £3,000 to a maximum of £9,000. The evidence presented within the literature review (chapter 4a, HESA, UCAS and OfS administrative datasets) suggests that some of these policy changes may have led to a flatlining or slight reduction in disadvantaged students applying and entering HE, until more recent years.

However, other policy decisions are likely to have improved young peoples' educational qualifications or even progression to HE. The introduction of raising the participation age (RPA) from age 16 in 2013 to age 18 in 2016, required young people to stay on in full-time education or training or volunteering with part-time work. Other policies may have helped to increase disadvantaged pupils' progression to HE, including increases in government funding for national WP programmes in 2016 and the decision to allow more students to enter HE via the cessation of the cap on HE student number controls in 2013.

As these policies were implemented in different academic years, the impact on participants within the research presented in this thesis will vary. In turn, it is difficult to discern the influence of these policies on participants' attainment, HE aspirations, attitudes, academic motivations, and their decisions on whether to enter HE. However, analysis three provided evidence that Aimhigher interventions were less effective in improving pupils' HE expectations and academic motivations. It is possible that this was due to the external factors discussed. Within the research, if the sample sizes were much larger, these effects could have been separated by investigating whether outcomes varied by year group.

All pupils within the study completed baseline and follow-up surveys either from 2012/13 to 2013/14 or 2013/14 to 2014/15. Most of these policies discussed were implemented in the year the first cohort were completing their baseline surveys. As outlined in analysis three (see section 6.12.1) non-treated and treated pupils tended to experience negative changes in terms of their outcome AABs. Both mentoring and summer school pupils' experienced improvements in HE knowledge outcome scores. Across other AAB measures, the patterns were more mixed with outcome scores either close to zero (HE attitudes in both treatments) or decreasing (HE expectations and academic motivations for mentoring).

This emphasises the importance of WP research to include a comparison group. The non-treatment group provided a useful yardstick in terms of what might have happened to treated pupils' AABs and HE entry behaviours if they had not participated in an Aimhigher intervention. Without a comparison group, the small and negative changes in other AABs may have been viewed as a negative treatment effect. However, in some cases, these effects were observed across both the treated and non-treated groups. The negative effects could have been caused by external factors such as changes in educational policy discussed. All WP studies should include a comparison group, as without this treated pupils' outcomes may be deemed to be very low and in turn, suppress the observed impact of the programme.

7.6.2 The Measurement of AABs: Practical and Policy Implications

The findings provide a significant contribution to the literature and WP programme delivery in terms of identifying non-cognitive mechanisms (AABs) that may help to significantly improve pupils' likelihood of entering HE. No published studies have investigated such effects across all AABs for the cohorts targeted (good attainment) by WP programmes. A pupil's HE expectations, HE attitudes, and academic motivations were found to be valid predictors (mediators) of a pupil's likelihood of entering HE. HE knowledge was also found to be a valid predictor of pupil HE entry behaviours, but less so than the other AABs. These findings have critical implications for the Aimhigher programme and more widely across the sector. Aimhigher summer schools and mentoring were found to improve most pupils' knowledge of HE. Summer schools and mentoring were also found to be effective in improving some pupils' HE attitudes. However, no positive treatment effects were observed for pupils' HE expectations and academic motivations. Both these factors were found to be strongly associated with HE entry behaviours. These findings suggest that the content of the Aimhigher programme should be reviewed to ensure that interventions are more effective in improving these outcomes.

Further, all survey measures were highly reliable (see section 6.8.1) with strong (HE expectations, HE attitudes and academic motivation) to moderate (HE knowledge) significant correlations between baseline and follow-up survey scores. There is no published evidence on the reliability and validity of such measures that are widely employed across WP programmes. Therefore, as the HE expectation, HE attitude and academic motivation survey measures are reliable and valid indicators, they could be employed more widely across the sector to evaluate outcomes from programmes. Further, these measures were found to provide a richer set of controls than pupil characteristics and could explain more of the differences in HE entry. This finding suggests that these AABs should be measured within academic research alongside pupil controls (e.g., attainment and socio-economic background) commonly accessed via the NPD.

WP programmes could employ baseline measures of pupils' AABs to identify those who are least likely to enter HE (see section 7.6.3). Pupils with low scores could be identified before intervention and targeted accordingly, with other measures of disadvantage that are currently employed. By utilising and targeting schemes in this way, would help to reduce 'deadweight' by ensuring pupils' who are more likely to enter HE are not targeted (e.g., pupils with higher AABs who may already be on a HE trajectory without accessing WP interventions). Collecting this data would support a learner analytics approach to target pupils more effectively by pre-screening those that are in most need of intervention. This would help to ensure resources are deployed in an effective and holistic way to address the needs of particular pupils, year groups and schools.

7.6.3 The Importance of Measuring Dosage of Engagement and Heterogeneity in the Treatment Effect

Mentoring and summer school programmes are high-cost interventions widely employed across the sector. No robust evidence has been presented within the literature on whether higher levels of engagement within mentoring were associated with improvements in outcomes and if pupils with different characteristics benefit more than others when engaging within mentoring and summer school interventions. When evidence is presented, it tends to focus on multi-intervention programmes, lacks important controls (Burgess, Horton and Moores, 2021) or includes pupils' self-reports of their engagement in mentoring (O'Sullivan *et al.*, 2017) which may respectively lack specificity and be inaccurate. Such evidence has important implications for WP policy and practice.

The research undertaken demonstrated that investigating the dosage of engagement for an isolated intervention (mentoring) and heterogeneity, identified treatment effects that would not have been observed with a binary model (e.g., treated or not). The findings have important implications for the Aimhigher programme, as mentoring was not found to improve pupils' likelihood of entering HE below ten engagements. As engagement increased from 11-15 to 15 or more mentoring sessions[32], a pupil's likelihood of entering HE increased. Mentored pupils' HE knowledge scores were found to improve between 6-10 and 11-15 engagements. No other significant effects were observed for mentored pupils in terms of their AABs until treatment effect heterogeneity was considered (discussed below) and these effects were few and far between. There are a number of possible explanations for these findings. It is possible that pupils' who engaged in fewer mentoring sessions did not experience improvements in outcomes, as they were less motivated to go to HE and in turn dropped out of the scheme early. In some cases, and quite often mentors reported that school staff would not allow pupils out of lessons to attend their mentoring sessions. Within this study, 54.4% of pupils (863) engaged in less than 11 mentoring sessions. As outcomes generally were more positive above 10 engagements, the programme has the potential to be more effective by increasing engagement levels and pupil outcomes.

These findings have important implications for the Aimhigher programme as monitoring reports suggest that before 2018/19, on average pupils' engaged over 10 times within the mentoring programme. However, in 2018/2019 engagement dropped to an average of 9.1 sessions and in 2019/2020 to 8.3 sessions. The Aimhigher programme should review current engagement levels with a view to increasing engagement to 11-15 sessions. The evidence presented suggests that this provides the optimal level of impact for pupils. It is important to note that, measuring outcomes by the quantity of engagement is quite a crude measure of impact, as the quality of engagement is also important (Ek and Funk, 2002; O'Sullivan *et al.*, 2017).

Investigating treatment effect heterogeneity provided the most controlled and unbiased estimate of results. The findings highlight that it cannot be assumed that summer school and mentoring interventions have a similar impact on pupils' of differing characteristics, as these effects were often positive, null and in some cases negative. Post-treatment mentored pupils' from more advantaged backgrounds (IDACI and non-EFSM6) experienced decreases in their HE expectations and academic motivations. All negative associations were observed for advantaged pupils. Post-treatment the majority (70%) of pupils experienced positive increases in one or more AABs, although beyond HE knowledge most

[32] One other treatment effect was observed at 6-10 engagements where HE entry rates improved for pupils from advantaged POLAR AHE areas.

were not significant. Black pupils did not significantly benefit at all post-treatment in terms of their AABs or likelihood of entering HE. Pupils from a Mixed ethnicity and SEN status also did not experience any post-treatment effects in terms of their likelihood of entering HE. Further, no significant improvements in pupils' AABs were observed if they lived in disadvantaged areas (POLARYPR). However, other than these findings the results were very promising as the Aimhigher programme seems to have improved some pupils' HE attitudes and most pupils' HE knowledge and HE entry outcomes. Many of these groups of disadvantaged young people are reported to be under-represented in HE (see chapter 4a, DfE 09/10 to 17/18; OfS 2020; UCAS 2020).

These findings suggest that the Aimhigher programme needs to understand why interventions are less effective in terms of improving SEN, Black and Mixed ethnicity pupils' outcomes. It is possible that few Aimhigher peer mentoring role models of a similar background were matched to pupils. However, there is no data is available to validate this claim. Studies have found that mentors are more likely to improve pupils' AABs if they are more relatable and from a similar background (White, Hogg and Terry, 2002; O'Sullivan *et al.*, 2017; Koshy and Smith, 2019).

The findings suggest that future WP research should include measures of engagement and heterogeneity, as without them significant effects may be suppressed. Further, the finding that interventions were not significantly effective for some pupils' is an area of concern. Identifying differences in outcome by characteristics is useful, as this suggests that programme delivery and content may need to be changed to support equity of outcome. No WP research within the literature has systematically investigated such effects. Measuring heterogeneity and dosage effects also has important implications in terms of how programme resources can be employed more efficiently and effectively to support much faster progress in closing gaps in HE participation. As most HEIs are a member of one of the three WP access tracking databases approved by the OfS, such measurements can easily be built into future research.

7.6.4 Sustained Progressive Programmes

There is evidence to suggest that sustained progressive programmes / multi-intervention programmes are more effective in increasing disadvantaged pupils' likelihood of entering

HE. Burgess, Horton and Moores (2021) evaluation of the Aimhigher Uni Connect programme found that increased engagement up to an optimal point (five to six engagements) was associated to an increased likelihood of pupils' participating in HE (UCAS acceptance). The research presented in this thesis provided similar findings, as higher levels of engagement in mentoring improved pupils' AABs and likelihood of entering HE. The Aimhigher Uni Connect programme evaluated by Burgess, Horton and Moores (2021) is a national WP programme funded by the OfS. From 2017/18 to 2021/22, £60 million in funding was provided for partnerships across England. Although the programme is set to continue until 2024/25, government proposals suggest that funding will be reduced by a third in 2021/2022 (OfS, 2022). The proposed changes are likely to reduce the number of schools/pupils engaged within a sustained progressive programme. If funding ceases for this national programme in 2024/2025, lessons should be learned from what happened when the National Aimhigher Programme ceased in 2010. Once funding ended for this programme very few partnerships delivering outreach activities across England were maintained. The Aimhigher West Midlands (Access Agreement) programme investigated in this research was able to continue working in partnership with local universities and schools. However, due to limited funding only a reduced offer of activities was delivered (summer schools and mentoring). Few pupils' (3.4%) participated in both summer schools and mentoring and few sustained engagements over more than one academic year (5.2%). Thus, consideration should be given as to whether the national Uni Connect Programme continues to be funded post 2024/25, as cessation of this funding could impact addressing participation inequalities in HE and the government's levelling up agenda.

7.6.5 Improving Standards of Evidence

Several reviews of the literature have found little rigorous evidence of the impact of WP initiatives' success in improving pupil AABs or progression to HE (Gorard *et al.*, 2006; Gorard, See and Davies 2012; Younger *et al.*, 2019, Robinson and Salvestrini, 2020). These reviews outlined that widening participation evaluations tend to be characterised by poor sampling techniques and a lack of controlled comparisons between participants and non-participants. In consequence, even when promising results are reported they may be due to unbalanced samples, as those participating are likely to be more motivated (Harrison and Waller, 2015) to continue in education and have higher attainment levels. As outlined within the method (5.1.1a) it has been suggested that randomised controlled trials (RCT's) and quasi-experiment approaches could address these limitations and increase understanding in terms of causality and 'what works' (Gorard *et al*., 2006; Gorard, See and Davies 2012; Robinson and Salvestrini, 2020). The method chapter provided an overview of how the OfS and TASO have supported the sector in terms of employing experimental methods to evaluate WP interventions. This section also outlined the practical and ethical considerations of employing such approaches, the importance of randomisation and matched comparison groups, issues around sampling bias (e.g., attrition, characteristics) and factors that may impact on outcomes (maturation and dilution). This section picks up on some of these issues in more depth and presents other issues impacting on both QEDs and RCTs.

RCTs are often referred to as the 'gold standard', as participants are randomly assigned to treatment and non-treatment conditions. Randomisation deals with sampling bias as the conditions will be balanced in terms of characteristics (see method section 5.1.1a). RCTs are regularly employed within medical research where the dosage of treatment is carefully controlled. Typically, within such trials, one group receive a new drug treatment and are compared to a control group who receive either a drug intervention that is currently in use or a dummy intervention (placebo) or no intervention at all. This allows the effects of the drug (dosage vs type of dosage or non-dosage) to be compared between participants with certain medical conditions. In turn, it is easy to control the type of drug and dosage that all groups receive, as access to the drug is not available outside of the laboratory.

However, Hammersley (2005) points out RCTs are not perfect and may not hold up as the 'gold standard' when employed in real-world settings outside the laboratory. Torgerson *et al*, (2008) outline that even when randomisation is applied samples may be imbalanced by chance in terms of one or more characteristics. RCT's are often based on small samples due to feasibility and in turn results are often not generalisable to the wider population (Taber, 2019) or statistically significant (see reviews; Torgerson and Elbourne, 2002 and Torgerson, Torgerson and Birks *et al*., 2005). Further, as outlined within the method both RCTs and QEDs can be further impacted by attrition.

The most significant problem when conducting RCTs (and quasi-experiments) in real-world settings concerns the fact that it is much more difficult to control for dosage, due to issues such as contamination or dilution (Torgerson *et al.*, 2008). In a WP context, this is where pupils from the treatment group may interact with peers from the non-treatment group, sharing what they have learned within the intervention. This is much harder to control within school settings and will reduce any potential positive or negative impact of the trial. As outlined within a traditional medical RCT conducted within a laboratory there is more control, as it is unlikely participants will have access to the new treatment drug outside the laboratory setting.

Another reason why this is much more difficult in the context of WP interventions is that the dosage is widely available outside of the trial in other formats. Information on HE can be accessed via numerous sources including school/college staff, other WP programmes, social media, television, printed materials, parents, peers and so on. Therefore, it is possible that both the intervention and comparison groups have received some form of dosage. This is usually overlooked within WP research. Advocates of the RCT approach would rightly suggest this dosage will be randomised across treatment and non-treatment groups and that this concern does not matter. However, this overlooks the fact that if the control group has had some dosage and may already have high AABs and be on a HE trajectory. This may suppress and neutralise the observed impact of the treatment group leading to non-significant findings. In such cases, it is not possible to determine, isolate and disentangle which types and dosage of interventions are most effective, as usually only engagement within the intervention under investigation is measured. Within a laboratory setting, such factors can be controlled for and measured so that the type of intervention and dosage is known to support effective comparisons. The measurement of dosage that students have received outside of WP programme under investigation is an important control to employ. This could be collected via self-reporting data from pupils. Many of the WP studies within the literature review and the research undertaken may have been impacted by such confounding variables, and which may have suppressed the observed impact of interventions.

The issue of the comparability of samples within quasi-experimental approaches (see method section, 5.1.1a) creates challenges in drawing inferences from findings. However, this challenge could be resolved by the OfS if agreements were to be put into place to allow HEIs to access anonymised matched comparison groups via the DfE (NPD), without the need for consent (e.g., as this would make it more difficult to form a matched group). This would support robust tracking of pupils' HE outcomes by improving the comparability of samples in terms of variables that are available from the NPD. As APPs are a statutory obligation there are provisions within the Data Protection Act (2018) to support this access to data. This would be the most helpful way that the DfE and OfS could support improvements in the standards of evidence and ensure that the £887.7 million (OfS, 2018) being spent on WP is based on robust evidence. Improving access to this data could significantly support improvements in the effectiveness of WP interventions and make faster progress in closing gaps in HE participation.

Neither RCTs nor experimental approaches are perfect in terms of evidencing the impact of WP programmes. However, both are an improvement on much of the WP evaluations that have previously taken place. This section has reviewed the use of experimental approaches to improve the standards of evidence in terms of 'what works.' However, this evidence should be triangulated with qualitative approaches to understand the processes that are effective in improving pupil outcomes.

The research undertaken commenced in 2012, when WP evaluations rarely employed experimental approaches. The studies quasi-experimental design has been cited as best practice by the university regulator (OfS), the Sutton Trust, shared widely within guidance across the sector and heavily informed the national evaluation of the Uni-Connect Programme funded (£60 million per year) across all regions in England. In turn, the research design has contributed to improving the standards of evidence for WP interventions across England. The design could be easily employed more widely across other intervention programmes within the field of social mobility and within universities to support evaluations across the APP, Teaching Excellence Framework (TEF) and new OfS proposals for HE quality outcomes.

7.6.6 The Importance of Attainment and Proposed Changes to Access and Participation Plans

Widening participation programmes tend to focus on improving AABs of disadvantaged pupils' with the potential (good attainment) to progress to HE. Evidence presented by HEFCE (2016) and Chowdry, Crawford, and Goodman (2010) provided some justification for this approach, as even when disadvantaged pupils' obtain good attainment levels, they are less likely to progress to HE than their more advantaged peers. HEFCE (2016) estimate that there is the potential for an additional 3,800 HE entrants across each cohort. However, as attainment is the most significant barrier to participation in HE, (Crawford and Greaves, 2015; Gorard 2018) raising attainment could lead to a far greater impact on closing the inequality gaps in HE participation. This suggests that the Aimhigher and more widely WP programmes across the sector should refine targeting and interventions to raise attainment. The OfS (2021) is currently developing proposals for HEI Access and Participation Plans (APPs) to focus more resource on improving the attainment of disadvantaged pupils, with a particular focus on primary schools. The research presented in this thesis found that AABs were associated with pupils' likelihood of entering HE (see section 7.4.1). In turn, this evidence suggests that in part the OfS attainment-raising agenda may be supported by interventions that focus on improving non-cognitive factors rather than a sole focus on attainment-raising activities alone.

However, the extent to which this is a responsibility of HE providers and whether they should be using student fees to support this work is the topic of much debate. Other Government proposals intend for student loans to be withheld from prospective entrants (aged up to 25 years of age) that have not achieved a minimum-entry requirement of level 4 at GCSE (or equivalent) English and math's or two E grades at A-level (or equivalent). A recent UCAS (2022) analysis outlines that minimum entry requirements would have the most significant impact on lower tariff universities and the most disadvantaged young people (FSM and Black ethnicity) who are less likely to obtain the GCSE grades required. Other OfS (2021) proposals under consultation include the requirement for HEIs to improve quality standards measured via the proportions of students continuing on their course to the second year, completing and progressing to further study or graduate-level employment. Proposals outline that if providers do not meet the minimum standards, the

OfS may apply sanctions including that a provider may only be allowed to charge the basic tuition fee (£6,000 per year). Analysis suggests that lower-tariff universities are less likely to meet the quality standards (Onward Think-Tank, 2021). This policy and the minimum entry requirements will disproportionately impact on lower-tariff universities that provide more opportunities for disadvantaged students to participate in HE. This policy will not support the government's levelling up agenda, as it will impact upon the financial stability of courses and universities that do the most to support the levelling up and widening participation agendas.

Section 7.7: Contribution of the Research

The discussion has outlined the unique contribution of the research undertaken in terms of WP policy, practice, and research implications. Within this section, I provide a recap of these important contributions and how they can be implemented to improve programme effectiveness and robust research practices. Implementing these changes may benefit WP programmes, schools / colleges, and pupils' by reducing inequalities in HE participation.

Widening Participation Policy and Practice

The findings of the research presented in this thesis provide insights into how Aimhigher and more widely the WP sector can improve the delivery and targeting of programmes. The key contributions of the research include:

1. WP programmes often focus on improving pupil AABs. There are no robust studies that have investigated the association between AABs and HE entry behaviours for pupils targeted by WP programmes (e.g., disadvantaged, and good attainment). The findings contribute to the literature as all four ABBs were found to play a key mediating role in pupils' HE entry behaviours. These findings also have important implications in terms OfS policy, which requires HEIs to provide a greater focus on improving pupil attainment. Findings from the research undertaken suggested that in part this agenda may be supported by interventions that focus on improving non-cognitive factors rather than a sole focus on attainment-raising activities alone.
2. There is little published robust evidence on the effectiveness of widely employed high-cost summer school and mentoring programmes. The research demonstrated that such

programmes delivered by Aimhigher were effective in improving most pupils' likelihood of entering HE and some AABs (mainly HE knowledge). The programme had some impact on improving pupils' HE attitudes, and no impact on raising pupils' HE expectations and academic motivations. These findings suggest that the Aimhigher programme needs to review programme content to support such improvements.

3. The reported association between the frequency of engagement within mentoring and pupil outcomes has important practical implications for the Aimhigher programme and the wider sector. Current Aimhigher mentoring engagement levels are below the optimal level (11-15 engagements) required to improve pupil AABs and their likelihood of entering HE. These findings contribute to the wider literature as no robust evidence has been presented for such associations.
4. The literature review found no evidence of WP evaluations investigating treatment effect heterogeneity for mentoring and summer school interventions. The analysis found that treatment effects in terms of pupil outcomes (AABs and HE entry) varied by pupil characteristics. Some of these effects on pupils' AABs were positive, negative, or null. The Aimhigher programme needs to do more to support equity of outcome, as pupils' of certain characteristics did not significantly benefit from intervention.

Widening Participation Research and Programme Evaluation

The experimental research design addressed several limitations of previous research (see section 7.1) and supports the OfS strategic priorities centred on improving standards of evidence. The research approach provides a step forward for the WP sector in evidencing programme effectiveness. The key contributions of the research undertaken included:

1. The research findings have demonstrated the importance of employing a comparison group. The comparison group provided a useful 'yardstick' to understand what might have happened to mentoring and summer school pupils' outcomes if they had not engaged.
2. The findings also provide a strong rationale for future WP research to investigate how pupil outcomes vary by levels of engagement (in mentoring) and their background characteristics (e.g., heterogeneity). Both analyses established specific treatment effects which may not be observed within a binary model (e.g., engaged vs not engaged).

Treatment effect heterogeneity is a critical analysis tool to understand how effects can vary (e.g., positive, negative, and null) dependent on a pupil's characteristics. Further, this analysis provided the most comparable and unbiased approach to estimating effects and importantly addressed some of the limitations of quasi-experimental designs.

3. The WP practice and policy section outlined that all four AABs were found to be associated with pupil HE entry behaviours. This suggests that future research should incorporate such measures in conjunction with controls for pupil background characteristics (e.g., pupil attainment and SES) that are regularly employed. This work could be supported via the employment of Aimhigher AAB measures that were found to be reliable and valid. There is no published evidence on the reliability of AAB survey measures which are widely employed across the WP sector.
4. The university regulator (OfS) and TASO are supporting the sector to improve standards of evidence via the employment of experimental methods. Guidance places significant emphasis on the employment of RCTs. However, the rationale for this prioritisation may be misplaced. Due to ethical concerns, RCTs face difficulties in evaluating multi-intervention programmes delivered over several years. In consequence, RCTs tend to evaluate isolated interventions. The research has demonstrated that quasi-experimental approaches are far more suited to tracking short, intermediate, and long-term outcomes of WP programmes.

The research commenced in 2012, when WP evaluations rarely employed experimental approaches. During this time the research approach and quasi-experimental design was disseminated widely across the WP sector, supporting improvements in evidence-based practice. The research approach and design have:

5. Been cited as best practice and published in sector-wide guidance by the university regulator (OfS, 2019; CfE 2020) and the Sutton Trust (2014).
6. Heavily informed the national evaluation strategy and approach of the Uni-Connect Prgramme funded (£60 million per year) across all regions in England. Informed the design of recently published WP research (Burgess, Horton and Moores, 2021).

7. Been presented at national and regional academic conferences (Society for Research into Higher Education, 2013; UK Evaluation Society Midlands[33], 2020); practitioner WP conferences (OFFA, HEFCE and OfS); WP newsletters (Action on Access, 2021) and articles (The Conversation, 2014).
8. Contributed to evidence reviews into; the impact of widening participation programmes (TASO, 2019; CfE 2019) HE tuition fees on access (BIS, 2012) and policy on careers guidance within secondary schools (DfE, 2011).

[33] Midlands Evaluation Showcase – Brought to you by the Midlands Regional Network of the UK Evaluation Society (wordpress.com)

Chapter 8: Summary and Conclusions

8.1 Chapter Introduction and Thesis Summary

8.1.1 Introduction

This chapter begins with a summary of the thesis, outlining how the key aims of the research were addressed and the critical literature (section 8.1.2). This is followed by a summary of the findings from the three empirical analyses (section 8.1.3) and the main substantiative limitations of the study (section 8.1.4). These limitations are then considered against the strengths of the findings, to provide some final conclusions and the contributions the research undertaken has made to the field (section 8.2). The findings are then considered more widely in terms of contributions to widening participation (WP) research, policy, and practice (section 8.3) The final section outlines recommendations for future WP research (section 8.4).

8.1.2 Thesis Summary

The research investigated the effectiveness of the Amihigher summer school and mentoring programmes on improving pupils' AABs[34]; likelihood of entering HE and whether AABs mediated pupils' HE entry behaviours. The Aimhigher programme aimed to address the widely reported SES inequalities in HE participation (DfE, 2009-2020; OfS 2020; UCAS 2020, see Chapter 4a). Over the past two decades, successive governments within England have made a concerted effort to reduce these inequalities. This has been driven by government policy and statutory commitments (Access and Participation Plans) focused on HE providers (Chapter 2). This work has been supported through WP programmes, which often consist of summer school and mentoring schemes (see chapter 3).

By establishing which interventions are most effective will enable WP programmes to make more progress in addressing gaps in HE participation. However, despite two decades of delivery and hundreds of millions of pounds spent per annum, there is very little robust evidence on programme effectiveness. Much of the evidence for WP programmes is based on post-16 students on level 3 courses (Robinson and Salvestrini, 2020). This focus has been

[34] AABs refer to pupils' higher education knowledge, attitudes, expectations, and academic motivation.

critiqued as there are only small SES differences in HE participation rates for such students, as inequalities are largely determined by prior levels of attainment (Gorard *et al.*, 2018). The research undertaken addressed this limitation, by evaluating the impact of Aimhigher interventions targeted at a wider group of pupils aged 13 to 18 years of age (year groups 9-13). Several systematic literature reviews have outlined evidence of programme effectiveness is also limited due to poor experimental design, a lack of comparison groups, controls and sampling bias (Gorard *et al.*, 2006; Gorard, See and Davies 2012, Younger *et al.*, 2019, Robinson and Salvestrini, 2020, see Chapter 3).

The research provided a major contribution to the literature by addressing some of these limitations via the employment of a quasi-experiment design, a comparison group, and important pupil controls (attainment socio-economic, demographic and AABs) associated with educational achievement and HE participation (see chapters 2 and 3). The research provided other important contributions by investigating issues that remain largely unexplored for the cohorts targeted by WP programmes (pupils with good attainment). This included investigating whether a) frequency of engagement in mentoring was associated with pupil outcomes, b) whether there were heterogeneous treatment effects (e.g., did some pupils benefit more from treatment than others) and most importantly c) were AABs valid predictors of pupils' likelihood of entering HE d) and how reliable were Aimhigher AAB survey measures (see Chapters 4 and 5). These research questions have important policy and practical implications for WP programmes with reference to how resources can be more effectively deployed.

Evidence was reviewed to ascertain which pupils were under-represented in HE (Chapter 4a). Evidence tends to focus on a) national administrative datasets (DfE, UCAS and OfS) and SES inequalities in HE; b) and how these inequalities are largely determined by prior attainment[35] (Crawford and Greaves, 2015; Gorard *et al.*, 2018); c) and more recent studies that have matched the national pupil database (NPD) to national survey data to determine if pupils' HE aspirations are important predictors of HE entry (Siddiqui, Boliver and

[35] This is highly topical debate in terms of who WP programmes should be targeting, as these studies would suggest that more progress could be made in addressing HE inequalities by improving disadvantaged pupils' attainment. However, it is debated whether HEIs should be using current student tuition fees to support this work and if all HEIs have the capacity, resource, and expertise to support this work. This debate is beyond the scope of this study.

Gorard, 2019; Croll and Attwood, 2013). These studies are limited in that they overlook AABs or focus on a limited number (e.g., aspirations) and more importantly focus on pupils' of all SES backgrounds and all attainment levels and not the cohorts of pupils commonly targeted by WP programmes. WP programmes tend to target disadvantaged pupils who have the potential (a good level of attainment) to progress to HE. Two critical studies suggested that disadvantaged pupils' were still less likely to participate in HE even when they obtained similar GCSE scores to their more advantaged peers (Chowdry, Crawford, and Goodman, 2010; HEFCE 2016). As attainment was not a barrier to their HE participation, it is possible that this was due to pre-existing differences in AABs (Chowdry *et al.,* 2013). WP Programmes are based on the widely held view that improving pupils' non-cognitive functions (AABs) will help to increase their likelihood of entering HE.

8.1.3 Key Findings

The research questions investigated if the Aimhigher programme increased pupils' likelihood of entering HE and AABs (including treatment effect heterogeneity); and if AABs played a mediating role in pupils' likelihood of entering HE (e.g., are they valid predictors); and if Aimhigher AAB survey measures were reliable. To investigate these research questions, treated and non-treated pupils were tracked to the point of HE entry via the NPD. The NPD also provided controls for pupil attainment and background characteristics. A sub-sample of pupils' completed baseline and follow surveys, to measure changes in their AABs. The findings were detailed in three empirical analyses (Chapters 6 and 7).

Key Findings of Analysis 1 – Improving HE Entry

1. Summer school pupils' were 115% significantly more likely to enter HE than non-treated pupils'.
2. Mentoring was effective, although less so than summer schools. Pupils who engaged 11-15 or more than 15 times, were respectively between 34% and 54% significantly more likely to enter HE than non-treated pupils. Increased engagement was associated with improved HE outcomes.

3. Both summer schools and mentoring were not found to significantly improve pupils' likelihood of entering HE if they were SEN or from a Black or Mixed ethnic group.

Key Findings of Analysis 3 – Improving AABs

1. Mentoring supported significant improvements in pupils' HE knowledge scores when they engaged 6-10 or 11-15 times. Higher levels of engagement (11-15) were associated with higher HE knowledge scores.
2. Summer schools also supported significant improvements in pupils' HE knowledge and HE attitudes.
3. No other significant results were observed for mentored pupils' HE attitudes, HE expectations and academic motivations until heterogeneity in the treatment effects were investigated.
4. Almost all pupils engaging in mentoring experienced significant positive improvements in their HE knowledge. For summer schools, significant improvements were observed across almost half of the pupil characteristics.
5. No significant positive treatment effects were observed for pupils' HE expectations and academic motivations.
6. Pupils of Black ethnicity and those living in disadvantaged areas (POLAR YPR) did not experience any significant improvements in terms of their AABs.

Key Findings of Analysis 2 – AABs Mediating Role on HE Entry Behaviours and their Reliability

1. All AABs were found to be important mediators in influencing pupils' HE entry behaviours. High HE expectation, HE attitude, and academic motivation scores were associated with a 70% to 81% increased likelihood of pupils' entering HE.
2. HE knowledge was also found to be important, but less so than other AABs. High HE knowledge scores were associated with a 44% increased likelihood of pupils' entering HE.

3. These associations between AABs and HE entry behaviours were found to be stratified by a pupil's background characteristics. Associations were stronger for advantaged pupils, compared to their more disadvantaged peers.
4. AABs were able to explain more of the differences in HE entry than could be explained by controls commonly employed within research (based on the NPD) and measures employed by WP programmes to target pupils.
5. All survey measures were found to be highly reliable with strong (HE expectations, HE attitudes and academic motivation) to moderate (HE knowledge) significant correlations between baseline and follow-up survey scores.

8.1.4 Study Limitations

The research undertaken provides a significant amount of additional data, evidence, and analysis than the current published WP research. However, there are limitations to the research. Chapters 5, 6 and 7 detailed limitations associated with the design, sampling, and scope of the research. The substantive limitations are outlined below and need to be considered before robust conclusions can be made.

Both summer schools and mentoring were found to improve pupils' likelihood of entering HE (analysis one, section 6.1). Missing data levels were low. However, summer school and mentored pupils were more advantaged than the non-treatment group. In turn, treated pupils' may have been more likely to enter HE, regardless of whether or not they had engaged within Aimhigher.

Findings suggested that mentoring improved most pupils' HE knowledge (analysis three, section 6.10). This finding was made more robust considering that mentored pupils' were far more disadvantaged than the non-treatment group and in turn would be expected to have much lower levels of HE knowledge and less positive attitudes to HE (Connor *et al.*, 2001; Avery and Kane, 2004; Gabaix and Laibson, 2006; Morris and Rutt, 2005; 2006; Callender and Mason, 2017). Summer schools were found to improve some pupils' HE knowledge and HE attitudes. The summer school sample was far more advantaged than the non-treatment group. The finding that all AAB measures were strong predictors of pupils' HE entry behaviours (analysis two, section 6.6) was very promising, as the non-treatment group was well matched in terms of characteristics to the full study sample.

However, it needs to be acknowledged that not all pupils completed surveys. In particular, the summer school sample was very small (n32). Within analysis two and three missing data levels were high. This means that drawing inferences to the full study cohort was problematic as the sample may have differed in terms of unobserved variables.

It is important to note that HE treatment effects may have differed depending on the time that had elapsed between when pupils engaged in the programme. It is possible that pupils' likelihood of entering HE was lower if they only engaged in an Aimhigher intervention within year 9 or 10 compared to those engaging closer to the point of HE entry (e.g., years 11-13). The research did not consider such factors. Further, the research did not measure whether pupils engaged in other non-Aimhigher WP interventions. This may have suppressed the treatment effects observed if non-treated pupils had accessed other interventions. Due to NPD processing delays and resource constraints all the factors that may influence pupils' AABs, or likelihood of entering HE, were not included in the research (see chapter 7, section 7.5.1).

8.2 Conclusions

To draw robust conclusions, it is important to consider the mentioned limitations, without dismissing the wealth of data, findings and analysis that has been achieved. The following section reflects on the strengths and nuances of evidence presented, to determine what inferences can be made.

HE Entry Outcomes

Several robust UK studies provided evidence of WP programmes supporting improvements in pupils' likelihood of applying, being accepted to, or entering HE (Morris, Rutt and Mehta, 2009; Chilosi *et al*., 2010; Burgess, Horton and Moores, 2021). Burgess, Horton and Moores (2021) reported that these improvements were associated with higher levels of engagement (up to an optimal point) within a multi-intervention programme. However, it is unclear how comparable samples were within these studies, as only a limited number of controls were employed. The findings within the research undertaken suggest that the increased likelihood of summer school and mentoring pupils' entering HE (above the non-treatment group) may have been due to that, treated pupils' were more advantaged than the non-treatment group. However, other findings provided more optimism in that heterogeneous treatment effects were observed, and that increased mentoring engagement was associated with higher HE entry rates. Treatment effects observed via the heterogeneity analysis provided the most controlled and unbiased estimate of the results, by improving the comparability of samples with each analysis. This analysis found that although treatments were associated with an increased likelihood of most pupils' entering HE, those who were SEN or from a Black or Mixed ethnicity did not appear to experience any significant benefits.

These findings contribute to the literature, as previous studies have not considered the influence of frequency of engagement and treatment effect heterogeneity for specific high-cost interventions. Findings of the Aimhigher treatment effect are indicative and would benefit from being replicated with samples that are more evenly matched across all pupil characteristics. This could be supported via access to improved comparison groups via the NPD (see section 8.4).

AAB Outcomes

Most mentored pupils experienced significant improvements in their HE knowledge scores and some experienced improvements in their HE attitudes, than the (more advantaged) non-treatment group. Almost half of pupils' that engaged in summer school pupils' experienced improvement in their HE knowledge. Summer schools were also found to improve some pupils' HE attitudes. Summer school results are only indicative, as pupils were more advantaged than the non-treatment group. Further, the sample was only small (n32) and likely to be underpowered. Missing data levels for both treatments were high and may impact on the inferences that can be made. However, the mentoring findings are further validated by the observed heterogeneous treatment effects (providing more control) and findings that increased engagement within mentoring led to higher HE knowledge scores. O'Sullivan *et al.*, (2017) reported that increased levels of engagement in a school mentoring programme improved pupils' HE knowledge and aspirations. However, this study was limited as engagement levels were based on pupils' self-reports and there was no non-treatment group to compare outcomes. The study undertaken contributes to the field of research as several randomised controlled trials (RCT's) of WP interventions in the

UK have found no such effects for either mentoring or summer school programmes (CfE, 2019). However, the mentoring treatment effects are indicative and would benefit from being replicated with larger samples.

All four AABs were found to be associated (playing a mediating role) in pupils' HE entry behaviours (analysis two, section 6.6). Further AABs were able to account for more of the differences in HE entry than could be explained by a pupil's background characteristics (e.g., attainment, socio-economic and demographic). This suggests that the four AABs are important controls to employ within future research in addition to those commonly accessed via the NPD (pupil attainment and SES). These results challenge previous research presented by Siddiqui, Boliver and Gorard (2019) who found that HE aspirations only accounted for three per cent of the differences in pupils' likelihood of entering HE, as attainment and SES were found to be far more important.

At, first sight it could be argued that the treatment effects observed on HE entry in analysis one may not be valid, as models did not incorporate pupil AABs. However, although non-treatment samples were well matched between both analyses, missing data was high as surveys were only completed with a sub-sample of pupils. In turn, samples may have differed in terms of unobserved characteristics and these findings and associated inferences can only be taken as indicative. Despite this, these findings provide a significant contribution to research in terms of mechanisms that may help to improve pupils' likelihood of entering HE. No studies have investigated such effects across all AABs for the cohorts targeted (good attainment) by WP programmes. These findings contribute to the literature by providing evidence that HE entry is associated with pupils' AABs and that this association is stratified by their background characteristics. In turn, these findings suggest that placing more emphasis on improving pupils' HE expectations, attitudes and academic motivations may be more helpful in closing gaps in HE participation. Improving pupils' knowledge may also be helpful in meeting these aims, but less so than improving other pupil AABs. The next section considers the research, policy, and practical implications of the three analyses.

8.3 Implications and Recommendations

This section outlines how the research design has contributed to improvements in research through the employment of a robust approach that has addressed gaps within the WP literature. This is followed by a consideration of wider policy and practical implications. A full discussion of these issues has been provided in chapter 7.

Research

The research presented in this thesis aimed to address limitations and gaps within the literature through the employment of an experimental design. The design provides an important contribution as it supports improved standards of evidence across the WP sector. In particular, the literature review and discussion (Chapters 3 and 7) outlined that few WP evaluations included a comparison group, measures of frequency of engagement (in mentoring) and did not investigate treatment effect heterogeneity and importantly whether AABs mediate HE entry outcomes. In particular, investigating heterogeneity is critical to improve the comparability of samples within quasi-experimental designs. Findings have shown that excluding such measures may suppress the observed impact of interventions and lead to a type 2 error. For example, within the mentoring analysis, when treatment was considered as a binary variable (treated or not), no significant effects were observed.

Comparison Groups

The research has highlighted that it is critical for WP evaluations to include a comparison (non-treatment) group. Within the research, the non-treatment group provided a useful 'yardstick' of what might have happened if treated pupils had not engaged in the programme. In particular, this was notable for pupils' HE knowledge scores, which increased for treated pupils', but decreased for non-treated pupils. All other AAB scores for treated and non-treated pupils' either experienced no change or negative changes when measured via the follow-up survey. If a comparison group had not been employed, it could have been viewed that treatment led to a negative effect. However, the comparison group also experienced similar changes suggesting that these null and negative changes may have been due to external factors such as changes in educational policy which may have impacted on pupils' educational trajectories. Without a non-treatment group to compare outcomes, the treatment groups' positive HE knowledge outcomes scores and HE entry rates may have seemed low, and any significance may have been suppressed.

Experimental Approaches

Some of the issues surrounding the comparability of samples may have been resolved if an RCT design was employed. However, although RCTs have methodological advantages (randomisation) they tend to focus on isolated one-off interventions. Tracking pupil outcomes over time within a multi-intervention programme would raise ethical objections (i.e., some pupils' would be excluded, and this may negatively impact on their educational trajectories). In turn, an RCT is unable to provide an understanding of how multiple engagements across various WP activities can improve pupil outcomes. Different types of interventions are likely to address different barriers to HE (e.g., AABs) and in combination may be more effective. RCTs risk oversimplifying this process and in turn may lead to non-significant effects, as observed across the Uni Connect RCTs (CfE, 2019). A quasi-experimental approach can address these ethical concerns and is more suited to evaluate engagement in a multi-intervention programme and outcomes over several years. The research undertaken commenced in 2012, when WP evaluations rarely employed experimental approaches. During this time the research approach and quasi-experimental design was disseminated widely across the WP sector, supporting improvements in evidence-based practice. The research approach and design have:

1. Been cited as best practice and published in sector-wide guidance by the university regulator (OfS, 2019; CfE 2020) and the Sutton Trust (2014).
2. Heavily informed the national evaluation strategy and approach of the Uni-Connect Programme funded (£60 million per year) across all regions in England. I supported this work through my membership of the OfS NCOP Trackers and Evaluation Advisory Group.

3. Been presented at national and regional academic conferences (Society for Research into Higher Education, 2013; UK Evaluation Society Midlands[36], 2020) and practitioner WP conferences (OFFA, HEFCE and OfS) since the studies' inception in 2012.
4. Been shared via WP newsletters (Action on Access, 2021), articles (The Conversation, 2014) and with WP practitioners and policy makers via social media (LinkedIn[37]).
5. Cited by policy makers in conference presentations of robust WP evaluation practices (Director OFFA, Professor Les Ebdon).
6. Informed the design of recently published WP research (Burgess, Horton and Moores, 2021).
7. Contributed to evidence reviews into; the impact of widening participation programmes (TASO, 2019; CfE 2019) HE tuition fees on access (BIS, 2012) and policy on careers guidance within secondary schools (DfE, 2011).

The evaluation approach and design have also supported improvements in research, through reports[38], training and guidance provided to practitioners and management within my professional employment:

8. I have supported six of the Aimhigher partnership universities to improve their own evaluation practice for institutional WP programmes. This work has also been shared internationally on request to various universities implementing WP programmes in Australia.
9. Within my new role as Evaluation Manager at the University of Wolverhampton, I have drawn on this evaluation approach to embedding more robust evidence-based practice across projects supporting statutory requirements across the APP, Teaching Excellence Framework, (TEF) Higher Education Innovation Fund (HEIF) and new OfS proposals for quality outcomes. This work is supporting improvements in student outcomes relating to access, continuation, completion, degree attainment and progression to further study or graduate level employment.

In turn, the research design has contributed to improving the standards of evidence for programmes that I personally support, more widely for WP interventions across England

[36] Midlands Evaluation Showcase – Brought to you by the Midlands Regional Network of the UK Evaluation Society (wordpress.com)
[37] (7) Aimhigher West Midlands NCOP Evaluation Plan | LinkedIn
[38] Research & Impact - Aimhigher West Midlands (aimhigherwm.ac.uk)

and internationally. The research approach and design could be easily employed more widely across other intervention programmes within the field of social mobility. These improvements to research design have wider implications in terms of WP policy and practice, which are discussed in the next section.

Policy and Practical Implications

The findings have outlined how outcomes varied by pupil characteristics and how frequently they engaged in mentoring. Further, Aimhigher interventions had a more limited impact on improving pupils' HE attitudes and no impact on improving pupils' HE expectations and academic motivations. These findings have both policy and practical implications for how improvements can be implemented across the design, delivery and targeting of the Aimhigher programme and more widely across the sector to support APP statutory obligations by reducing inequalities in HE participation. Implementing these changes may improve programme effectiveness by increasing disadvantaged pupils' participation in HE. The findings are also relevant more widely within countries where similar policies are in effect, such as in Europe, Australia, and the U.S.

Frequency of Engagement

The reported association between the frequency of engagement within mentoring and pupil outcomes has important practical implications for the Aimhigher programme. Over recent years (up to 2019) the average level of engagement across the Aimhigher mentoring programme decreased to almost eight engagements. The research suggested that below 11 engagements pupils did not significantly benefit at all in terms of their likelihood of entering, HE. Furthermore, HE knowledge was more likely to improve at 11-15 engagements, although smaller significant benefits were observed at lower levels of engagement (6-10). Slightly increasing engagement levels within the Aimhigher programme could lead to significant benefits for pupil outcomes. These findings contribute to the literature as no robust evidence has been presented on whether there is an association between the frequency of engagement in mentoring programmes and pupil outcomes. Previous evidence is limited as engagement was based on pupils' self-reports (O'Sullivan *et al.*, 2017) which may be inaccurate or engagement within multi-intervention programmes

(Burgess, Horton and Moores, 2021). These findings also have implications for WP programmes, as conducting this analysis will help to ensure resources are employed more efficiently by determining optimal levels of engagement required for positive pupil outcomes.

Treatment Effect Heterogeneity

The literature review found no evidence of WP evaluations investigating treatment effect heterogeneity for mentoring and summer school interventions. The limited analysis available focussed on multi-intervention programmes (Burgess, Horton and Moores, 2021). The research presented in this thesis contributed to the literature by demonstrating that investigating heterogeneity provides a more controlled analysis and a useful way of understanding if effects differ by pupil characteristics. It cannot be assumed that interventions have a similar impact on pupils of differing characteristics, as effects may be positive, negative, or null. Within the research, most effects were positive regardless of pupil characteristics. However, Mixed ethnicity and SEN pupils' only experienced significant improvements in HE knowledge and no benefits in their likelihood of entering HE. Black pupils did not significantly benefit at all post-treatment in terms of their AABs or likelihood of entering HE. Pupils from disadvantaged areas (POLAR YPR) did not experience any significant improvements in their AABs. These findings have important implications for Aimigher, to ensure that the design and delivery of interventions lead to more equitable outcomes for all pupils. Pupils from different backgrounds may require differing levels of and types of support based on their needs. This could also include reviewing the extent to which role models are incorporated into the programme. Other studies have reported mentoring programmes are more effective when mentors and mentees are from similar backgrounds, (White, Hogg and Terry, 2002; O'Sullivan *et al.*, 2017; Koshy and Smith, 2019).

The Importance of AABs

Findings from the research presented in this thesis and previous studies (see section 8.3) provide evidence to suggest that AABs may play an important mediating role in pupils' HE entry behaviours. These findings support WP programmes' attempts to improve these

AABs. However, Aimhigher interventions had a limited impact on improving pupils' HE attitudes as only a few groups benefited. Interventions had no positive impact on improving pupils' HE expectations and academic motivations. Mentoring was found to improve HE knowledge for most pupils' and summer school supported improvements for some pupils.

It is possible that few improvements in pupils' expectations were observed, as Aimhigher interventions were solely directed at pupils. Nash (2000, see Chapter 7) suggests that to change aspirations, interventions need to focus on the family environment and include parents/carers. The findings provide a significant contribution to the research as no literature has been published on whether AABs are associated with HE entry behaviours of pupils targeted by WP programmes (e.g., those with good attainment). These findings provide critical practical and policy implications for WP programmes. Firstly, findings have important implications in terms OfS policy, which requires HEIs to provide a greater focus on improving pupil attainment. Findings from the research undertaken suggested that in part this agenda may be supported by interventions that focus on improving these non-cognitive factors rather than a sole focus on attainment-raising activities alone. It is important to note that there was a stronger association between a pupil's likelihood of entering HE and their HE expectations, attitudes, and academic motivation. Improving pupils' HE knowledge may also be important, but less so than these other AABs. Findings also suggested that all four AABs were valid and reliable measures. This provided valuable insights, as there is no published evidence on the reliability and validity of such survey measures, which are widely employed across WP programmes for evaluation purposes. However, these findings suggest the Aimhigher programme needs to review the content of interventions, to ensure that they are more able to support improvements in all pupils' HE expectations, attitudes, and academic motivations.

WP programmes are often criticised for 'deadweight', (Harrison and Waller, 2015) as a certain proportion of pupils that engage are likely to be more academically motivated and already on a HE trajectory. Programmes could improve effectiveness, and the targeting of resource, by employing a learner analytics approach to pre-screen and target pupils' most in need. Collecting baseline data on pupils' AABs (in addition to SES measures) would enable programmes to identify and target pupils most in need of intervention. This would help to ensure resources are deployed in an effective and holistic way, to understand and address the needs of pupils, year groups and schools. A more intelligent use of data could support faster progress in closing gaps in HE participation. Aimhigher AAB survey measures could be employed more widely to support this work.

8.4 Future Research

This chapter has outlined how future WP research can be improved via the employment of a comparison group, the measurement of the frequency of engagement and treatment effect heterogeneity. Such measures provide more control and without them, important significant effects may not be observed or at worst suppressed. The chapter has provided a strong rationale for employing a quasi-experimental approach (over an RCT) to track pupils' engagement across a WP programme and different outcomes at various points in their educational careers. The evidence presented suggests that baseline measurements of pupil AABs could provide a richer set of controls, than those regularly employed within research and accessed via the NPD (e.g., pupil attainment and SES). In addition to the suggested improvements there are other ways that future WP research could be advanced to improve the standards of evidence.

Published evaluations of WP programmes provide no consideration of whether non-treated pupils' have accessed similar interventions outside of the programme under investigation. This may suppress the impact of a treatment/intervention that is being investigated. This is a critical control to employ within future research. This could be collected via pupil self-reports.

There is a tendency for WP research to focus solely on how programmes have impacted on pupils' likelihood of participating HE. Future research should also consider wider impacts for pupils' who may have been supported into other positive education, training, and employment pathways.

The research findings have demonstrated that there is an association between increased levels of engagement within mentoring and improved outcomes. Measuring outcomes by the quantity of engagement is quite a crude measure of impact. It is also important to measure the quality of mentoring support as this will also be associated with improved pupil outcomes (see Ek and Funk, 2002; O'Sullivan *et al.*, 2017).

A 5-point Likert scale was employed to measure pupils' AABs. Pupils' scores were relatively high at baseline leaving little room for change post-intervention. Sensitivity could be resolved by increasing the scale items (e.g., 7-points), although research presented suggested that above five items, scales tend to lose reliability. Responses to survey items were aggregated into four AAB measures. The research demonstrated that HE knowledge, expectations, attitudes, and academic motivations seem to be valid and reliable measures. The research could be advanced by establishing which individual survey items are most/least valid and reliable**.** The baseline and follow-up surveys were completed over one academic year. It is possible that a greater impact on AABs would have been observed if surveys were more spread out, allowing for pupils to engage in more interventions. To establish the importance of AABs on HE entry, it is important for future studies to survey all pupils' engaging in interventions (including a comparison sample). This will limit the impact of missing data when making inferences about pupils' where the HE entry outcomes are available.

Quasi-experiments are more suited (than RCTs) to measure the impact of pupils' ongoing engagement within multi-intervention programmes. However, as participants are not randomised into conditions, samples are likely to be less balanced and comparable in terms of pupil characteristics. Improved access to NPD data (pupil-level anonymised matched comparison groups) would minimise sampling bias within quasi-experimental approaches tracking HE outcomes. As APPs are a statutory obligation, there are provisions within the Data Protection Act (2018) to support access to this data. It is critical that the OfS and DfE agree on how this data can be shared with HEIs. This would support significant improvements in the standards of evidence across the sector and improvements in the effectiveness of WP interventions. In turn, this would facilitate swifter progress in addressing inequalities in HE participation.

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Appendix 1: Summary of widening participation indicators: gaps in attainment (KS4) and HE progression rates between advantaged and disadvantaged pupils

Indicator (disadvantaged group)	Data Source	KS4 attainment 8 gaps increasing or decreasing (14/15 to 18/19)	HE participation rate (population) 2009/10 to 2017/18.	Id the HE participation gap between disadvantaged & advantaged cohorts increasing or decreasing (09/10 to 17/18)	
				Percentage point difference	**Ratio difference**
FSM eligible	Attainment & HE data KS4 cohort (DfE)	0.4 pp increase (13.4 to 13.7 pp) FSM 37% (14/15) & 34.9% (18/19) Non-FSM 50.3% (14/15) & 48.6% (18/19)	FSM 18.6% (09/10) & 26.3% (17/18) Non-FSM 36.2% (09/10) & 44.9% (17/18)	1pp increase (17.6 pp to 18.6 pp)	Decrease 1.9 to 1.7
No Parental HE	No national administrative data available				
Ethnicity (analysis compares highest & lowest performing ethnic groups e.g. Chinese vs White)	Attainment & HE data KS4 cohort (DfE)	5.2pp increase 13pp to 18.2pp White 48.1% (14/15) & 46.1% (18/19) Chinese 61.1% (14/15) & 64.3% (18/19)	White 31.6% (09/10) & 38.2% (17/18) Chinese 73.3% (09/10) & 77.6% (17/18)	2.3pp decrease (41.7pp to 39.4%pp)	Decrease 2.3 to 2
Males		1.1pp increase 4.4pp to 5.5 pp Males 46.3% (14/15) & 44% (18/19) Females 50.7% (14/15) & 49.5% (18/19)	Males 30% (09/10) & 37.2% (17/18) Females 37.8% (09/10) & 47.4 % (17/18)	2.4pp increase (7.8pp to 10.2pp)	No change
Disability (SEN support & EHCP / Statement)		0.3pp increase 22pp to 22.3pp (All SEN vs no SEN) All SEN 30% (14/15) & 27.6% (18/19) No SEN 52% (14/15) & 49.9% (18/19)	No SEN 39.2% (09/10) & 48% (17/18) SEN support 11.2% (09/10) & 20.8% (17/18) EHCP/Statement 5.5% (09/10) & 8.5% (17/18)	Gap no SEN vs SEN support 0.8pp decrease (28pp to 27.2pp) Gap no SEN vs EHCP/Statement 5.8pp increase (33.7pp to 39.5pp)	Ratio no SEN vs SEN support Decrease 3.5 to 2.3 Ratio no SEN vs EHCP/Statement Decrease 7.1 to 5.6
English as a first language		0.8pp increase 0.2pp to 1pp. English 48.4% (14/15) & 46.6% (18/19) Other than English 48.6% (14/15) & 47.6% (18/19)	English 32.1% (09/10) & 39.7% (17/18) Other than English 50.8% (09/10) & 57.8% (17/18)	0.4pp decrease (18.7pp to 18.1pp)	Decrease 1.6 to 1.5

Indicator (disadvantaged group)	Data Source	KS4 attainment 8 gaps increasing or decreasing (14/15 to 18/19)	HE participation rate (population) 2009/10 to 2017/18.	Id the HE participation gap between disadvantaged & advantaged cohorts increasing or decreasing (09/10 to 17/18)	
				Percentage point difference	**Ratio difference**
Looked after children (LAC)	Attainment for 15/16 to 18/19 only (DfE) HE data (DfE) KS4 cohort	0.2pp increase 25.3pp to 25.5pp LAC 22.8% (15/16) & 19.1% (18/19) Non-LAC 48.1% (15/16) & 44.6% (18/19)	LAC 9% (09/10) & 12% (17/18) Non-LAC 34% (09/10) & 42% (17/18)	5pp increase (25pp to 30pp)	Decrease 3.8 to 3.5
State-maintained schools	NA	No national administrative data available			
POLAR (YPR) Q1	HE data (DfE) KS4 cohort	No national administrative data available	Q1 18% (09/10) & 26.4% (17/18) Q5 51.3% (09/10) & 57.9% (17/18)	1.5pp decrease (33pp to 31.5pp)	Decrease 2.9 to 2.2
TUNDRA Q1	OfS		Data has just been released so comparisons across time series is not possible		
IDACI (deciles 1-4)	Attainment for 15/16 to 18/19 only (DfE)	Decreased 3.4pp to 4.3pp* Data is not available to compare % point change between high and low deciles	No national administrative data available		
IMD Q1	HE data 14/15 TO 18/19 (OfS) KS4 cohort	No national administrative data available	Q1 15.2% (14/15) & 16.9% (18/19) Q5 27.8% (14/15) & 26.7% (18/19)	2.8pp decrease (12.6pp to 9.8pp)	Decrease 1.8 to 1.6
MEM (group 1)	UCAS acceptances 2018 to 2019		Group 1 – 12.3% (2018) & 13.1% (2019) Group 5 – 56.3% (2018) & 57.5% (2019)	0.4pp increase (44pp to 44.4pp)	Decrease 4.4 to 3.6
ABCDs	OfS KS4 cohort		Data has just been released so comparisons across time series is not possible		

*DfE only provide date for the 4 most disadvantaged deciles and the extent to which their scores have fallen over the time. This is not a comparison to the most advantaged deciles as no further data is provide other than scores for these cohorts have increased over the time.

Appendix 2: Ethics Approval Form

UNIVERSITY OF BIRMINGHAM **APPLICATION FOR ETHICAL REVIEW**

Who should use this form:

This form is to be completed by PIs or supervisors (for PGR student research) who have completed the University of Birmingham Ethical, Review of Research Self-Assessment Form and have decided that further ethical review and approval is required before the commencement of a given Research Project.

Please be aware that all new research projects undertaken by postgraduate research (PGR) student's first registered as from 1st September 2008 will be subject to the University's Ethical Review Process. PGR student's first registered before 1st September 2008 should refer to their Department/School/College for further advice.

Researchers in the following categories are to use this form:

1. The project is to be conducted by:

○staff of the University of Birmingham; or

○a research postgraduate student enrolled at the University of Birmingham (to be completed by the student's supervisor);

2. The project is to be conducted at the University of Birmingham by visiting researchers.

Learner's undertaking undergraduate projects and taught postgraduates should refer to their Department/School for advice.

NOTES:

- Answers to questions must be entered in the space provided – the beginning of an answer field will be indicated by a grey bar (   ).
- Use the up and down arrow keys to move between answer fields; use the side scroll bar to navigate around the document.
- An electronic version of the completed form should be submitted to the Research Ethics Officer, at the following email address: aer-ethics@contacts.bham.ac.uk. Please **do not** submit paper copies.
- If, in any section, you find that you have insufficient space, or you wish to supply additional material not specifically requested by the form, please it in a separate file, clearly marked and attached to the submission email.
- If you have any queries about the form, please address them to the Research Ethics Team.

UNIVERSITY OF BIRMINGHAM APPLICATION FOR ETHICAL REVIEW	*OFFICE USE ONLY:* Application No: ERN_12-1065 Date Received:

1. TITLE OF PROJECT

A longitudinal study looking at the impact of University widening participation outreach work on disadvantaged school children's future intentions / expectations, confidence, knowledge of higher

2. THIS PROJECT IS:

University of Birmingham Staff Research project ☐ I'm a member of staff and a PHD student

3. INVESTIGATORS

a) PLEASE GIVE DETAILS OF THE PRINCIPAL INVESTIGATORS OR SUPERVISORS (FOR PGR STUDENT PROJECTS)

Name: Title / first name / family name	Professor Peter Davies (Supervisor)
Highest qualification & position	P.h.D.
School/Department	School of Education
Telephone:	[redacted]
Email address:	

Name: Title / first name / family name	Matthew Horton
Highest qualification & position	MA/Aimhigher Research Co-ordinator
School/Department	Education
Telephone:	[redacted]
Email address:	

b) PLEASE GIVE DETAILS OF ANY CO-INVESTIGATORS OR CO-SUPERVISORS (FOR PGR STUDENT PROJECTS)

Name: Title / first name / family name	Dr. Tracy Whatmore
Highest qualification & position	PhD
School/Department	School of Education
Telephone:	[redacted]
Email address:	

4. ESTIMATED START OF Date: 14/11/2012 **PROJECT**

ESTIMATED END OF Date: 30/11/2015 **PROJECT**

5. FUNDING

List the funding sources (including internal sources) and give the status of each source.

Funding Body	Approved/Pending /To be submitted
NA	

6. SUMMARY OF PROJECT

Describe the purpose, background rationale for the proposed project, as well as the hypotheses/research questions to be examined and expected outcomes. This description should be in everyday language that is free from jargon. Please explain any technical terms or discipline-specific phrases.

A great deal of evidence has shown that young people from disadvantaged backgrounds are less likely to go to higher education (HE), than those from more advantaged backgrounds. Research indicates that lower levels of attainment, low levels of aspiration, financial concerns (Morris, 2005) a lack of family experience of HE (Connor *et al*, 2001; DfEE, 1997; Johnston *et al*, 1999) ethnicity and parental (and sibling) social class have acted as significant barriers to WP (Gorard, *et al*., 2006). Gorard and Rees (2002) suggest that '*family poverty, lack of role models, and a sense of 'not for us', coupled with poor experiences of initial schooling can act to create a kind of lifelong attitude to learning – a negative student identity'.* In this way those families who do not have a tradition of university lack the cultural and social capital to achieve equitable outcomes.

Over the past decade government policies and interventions have aimed to redress this inequality with programmes such as Aimhigher which ended in 2010. Despite this the Birmingham and Solihull Aimhigher partnership has continued, via support through a locally funded model. The programme consists of a partnership of local HEIs (UOB, BCU, UCB and Aston) that deliver WP activities to students (years 8-13) within West Midlands schools and academies. Interventions include summer schools, mentoring and health care activities which aim to raise disadvantage students' intentions / expectations, confidence, knowledge, attainment and post 16 destinations.

Robust evidence continues to be limited in terms of identifying the impact of outreach interventions on students in terms of raising intentions / expectations, attainment and positive destinations to HE. Much of the evidence is based on small sample frames and lacks or has poorly applied control samples. This evaluation aims to address these issues with a large cohort of Birmingham and Solihull Aimhigher students/schools being tracked longitudinally over 4 years. The evaluation aims to establish if there are any causal links between engagement within AH activities and positive student outcomes. It is expected that findings will have wider implications at a local and national level in terms WP, identifying causality, what works and value for money.

The main objectives of this study are to measure the impact of WP activities on improving disadvantaged students' intentions / expectations, knowledge/understanding of HE, GCSE (or equivalent) attainment and post 16 destinations. The main objectives of the research are outlined below.

Hypotheses: Attitudinal Changes

Higher engagement[39] in WP activities will be associated with more positive attitudes to HE and knowledge of HE. Within each year group higher engagement (compared to lower engagement/no engagement) in WP activities will be expected to be associated with:

- Increased intentions to go to HE
- Increased awareness/understanding/knowledge of HE
- Increased confidence about progression

The study will also explore whether there are any associations between activity type and intentions / expectations.

Hypotheses: Improvements in attainment

Higher engagement (compared to lower engagement/no engagement) in WP activities will be associated with:

- Improved GCSE attainment as measured from capped points[40] scores (estimated vs actual scores)

The study will also explore whether there are any associations between activity type and attainment.

Hypotheses: Improved destinations

It is expected that higher engagement (compared to lower engagement/no engagement) in WP activities will be associated with:

[39]Ho's refer to higher engagement as there will be two types of non-treatment group – firstly engaged against not engaged and also number of engagements.

[40]Fischer Family Trust (FFT) has been used to compare students estimated and actual KS4 attainment levels in terms of capped points scores which measure the total score for the 8 best subjects.

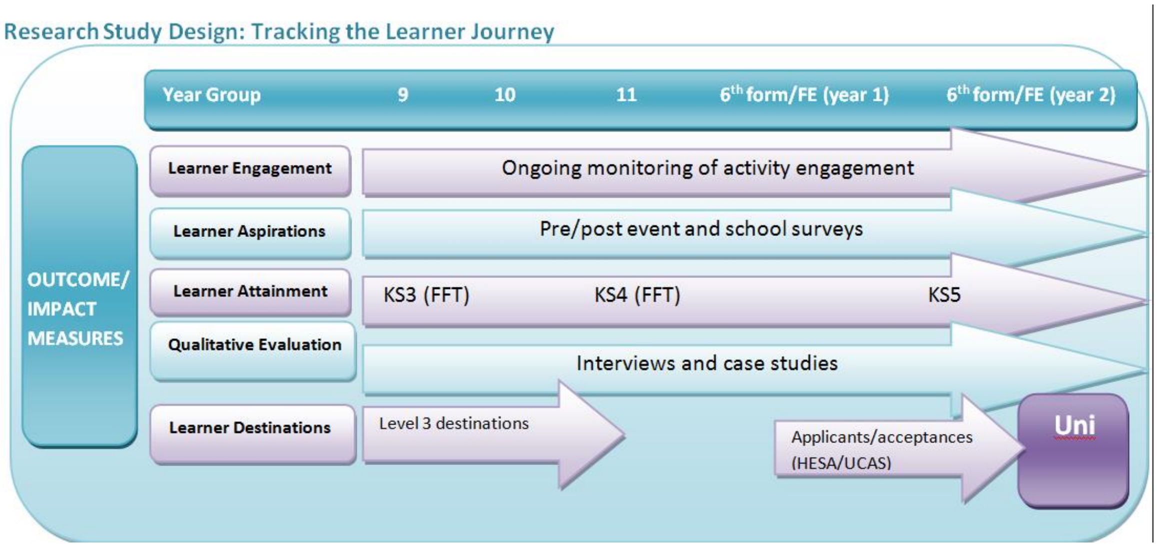
- A decrease in students who are classified NEET (not in education, employment or training)
- An increase in students enrolled on level 3 courses
- An increase in UCAS application/acceptances.

Analysis will also explore whether there has been a closing in the gap of HE applications and acceptances for disadvantaged students. Data will explore whether there is higher % increase in UCAS applications/acceptances from disadvantaged students who have engaged within WP activities from Birmingham and Solihull post 16 schools and colleges.

7. CONDUCT OF PROJECT

Please give a description of the research methodology that will be used

This longitudinal research study will be conducted over 4 years, from 2011 to 2015 with the primary aim of measuring the impact of Aimhigher WP activities accessed by students within West Midlands schools. The evaluation design is outlined below:



Monitoring individual student engagement in WP activities

Data will be collected via pre-enrolment personal data forms (see attachment – parent information, data and consent leaflet). Personal data forms and school attainment/census data will be collected to establish the background characteristics of the population of students that participated within the study. For those not engaging within activities only school census data will be available. Data will only be matched (to questionnaires etc.) when relevant consents are provided as described in later sections.

Measuring the impact of Learner Engagement on attitudinal changes (HE intentions / expectations, knowledge and understanding)

All students that access Aimhigher activities (the treatment group) will complete pre and post event questionnaires. Ongoing changes in student's attitudes will be measured again via a questionnaire when they access activities in the future. To establish a student non-treatment group, annual online questionnaires will be completed with an opportunistic sample of 10-15 schools. This will serve as a comparison to measure attitude changes in students who have not accessed the Aimhigher programme (the non-treatment group). To increase engagement these surveys will also include school-based questions focusing on student subject preferences etc., to support curriculum planning. Draft questionnaires are attached, which indicates the type of questions that will be asked (see Unifest pre/post event and school question bank).Level of engagement in Aimhigher activities will also be used as a non-treatment group. Learners will be categorised into different bandings (high, medium, low and no engagement) depending on their engagement in WP activities. This will enable analysis to identify whether level of engagement is associated with positive outcomes (attainment, destination, attitudes, intentions / expectations etc.).

Measuring the Impact of Learner Engagement on Attainment (KS3, 4 and 5)

To measure whether increased engagement in WP activities lead to improved attainment data will be sourced from:

- Local Authorities data on students FFT Key Stage 4 estimated and actual grades (5 A-C* including English and Maths and estimated/actual capped points scores).

The study will also explore which WP activities are most effective in terms of raising student attainment.

Measuring the Impact of Learner Engagement and Post 16 Destinations

To measure whether increased engagement in WP activities leads to improved post 16 destinations, data will be sourced from connexions (or DFE/LA) to identify the numbers of students who were NEET (not in education, employment or training) or taking level 3 qualifications. Data from UCAS/HESA will be sourced to identify the proportions of students that have applied and been accepted to HE.

8. DOES THE PROJECT INVOLVE PARTICIPATION OF PEOPLE OTHER THAN THE RESEARCHERS AND SUPERVISORS?

Yes X☐ No ☐

Note: "Participation" includes both active participation (such as when participants take part in an interview) and cases where participants take part in the study without their knowledge and consent at the time (for example, in crowd behaviour research).

If you have answered NO please go to Section 18 . If you have answered YES to this question please complete all the following sections.

9. PARTICIPANTS AS THE SUBJECTS OF THE RESEARCH

Describe the number of participants and important characteristics (such as age, gender, location, affiliation, level of fitness, intellectual ability etc.). Specify any inclusion/exclusion criteria to be used.

Over 3 years 20-40 secondary schools will be recruited to the project.

Non-treatment group (approximately 15 schools)
Within each school we will aim for participation, subject to permissions, of one or two full Year groups from years 9 to 12. Over the 3 years of the study there will be approximately 2000-2600 participants.

Treatment group (approximately 25-30 schools)
The treatment group over 3 years will consist of approximately 900 students who have taken part in Aimhigher activities.

The study will include males and females; students from different ethnic groups and students from different socio-economic backgrounds.

10. RECRUITMENT

Please state clearly how the participants will be identified, approached and recruited. Include any relationship between the investigator(s) and participant(s) (e.g. instructor-student).

Note: Attach a copy of any poster(s), advertisement(s) or letter(s) to be used for recruitment.

All schools that take part in the study will be participating in Aimhigher activities. All students within the treatment group will have accessed Aimhigher activities. These students are selected to take part in activities as they are from disadvantaged backgrounds. This information is gathered via personal data collection forms that are completed by the student's parent/carer. These forms brief parents/carers about the nature of the study and include an opt-out section. At the start and end of each Aimhigher activity students will complete a questionnaire to measure the impact of the activity in terms of changes in attitudes.

The non-treatment group will consist of students from the same schools who have not participated in Aimhigher activities. Discussions will be held with the head teacher to identify if they would like to take part in the study. If the school expresses a willingness to consider participation, we will send a formal letter inviting participation together with a summary of the project (see school letter attached). We will request that all students in 1 or 2 year groups (9-12) in each participating school are included in the project. The school will be asked to send letters to the parents of each student asking for parents' permission for their child's participation in the study. We will provide schools with this 'opt-out' letter (see attached parent information and opt out letter – non-treatment group).

11. CONSENT

a) Describe the process that the investigator(s) will be using to obtain valid consent. If consent is not to be obtained explain why. If the participants are minors or for other reasons are not competent to consent, describe the proposed alternate source of consent, including any permission / information letter to be provided to the person(s) providing the consent.

Non-treatment group (students not involved in Aimhigher activities)

1. For the non-treatment group (students not engaged in Aimhigher activities) we will approach schools on an individual basis and seeking their informed consent.
2. Personal data collection forms (treatment group) or a letter (non-treatment group) will be sent to parents summarising the project and giving them the option of withdrawing their child from the collection of data for the project. Learner's whose parents opt-out will not be excluded from the online survey. These students will be allowed to complete the online questionnaire as it will also include school questions on their option choices that need to be completed for curriculum planning purposes. The questions relating to this research study in terms of intentions / expectations etc. will be deleted from their responses.
3. Learners will be provided with a summary of the project and they will be asked for their consent (i.e. on an opt in basis) with regard to (i) their responses to questionnaires being included in the project data (ii) matching their Aimhigher attendance data, Fischer Family Trust (FFT) attainment data and school census data to their questionnaire data and (iii) possible future matching of the questionnaire responses to post 16 destinations data (DFE/School data) and UCAS applications/acceptances and HESA entry data.

Note: Attach a copy of the Participant Information Sheet (if applicable), the Consent Form (if applicable), the content of any telephone script (if applicable) and any other material that will be used in the consent process.

c) Will the participants be deceived in any way about the purpose of the study?

Yes ☐ No X☐

If yes, please describe the nature and extent of the deception involved. Include how and when the deception will be revealed, and who will administer this feedback.

12. PARTICIPANT FEEDBACK

Explain what feedback/ information will be provided to the participants after participation in the research. (For example, a more complete description of the purpose of the research, or access to the results of the research).

We will provide each school with an analysis of the questionnaire results for their student's and a comparison between these results and the results for the whole sample. We will also provide schools with a copy of the final project report.

13. PARTICIPANT WITHDRAWAL

a) Describe how the participants will be informed of their right to withdraw from the project.

Schools and parents will be informed of their right to withdrawal through consent letters. Learners will be advised of their right not to provide information in the questionnaire.

b) Explain any consequences for the participant of withdrawing from the study and indicate what will be done with the participant's data if they withdraw.

Non-treatment group
The school-based activities (completing a questionnaire) form part of the standard activities which take place in secondary schools. Learner's routinely answer sets of questions and participate in lessons in school, and this covered by the school's general responsibility for student's' well-being.

Within the non-treatment group (students who have not participated in Aimhigher activities) the online questionnaire will take place within the school's normal curriculum time (usually ICT). The questionnaire deals with aspects of student's learning and intentions / expectations which schools are required to address. The research element relates to the use of the data made by the project and the consent requests are focused upon this. In cases where parents have not given permission for the use of information provided by or about the student, then their research study data will be deleted but not their school questions on option choices. This will be made clear within letters sent to parents and within the online questionnaires that students complete.

Treatment group
Learners accessing Aimhigher activities will be given questionnaires to complete. Learners will be made aware that they do not have to complete the questionnaire if they do not wish to. Questionnaires will also include a student opt in section to match their questionnaire data with their attainment, school census, post 16 destinations data and Aimhigher event attendance data. Also, the personal data form that collects further student and parental data will be used for parent/student to opt out of sharing/matching data on their student.

In both the treatment and non-treatment groups if a student or parent opts out of the research study, they will still be allowed to take part in Aimhigher activities.

If a school or a student within a participating school should withdraw from the project they will be given an opportunity to request that any information they have provided should be removed from the project records.

14. COMPENSATION

Will participants receive compensation for participation?

i) Financial **Yes** ☐ **No** X☐

ii) Non-financial **Yes** ☐ **No** X☐

If **Yes** to **either** i) or ii) above, please provide details.

If participants choose to withdraw, how will you deal with compensation?

15. CONFIDENTIALITY

a) Will all participants be anonymous? **Yes** X☐ **No** ☐

b) Will all data be treated as confidential? **Yes** X☐ **No** ☐

Note: Participants' identity/data will be confidential if an assigned ID code or number is used, but it will not be anonymous. Anonymous data cannot be traced back to an individual participant.

Describe the procedures to be used to ensure anonymity of participants and/or confidentiality of data both during the conduct of the research and in the release of its findings.

1. The research report will not identify results by school. 2. We will generate a unique pupil identifier so that we can maintain a separate database of student names and UPI. The dataset with student responses will only contain the UPI.

If participant anonymity or confidentiality is not appropriate to this research project, explain, providing details of how all participants will be advised of the fact that data will not be anonymous or confidential.

16. STORAGE, ACCESS AND DISPOSAL OF DATA

Describe what research data will be stored, where, for what period of time, the measures that will be put in place to ensure security of the data, who will have access to the data, and the method and timing of disposal of the data.

All research data will be stored on password protected Aimhigher systems. Electronic questionnaires will be stored on secure server and paper questionnaires/consent /data forms in locked filing cabinets. Across four HEIs, there are over 100 field investigators involved in this large-scale research project who have different roles in terms of distributing questionnaires/consent forms and inputting data onto systems. All staff are CRB checked and all HEIs have signed up to the Aimhigher information sharing protocol (this was developed with David Ash – Solicitor UoB). This protocol can be accessed via the following link: http://www.aimhigherwm.ac.uk/partners-and-programmes/universities/targeti-data-monitoring-and-evaluation

17. OTHER APPROVALS REQUIRED? e.g. Criminal Records Bureau (CRB) checks

X☐ YES ☐ NO ☐ NOT APPLICABLE

If yes, please specify.

I will need to renew my CRB check for school visits. We will follow the standard procedure through HR in completing this process before any visits to schools.

18. SIGNIFICANCE/BENEFITS

Outline the potential significance and/or benefits of the research A great deal of evidence has shown that young people from disadvantaged backgrounds are less likely to go to higher education (HE), than those from more advantaged backgrounds. Over the past decade government policies and interventions have aimed to redress this inequality with programmes such as Aimhigher.

National evidence suggests that that over the years the proportions of disadvantaged students participating in HE has significantly increased in comparison to advantaged students' participation. However, it is not yet clear if the introduction of the new student fees system will affect this closing of the gap. Evidence suggests that the new fee arrangements may have deterred more disadvantaged than advantaged students from entering HE (Horton 2011). Other negative consequences on these students could also be the ending of the national Aimhigher programme and scrapping of educational maintenance allowance (EMA). These issues make it even more important to ensure that a robust evidence base is developed to inform HEIs and schools, on which types of WP activities are most effective.

Robust evidence is limited in terms of identifying the impact of outreach interventions on students in terms of raising intentions / expectations, attainment and positive destinations to HE. Much of the evidence is based on small sample frames and lacks or has poorly applied control samples. This study aims to address these issues with a large cohort of students being tracked longitudinally over 4 years.

The study will provide:

a. Evidence which can inform policy towards WP in terms of which types of WP activities are most effective in terms of raising intentions / expectations, confidence, knowledge of HE and positive destinations.
b. Support to HEIs in terms of planning and delivering effective activities and will also provide local HEIs an evidence base for reporting to the Office for Fair Access (OFFA).
c. Support to schools in terms of curriculum planning by finding out student's option choices and post 16 intentions / expectations. Questions on information and guidance will also help schools to meet their new duty in terms of IAG standards.

19. RISKS

a) Outline any potential risks to **INDIVIDUALS**, including research staff, research participants, other individuals not involved in the research and the measures that will be taken to minimise any risks and the procedures to be adopted in the event of mishap

I will visit schools for project initiation purposes. Questionnaires will be completed in schooltime but I will not be responsible for individual student's or for groups of students (in lessons or otherwise) at any time.

In the unlikely event that a student discloses any information regarding safeguarding issues this will immediately be reported to the school and local authority. Aimhigher has well developed processes in place for such safeguarding issues:

b) Outline any potential risks to **THE ENVIRONMENT and/or SOCIETY** and the measures that will be taken to minimise any risks and the procedures to be adopted in the event of mishap.

Not applicable

20. ARE THERE ANY OTHER ETHICAL ISSUES RAISED BY THE RESEARCH?
Yes ☐ No X☐

If yes, please specify

21. CHECKLIST

Please mark if the study involves any of the following:

- Vulnerable groups, such as children and young people aged under 18 years, those with learning disability, or cognitive impairments X☐
- Research that induces or results in or causes anxiety, stress, pain or physical discomfort, or poses a risk of harm to participants (which is more than is expected from everyday life) ☐
- Risk to the personal safety of the researcher ☐
- Deception or research that is conducted without full and informed consent of the participants at time study is carried out ☐
- Administration of a chemical agent or vaccines or other substances (including vitamins or food substances) to human participants. ☐
- Production and/or use of genetically modified plants or microbes ☐
- Results that may have an adverse impact on the environment or food safety ☐
- Results that may be used to develop chemical or biological weapons ☐

Please check that the following documents are attached to your application.

	ATTACHED	NOT APPLICABLE
Recruitment advertisement	X☐	☐
Participant information sheet	X☐	☐
Consent form	X☐	☐
Questionnaire	X☐	☐
Interview Schedule	☐	☐

22. DECLARATION BY APPLICANTS

I submit this application on the basis that the information it contains is confidential and will be used by the University of Birmingham for the purposes of ethical review and monitoring of the research project described herein, and to satisfy reporting requirements to regulatory bodies. The information will not be used for any other purpose without my prior consent.

I declare that:

- The information in this form together with any accompanying information is complete and correct to the best of my knowledge and belief and I take full responsibility for it.

- I undertake to abide by University Code of Conduct for Research (http://www.ppd.bham.ac.uk/policy/cop/code8.htm) alongside any other relevant professional bodies' codes of conduct and/or ethical guidelines.
- I will report any changes affecting the ethical aspects of the project to the University of Birmingham Research Ethics Officer.
- I will report any adverse or unforeseen events which occur to the relevant Ethics Committee via the University of Birmingham Research Ethics Officer.

Name of Principal investigator/project	Matthew Horton
Date:	11.09.12

Please now save your completed form, print a copy for your records, and then email a copy to the Research Ethics Officer, at aer-ethics@contacts.bham.ac.uk. As noted above, please do not submit a paper copy.

Appendix 3: School Information and Consent Letter

Project Summary: A study looking at the impact of University widening participation outreach work on disadvantaged school children's future intentions / expectations, attainment and post 16 destinations.

Dear **[Insert name of head teacher/deputy head]**
Over the next 3 years Aimhigher is conducting a longitudinal research study to demonstrate the impact of the programme on students. This research study is being carried out by Matthew Horton (Aimhigher Research and Monitoring Officer) as part of his PhD at the University of Birmingham's School of Education. As your school is taking part in Aimhigher activities we would like to invite you to take part in the study. 10-15 local schools will be recruited. By taking part in the study there will be a number of benefits to your school.

WHAT IS THE PROJECT TRYING TO DO?
The purpose of this study is to measure the impact of Aimhigher activities on improving disadvantaged students' intentions / expectations, knowledge/understanding of HE, GCSE (or equivalent) attainment and post 16 destinations. The study will involve 1 to 2 year-groups within each school completing an online questionnaire on an annual basis for up to 3 years. The questionnaire will include school-based questions (e.g., to explore option choices) and Aimhigher questions about students' intentions / expectations for the future and knowledge of higher education. The survey normally takes 20 minutes to complete in school time and requires access to a PC and the internet. The data from this questionnaire will allow us to measure the impact of Aimhigher activities by comparing responses of students who have and have not taken part in Aimhigher activities. The main objectives of the research are outlined below.

d. Evidence which can inform policy towards widening participation in terms of which types of widening participation activities are most effective in raising intentions / expectations, confidence, knowledge of HE and positive destinations. This will support HEIs and schools in terms of planning and delivering effective activities.
e. Support to schools in terms of curriculum planning by finding out student's option choices, post-16 intentions / expectations and views on in-school information advice and guidance (feedback may help schools meet their duty in terms of IAG Quality standards). We have been undertaking these learning choices questionnaires for many years and have a bank of questions that schools can use.

The study intends to track students in terms of their annual questionnaire responses, attendance in Aimhigher activities and attainments/post 16 destinations. Learners participating in the project will be asked to give permission for (i) their questionnaire answers to be used in the research (ii) matching their questionnaire answers to their attendance at Aimhigher activities**,** school attainment/census data (this will be provided by the local authority) and post 16 education and UCAS / HESA data (e.g., where did they go after school/did they go to university).
A letter will also be provided for students' parents/carers to brief them about the aims of the questionnaire and research study and to allow them to opt out their child out of the research study.

PROJECT PLAN
1. October 2012: recruitment of schools.
2. October to mid November 2012: Project initiation meeting with schools. An initial meeting will be held to discuss the research study methodology and school questions you would like to include.

3. November 2012: gathering permission for student participation. We will prepare a letter to be sent to parents which will seek their permission for the information provided by the students to be used in the research project. Parents' permission will also be requested for matching questionnaire responses with the child's Aimhigher attendance data, school attainment/census and post 16 destinations data.
4. December 2012 – February 2013: Online surveys completed in schools
5. March 2013 – Schools will be provided with a report on their school-based questions.

These timelines are not set in stone and can be adjusted to support your requirements and the school planning process.

DATA SECURITY AND PROJECT REPORTING

1. In terms of you school questions we will provide an analysis for each school of the questionnaire results. We will also provide you with results of the Aimhigher programme once the research is completed.
2. We will maintain the anonymity of participating schools, teachers and pupils in our reporting of project outcomes.
3. We will keep the records of student data level secure.

CONTINUED PARTICIPATION IN THE PROJECT

We appreciate that circumstances may arise such that the school finds it necessary to withdraw from participating in the project. The usefulness of the project depends on maintaining a strong sample of schools throughout its duration so we will assume that agreement to participate in the project takes into account any foreseeable circumstances. In order to provide the project team with a reasonable prospect of recruiting a replacement school we ask that each year the 30th October regarded as a final date beyond which schools will not be expected to withdraw from the project.
If you are happy for your school to take part in this study ,please sign and return the attached consent form (see overleaf). If you have any questions, you can contact Matthew Horton (Aimhigher Research Coordinator) who will be pleased to offer any further information (email: [redacted]
telephone: [redacted]

School Consent Form

I confirm that I have read and understood the summary and detailed information sheets for this project and have had the opportunity to ask questions.

I understand that all the children's results will be kept confidential and that no material which could identify individual children or the school will be used in any reports of this study, without my specific permission.

I agree that my school will take part in the above study and support it to the best of our ability.

Please write in block capitals

Name of Head teacher/Deputy Head teacher...
School...
Tel No...
Email address..
Signature of Head teacher...Date.......................

Thank you for agreeing to take part in this important research, please could you return this consent form to Matthew Horton, Aimhigher, University of Birmingham, Edgbaston, Birmingham, B15 1BR

Appendix 4: Treatment Group Parent Information and Consent Form

SECTION 2 - Information to be completed by PARENTS/CARERS

1 Do you or your partner have any higher education qualifications? These could have been taken at a university or a further education college, and include Honours Degrees, Degrees, Foundation Degrees, Higher National Diplomas (HNDs), Higher National Certificates (HNCs) and Diploma of Higher Education.

Mother/carer ☐ Yes ☐ No Father/carer ☐ Yes ☐ No

2 Please let us know your employment status, job title and work e.g. Shop Assistant, Receptionist, Taxi Driver etc. Please write 'N/A' (not applicable) if you are unemployed or not a wage earner.

Mother occupation ________ Father occupation ________

3 Does your child have a disability and/or a learning difficulty? ☐ Yes ☐ No

4 Is your child subject to a local authority care order (or if over 16 are they leaving the care system)? ☐ Yes ☐ No

5 Is you child eligible for or receiving Free School Meals or the 16 – 19 Bursary? ☐ Yes ☐ No ☐ Don't Know

Declaration:

For your child to take part in Aimhigher please sign this declaration.

I the parent / carer have read this form. I consent for the data I have provided to be shared with Aimhigher universities, local authorities and UCAS, and for information about my child's involvement in Aimhigher to be used to improve Aimhigher activities in the future.

Signature of parent/carer: .... Print name: ....

Date signed: ....

Opt Out
Only complete this section if you DO NOT WANT your and your child's data to be used for Aimhigher research purposes or DO NOT WANT images of your child to be used for Aimhigher publicity. Ticking "No" to the following will not stop your child taking part in Aimhigher activities.

Only tick if you DO NOT with these things to happen

I the parent/carer do not consent for data on this form to be matched with any Aimhigher questionnaires my child completes, school census and local authority attainment data, post 16 education and UCAS data (e.g. where did they go after school/did they go to university) ☐

I the parent/carer do not consent for my child's image to be used in Aimhigher information materials. ☐

Additional information: To be completed by School / College staff

Please provide any information you feel will help Aimhigher support the young person

....

Which Aimhigher activities from your agreed service level do you intend the young person to access? (please tick all that apply)

☐ Mentoring ☐ UniFest ☐ Health Work Placements

Please return this form to:
Aimhigher
FREEPOST (BM2843)
University of Birmingham
Edgbaston
BIRMINGHAM
B15 1BR


Thank you for giving us this information. Your child will now join a group of more than 1000 young people who are receiving support from Aimhigher in the local area.

For more information about Aimhigher please visit our website
www.aimhigherwm.ac.uk

Contact us by email: aimhigher@contacts.bham.ac.uk

Or telephone us on


Aston University · Birmingham City University · UCB · University of Birmingham

Aimhigher
Your pathway to Higher Education

Information for Parents and Carers

"It's been great having someone you can talk to about educational matters. My mentor has been great!... I've definitely gained from this scheme."

Introduction

This leaflet gives information for the parents and carers of young people who have been chosen to take part in Aimhigher. It tells you what Aimhigher is all about and why your son or daughter has been chosen to take part. It also asks for some information about you and your child, to help us develop our activities and prove that what we do really does support young people in making the most of the educational opportunities that are open to them. We hope you find it helpful, but if you have more questions please get in touch...our contact details are at the end of this leaflet.

Aimhigher in your local area

Aimhigher is a local initiative that aims to raise the aspirations and achievements of young people so that they have every opportunity to reach their full potential and possibly go on to higher education. Aimhigher works in partnership with schools, colleges, academies and local universities to deliver a range of activities that give around 1,000 young people a year experiences of higher education and support with their learning and career planning.

Who can take part?

Teachers in schools, colleges and academies identify learners they feel will benefit from Aimhigher and when would be the best time. Some learners may find that they are part of Aimhigher for more than one year between Years 9 to 13, and others may just take part in one activity. Typically, Aimhigher learners have the potential to go into higher education but may be from families where there is no experience of university. Aimhigher also helps young people who have a disability / learning difficulty, or are in the care system.

What does Aimhigher do?

"It has made me realise how the world of work works, helped me to plan ahead and given me an idea of what career I want to go into..."

Aimhigher provides a co-ordinated programme that learners, with support from their school or college, can choose from to best fit their needs and interests. Activities vary from the development of skills required to support learning, finding out about careers and subject areas and taster experiences to support decisions about future educational options. They give young people a chance to explore for themselves different career ideas, find out more about qualifications and learning choices and make the right decisions about their future. Aimhigher activities take place in schools, colleges, local universities or in professional workplaces like hospitals.

There are three main activities where we need to collect information from you. If your child takes part in more than one of the activities below we will only need to collect information from you once.

The Aimhigher Mentoring Scheme

If you are receiving this leaflet in the autumn term it is probably because your child has been chosen to take part in the Aimhigher Mentoring Scheme. This involves undergraduate students (mentors) from local universities and learners in schools, colleges or academies. The mentors support a group of five learners on a weekly basis for approximately 15 weeks. Sessions take place during the school or college day and can be either one-to-one or in a group. A controlled e-mentoring system is available to support periods when face-to-face activity cannot take place. Mentors can help a young person by:

- raising their aspirations to take their education further
- raising their educational performance which may improve their examination results
- increasing their awareness of higher education
- improving their self-esteem, motivation, confidence, persistence, application and time management
- giving them a greater understanding of how to apply to higher education.

Aimhigher Mentors are role models for learners at key stages in their 14 to 19 education and our evidence shows that learners benefit greatly from the support mentors provide.

UniFest

UniFest is a programme of residential events at local universities, usually in June and July each year, and is often called summer school. UniFest gives your child a great chance to explore what university is all about for themselves, so that they can make the right decisions about their future. The experience is exciting, fun and can really motivate young people to do their best at school or college.

If your child is selected to take part in UniFest they will be given information about the events and a form to bring home in January. The form will include a section for parents and carers to give consent for their child to attend.

Offers of places are made early in the summer term, and before each UniFest event parents / carers and young people are invited to information evenings at their host university, to meet staff, have a look at accommodation and have all their questions answered.

Healthy Careers

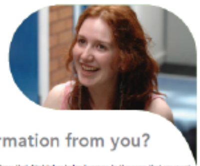
Our Healthy Careers project organises visits to hospitals and other NHS workplaces, and events where young people can meet professionals from wide range of healthcare careers. The project also organises week-long work experience placements giving young people a chance to further develop their understanding of the enormous variety of job roles in the health and care sector. If you child is selected for a work placement you will be given more information and asked to consent to them taking part.

"The experience has been truly inspiring for my daughter, and she has returned with much needed valuable information to help her with future decisions."

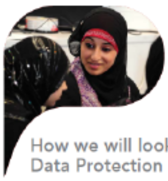
Safeguarding – taking care of young people

The safety and wellbeing of learners is the highest priority for everyone involved in Aimhigher:

- Our mentors undergo a Criminal Records Bureau (CRB) check and are given full training and guidance in child protection. They have a code of conduct which identifies their responsibilities for protecting the learners they work with
- UniFest events are fully risk assessed, and supervised 24 hours a day by qualified staff and trained students, also checked by the CRB
- Healthy Careers activities are fully risked assessed. The project officer is CRB checked and work placements are fully supervised.



Why do we need information from you?



We have to show that Aimhigher helps learners in the ways that we want it to. To do this we need information from learners and their parents or carers, and your consent to find out if your child goes on to gain their GCSEs, A levels or other qualifications and then apply for university. This is an important part of a research study that we are undertaking, and involves asking learners that attend Aimhigher activities to complete questionnaires.

The form attached to this leaflet asks for your permission to use and match questionnaire responses with information on the Aimhigher events your child has attended, their attainment data, school census data and data relating to their post 16 destinations (e.g. what did they do after school/did they go to university). This is important to help us see if Aimhigher is having a positive effect and will also help universities and schools to plan even more effective activities in the future.

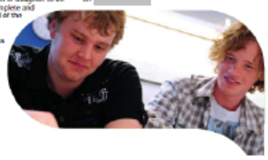
How we will look after this information? - Data Protection

All information collected will be held confidentially and each learner's name and school name will be held separately from the rest of the information. If you have questions about our research please contact Matthew Horton - email: m.a.horton@bham.ac.uk). If you do not wish any information about your son or daughter to be included in this research please complete and return the "opt out" section at end of the form.

None of the information you give us will be shared unless you give us your permission. Any information we publish about Aimhigher will not identify you or your child

Please complete the form attached to this leaflet and return it to your school, college or academy.
Keep this part of the leaflet in a safe place.

unless you have given us your permission. Under the Data Protection Act 1998, you have the right to a copy of the data held about you by us, for a small fee. If you have any concerns about how your data will be used or would like a copy of your data please contact Aimhigher on



Information and Consent Form

Aimhigher
Your pathway to Higher Education

Data Protection
To take part in Aimhigher the data provided on this form (or subsequent correspondence) will need to be shared with local Universities, the school, academy or college your child attends, your local authority and the University and College Admissions Service (UCAS) for the following reasons:

1. To pass information to the university or other partners who will be delivering Aimhigher activities
2. To improve future Aimhigher activities
3. To monitor the effectiveness and impact of Aimhigher.

Any information we publish about Aimhigher will not identify you or your child without your permission. Under the Data Protection Act 1998, you have the right to a copy of the data held about you by us, for a small fee. If you have any concerns about how your data will be used or would like a copy of your data please contact Aimhigher on 0121 414 2510.

Marketing
Photographs and/or video/digital footage of your child may be taken. We will only use these images with your consent, to help other young people who are thinking about taking part in Aimhigher.

SECTION 1 - Information to be completed by the YOUNG PERSON

Please read the information on the attached leaflet before completing this form.
Please complete the form in BLOCK capitals and return it to your teacher or tutor.

First name: Surname:

Home Address:

Home Postcode:

Mobile number:

Your email:
(Optional: This may be used to contact you with updates about Aimhigher and to ask for your feedback.)

Gender: ☐ Male ☐ Female

Date of Birth: ☐☐ / ☐☐ / ☐☐☐☐ DD/MM/YYYY

Which Ethnic Group do you belong to?

☐ White	☐ Other Black background	☐ Mixed - White & Black African
☐ Black or Black British – Caribbean	☐ Asian or Asian British – Indian	☐ Other Mixed Background
☐ Chinese	☐ Mixed - White & Asian	☐ Other ethnic background
☐ Other Asian background	☐ Black or Black British – African	☐ Not known
☐ Mixed - White & Black Caribbean	☐ Asian or Asian British – Bangladeshi	☐ Prefer not to say
☐ Irish Traveller	☐ Asian or Asian British – Pakistani	

Name of school, college or academy:

Your Year Group: 8 9 10 11 12 13 College/training year 1 College/training year 2
Please circle

Appendix 5: Non-Treatment Group – Parent Information and Consent Form

Date

Aimhigher Learning Choices Study

Dear Parent/Carer

Aimhigher is a local partnership of schools, academies, colleges and universities that aims to raise the intentions / expectations and achievements of young people so that they have every opportunity to reach their full potential and possibly go on to higher education. We have to show that Aimhigher helps students in the ways that we want it to. To do this we are carrying out a study within your child's school. This study will involve your child's year group completing an online learning choices questionnaire that will ask them about their future intentions / expectations and knowledge of higher education. Your child's school may also include questions on your child's option choices. The questionnaire will take about 20 minutes and will be completed during school time. The results of the study will help the school and universities in delivering effective activities. So that we can review the impact of Aimhigher activities students' will be asked for their permission:

(1) To use their answers to questions in the research
(2) To match answers to their questionnaires to their examination results, school census data, post 16 education and UCAS / HESA data (e.g. where did they go after school/did they go to university) and any data relating to their attendance at Aimhigher activities. This data will be sourced from your school, the local authority, NPD, UCAS and HESA.

All information collected during the project will be held confidentially by Aimhigher and each student's name and the school name will be held separately from the rest of the information.

If you do not wish any information about your son or daughter to be included in this research, please complete and return the "opt out" section at end of this letter. Please note that as the questionnaire may include other questions requested by your child's school, such as subject option choices and this data will need to be analysed and returned to the school to support curriculum planning. If you have questions about our research, please contact Matthew Horton - email: [redacted]). You can also use this contact email if you wish for you child withdraw from the research at any time.

Yours sincerely
Matthew Horton (Aimhigher Research and Monitoring Officer)

---✂---

Only complete this section if you **DO NOT WANT** you and your child's data to be used for Aimhigher research purposes. This *will not stop your child taking part in Aimhigher activities. Please write in CAPITALS the name(s) of your child/children you wish to exclude from the research and the name of the school they attend in the box below and then sign the declaration below.*

1. First Name	*Surname*	*School*
2. First Name	*Surname*	*School*

I the parent/carer **do not** consent for data on the Aimhigher learning choices questionnaire to be matched with any future Aimhigher questionnaires my child completes, Aimhigher monitoring forms, school census and local authority attainment data, then NPD, post 16 education, UCAS and HESA data (e.g., where did they go after school/did they go to university)

Signature of parent/carer: Print name: Date signed:

Please return this form to: Aimhigher, University of Birmingham, Edgbaston, Birmingham, B15 1BR

Appendix 5a. Reading age of Question Items via the SMOG Calculator.

Question items	Outcome Measure	SMOG Index Score	Year group* & comprehension
I understand what student life would be like in higher education	HE Knowledge	11.21	Year 8: easy to read
I know enough about higher education to decide whether to go or not		8.84	Year 8: easy to read
I understand how to apply to higher education		11.21	Year 8: easy to read
I know the qualifications that I will need to be able to go to higher education		11.21	Year 8: easy to read
I know the grades that I will need to be able to go to higher education		8.84	Year 8: easy to read
I am clear on which higher education course/subject to apply for		8.84	Year 8: easy to read
I am clear on which higher education institutions I want to apply for		11.21	Year 8: easy to read
I understand how the UCAS application process works (UCAS is the organisation responsible for managing applications to higher education courses)		18.24	Year 9: fairly easy to read
University is for people like me.	HE Attitudes	8.84	Year 8: easy to read
I can't afford to continue into higher education because I am worried about getting into debt.		11.21	Year 8: easy to read
It is not worthwhile continuing with education.	HE attitudes and academic motivation	11.21	Year 8: easy to read
I'm not interested in education.		11.21	Year 8: easy to read
I do not feel confident in my ability to cope with learning in higher education.	HE attitudes / confidence in academic ability	13.02	Year 9: fairly easy to read
I am planning / considering going to higher education before I am 30 years old.	HE expectations and intentions	11.21	Year 8: easy to read
I will not get the required grades to go into higher education.		8.84	Year 8: easy to read
Response: Definitely. Probably. Not Sure. Probably not. Definitely not.	na	8.24	Year 8: easy to read
Response: Strongly agree. Agree. Not sure. Disagree Strongly Disagree.	na	7.17	Year 8: easy to read
All 15 question items	All	11.34	Year 8: easy to read

*Note the SMOG guidance relates index scores to grades. This has been converted to year groups used in England.

Appendix 6: Coding Sheet Control Measures

Control variables	Variable name	Source	Value label	Code
KS2 attainment	Ks2lev4	KS2_LEVXEMSTA. Achieved Level 4 or above (expected level) in KS2 English, Maths and Science Teacher Assessment.	Yes No Missing data	1 0 "."
Treatment group 1	Treatgrp1	Aimhigher records	Mentoring Non-treatment group Missing data	1 0 "." Category (nominal)
Treatment group 2	Treatgrp1	Aimhigher records. Measures the number of times a pupil has engaged in mentoring across one or more academic years	1 2 3 4 5 Non-treatment group Engaged in summer school or summer school and mentoring	1-5 engagements 6-10 engagements 11-15 engagements more than 15 engagements 0] "." Category (ordinal)
Number of engagements in mentoring scheme	Mentdose	Aimhigher records		
Dosage (# engagements in Aimhigher interventions)	Aimdose	Aimhigher records	Dosage No dosage	1-250 0 Level of measurement category (ordinal)

Type of engagement	Dosetype	Aimhigher records	Mentoring (treatment group 1) Summer school (treatment group 2) No dosage (non-treatment group)	1 2 3 Level of measurement category (nominal)
EVER FSM 6	efsm6	Aimhigher records & NPD: PLASC census data (field EVERFSM_6)	Yes No Missing data	1 0 "." Level of measurement category (ordinal)
Gender	Gender	Aimhigher records & NPD: PLASC census data (field Gender)	M (Male) F (Female) Missing data	1 0 "." Level of measurement category (nominal)
Ethnicity	Ethnicity	Aimhigher records & NPD: PLASC census data (field EthnicGroupMajor)	 Asian/Chinese Black Mixed Any Other Ethnic Group White Missing data	 1* 2 3 4 5 "." Level of measurement category (nominal) *Due to small samples, (<10) pupils' with a Chinese ethnicity have been incorporated into the Asian ethnic group.
First language	Eal	NPD: KS2, KS4 & KS5 attainment data (field EALGRP)	English as a 1st language English as an additional language (EAL) Unclassified language Missing data	1 2 3 "." Level of measurement category (nominal)

IMD	Imd	Aimhigher records and NPD postcode records (PLASC census)	Disadvantaged Advantaged Missing data	Initially data is ranked 1-32482. A rank of 13,000 or below represents a disadvantaged neighbourhood (40% most disadvantaged) and above 13,000 an advantaged neighbourhood. This data is recoded to a dummy ***ordinal*** variable: 1 0 “.” Level of measurement (category - nominal)
IDACI	Idaci			
POLAR YPR and AHE	Polarypr		Disadvantaged Advantaged Missing data	POLAR (YPR and AHE) quintiles 1 and 2 are regarded as disadvantaged and quintiles 3,4 and 5 as advantaged. This was recoded into a dummy variable: 1 0 “.” Level of measurement (category - nominal)
	Polarahe			
Special Educational Need Status	Sen	Aimhigher records & NPD: PLASC census data (field SENprovision)		NPD data is coded as: N = No Special Educational Need A = School Action or Early Years Action P = School Action Plus or Early Years Action Plus S = Statement

			Special educational need No special educational need Missing data	The above categories have been recoded into a nominal dummy variable: 1 0 "." Level of measurement category (nominal)
School attended	School	Aimhigher records	School	1-99 Level of measurement category (nominal)
Control variables	Variable name	Source	Value label	Code
Baseline survey measures: A dummy proxy variable **(ordinal)** was created by amalgamating average total scores for each theme area (knowledge, attitudes, expectations & confidence in academic ability). Scores on each measure can range from 1-5. Level of measurement category (ordinal)				
Knowledge of higher education (8 question items)				
I understand what student life would be like in higher education				
I know enough about higher education to decide whether to go or not				

I understand how to apply to higher education I know the qualifications that I will need to be able to go to higher education I know the grades that I will need to be able to go to higher education I am clear on which higher education course/subject to apply for I am clear on which higher education institutions I want to apply for I understand how the UCAS application process works (UCAS is the organisation responsible for managing applications to higher education courses)	Knwcontrol	Aimhigher baseline survey. None of these questions are routed.	Definitely Probably Not Sure Probably not Definitely not No response	5 4 3 2 1 "."
Attitudes to higher education (5 question items)				
University is for people like me		Aimhigher baseline survey. Not routed	Definitely Probably Not Sure Probably not Definitely not No response	5 4 3 2 1 "."

I do not feel confident in my ability to cope with learning in higher education	Attcontrol	Aimhigher baseline survey. All questions items routed based on response to I am planning/considering going to higher education before I am 30 years old (see expectations / intentions). Routes to these questions items defined as barriers.	Strongly agree Agree Not Sure Disagree Strongly Disagree No response	Negative statements reverse coded: 1 2 3 4 5 “.”
I cannot afford to continue into higher education because I am worried about getting into debt				
It is not worthwhile continuing with education				
I am not interested in education				
Expectations towards higher education (2 question items)				
I am planning/considering going to higher education before I am 30 years old	Expcontrol	Aimhigher baseline survey. Responses to this question routed respondents to other survey items (barriers)	Definitely Probably Not Sure Probably not Definitely not No response	5 4 3 2 1 “.”
I will not get the required grades to go into higher education		Aimhigher baseline survey. Questions items routed based on response to I am planning/considering going to higher education before I am 30 years old (see expectations / intentions)	Strongly agree Agree Not Sure Disagree Strongly Disagree No response	Negative statements reverse coded: 1 2 3 4 5 “.”
Confidence in academic ability (2 question items)				

I will not get the required grades to go into higher education I do not feel confident in my ability to cope with learning in higher education	Concontrol	Aimhigher baseline survey. Questions items routed based on response to I am planning/considering going to higher education before I am 30 years old (see expectations / intentions)	Strongly agree Agree Not Sure Disagree Strongly Disagree No response	Negative statements reverse coded: 1 2 3 4 5 "."
Academic Motivation (2 question items)				
It is not worthwhile continuing with education I am not interested in education	Motcontrol	Aimhigher baseline survey. Questions items routed based on response to I am planning/considering going to higher education before I am 30 years old (see expectations / intentions)	Strongly agree Agree Not Sure Disagree Strongly Disagree No response	Negative statements reverse coded: 1 2 3 4 5 "."
I am planning/considering going to higher education before I am 30 years old			Definitely Probably Not Sure Probably not Definitely not No response	5 4 3 2 1 "."

Appendix 7: Coding Sheet Outcome Variables

Outcome variables	Variable name	Source	Value label	Code
Knowledge of higher education (8 question items)	Knwoutcome	Aimhigher baseline and follow-up survey	Score Missing data	A dummy proxy variable **(ordinal)** was created by amalgamating average total scores for each variable (knowledge, attitudes, expectations & confidence in academic ability). The variable will be used to measure changes form baseline to follow survey (scores) which can range from: +4 to -4 "." See baseline survey for scoring of each proxy measure and individual level question items. Shifts in scores for each question item were only measured if a pupil completed the same question within the baseline and follow-up survey. To support this analysis the survey variable outlined below was used (e.g. engaged between surveys – treatment group). Level of measurement category (ordinal)
Attitudes to higher education (5 question items).	Attoutcome			
Confidence in academic ability (2 question items)	Conoutcome			
Expectations towards higher education (2 question items)	Expoutcome			
Academic Motivation	Motoutcome			

Engaged in Aimhigher activities in between baseline and follow-up surveys	Enginsurv	Aimhigher baseline and follow-up survey	Treatment group completed both surveys and engaged in between surveys Non-treatment group completed both surveys Completed both surveys and engaged before or after survey only Not requested to complete survey Missing data completed 1 survey only	3 2 1 0 "." This variable was developed to support the survey outcome analysis so that only pupils' in the treatment group that had engaged in between baseline and follow-up surveys were included within the analysis and also the non-treatment group This variable ensures that pupils' who only engaged before the baseline and/or after the follow-up survey only were excluded from the analysis.
Completed baseline and follow-up survey	Bothsurvey	Aimhigher baseline and follow-up survey	Completed both surveys Missing data (completed one survey only) Not requested to complete survey	2 1 "." Level of measurement category (nominal)
KS4 attainment	ks4vabest		VA best 8 score	

		NPD KS4 attainment (field: KS4_B8VAPRED and B8SCRPLUSBONUS (2010/11 to 2012/13) or B8SCRPLUSBONUS_PTQ (2013/14) or B8SCRPLUSBONUS_PTQ_EE (2014/15).	Score Missing data* *data is missing for predicted, actual KS4 scores or both	Two KS4 variables are employed to measure Best VA shifts from KS4 predicted scores to KS4 actual scores. On each variable these scores range from: 0-580 Sores will be recoded into a dummy ***ordinal*** variable looking at the difference in best 8 VA scores from predicted to actual scores achieved in KS4 exams. Scores will be coded from a range of: +580 to -580 "." *This is not a valid outcome for cohort 1 as they were already in year 12 when the study commenced.* Level of measurement interval This outcome variable is combined with the variable below to ensure treatment group pupils' are only included if they engaged in Aimhigher activities if they were in years 10 or 11 (e.g. engaged when taking KS4). *Due to delays in NPD processing this data was only available for cohorts 2, 3 and 4 and missing for cohorts 5 and 6.*
Enrolled on a level 3 qualification	lev3prog	NPD KS5 attainment (field: TRIGGER) *Indicates whether the pupil meets the trigger criteria (i.e. 16-18 year old student who attempted at least a GCE/Applied GCE A level or Applied GCE Double Award level in*	Enrolled on L3 Not enrolled on L3 Missing data*	1 0 "." *This is not a valid outcome for cohort 1 as they were already in year 12 when the study commenced. This cohort is treated as missing data not coded as 1 or 0 but "."*

		the summer of relevant academic year.		*Aimhigher records are only included in the analysis if they match (e.g. first name, surname, DOB and postcode to an NPD census KS2 or KS4 record). *Due to delays in NPD processing this data was only available for cohorts 2, 3 and 4 and missing for cohorts 5 and 6.* Level of measurement category (ordinal)
HE entry	Heentry	HESA entry data. Field Academic year (of entry). *Within the current study this measures HE entry at age 18 on a programme above level 3 (any course of prescribed HE at a UK institution, whatever the mode of study e.g. HND, HNC, foundation degree) and staying on their course for a least 50 days.*	Entered HE Did not enter HE Missing data*	Academic year of entry (yyyy) has been coded to a dummy variable: 1 0 "." **Aimhigher records are only included in the analysis if they match (e.g. first name, surname, DOB and postcode to an NPD census KS2, KS4 or KS5 record). This is because pupils' that do not match to NPD records are more likely to be counted as not going to HE (due to pupil transcription errors)* *HE outcome data is available for cohorts 1-5.* Level of measurement category (ordinal)

Appendix 7a: A comparison of survey and non-survey schools - DfE school performance tables (2012)

School type	% Male	% Female	% EAL	% FSM6	% Disabled	% GCSE's 5 GCSEs (or equivalent A-C* including English and Maths	% White
Survey school	51.3	48.7	0.6	48.5	5.3	0.5	88.9
Survey school	56.9	43.1	43.5	59.5	16.6	0.54	7.6
Survey school	54	46	76	65.8	18.3	0.69	3.7
Survey school	49.2	50.8	1.7	30.7	4.4	0.45	67.4
Survey school	57	43	84.2	70	23.7	0.52	3.5
Survey school	61.1	38.9	73.4	82	13.4	0.51	3.3
Survey school	52.8	47.2	5	17.1	9.8	0.58	77.4
Non-survey school	47.6	52.4	4.5	50	9.2	0.52	89.8
Non-survey school	51.8	48.2	4.8	13.5	11.1	0.67	73
Non-survey school	55.9	44.1	59.8	57	5.8	0.43	20.9
Non-survey school	54.2	45.8	8.7	52.7	6.5	0.53	75.7
Non-survey school	50.6	49.4	3.1	5.2	9.6	0.90	85.5
Non-survey school	56.5	43.5	36.2	73.8	12.7	0.48	3.4
Non-survey school				MISS	MISS	MISS	79.3
Non-survey school	52.9	47.1	3.2	52.8	12.5	0.61	74.5
Non-survey school	49.9	50.1	4.7	56.6	17.3	0.46	78.7
Non-survey school	88.5	11.5	17.7	10.4	0.5	0.99	60.9
Non-survey school	51.1	48.9	0	8	11.4	MISS	97.7
Non-survey school	48.4	51.6	10.7	12.9	13.8	0.62	83.5
Non-survey school	100	100	90.5	62.9	13.1	0.59	0.80
Non-survey school	54.5	45.5	11.6	38.6	5.3	0.48	67.9
Non-survey school	55.5	44.5	93.7	64.5	10.1	0.41	1
Non-survey school	48.5	51.5	13	17.1	8.8	0.71	76.4
Non-survey school	47.9	52.1	4.4	60.6	16.3	0.37	75.4
Non-survey school	50.7	49.3	0.4	17.6	9.4	0.62	95.7
Non-survey school	48.8	51.2	6.5	23.9	11.7	0.57	93.9
Non-survey school	52.3	47.7	17.8	47.4	10.8	0.45	47.2
Non-survey school	50.4	49.6	0.9	42.6	14.7	0.59	87.4
Non-survey school	49.3	50.7	1	21.6	4.8	0.58	90.3
Non-survey school	59	41	10.7	51.2	15.1	0.54	66.3
Non-survey school	48.9	51.1	15.1	62.4	13.7	0.6	68.1
Non-survey school	49.1	50.9	4.2	30.4	5.1	0.49	97.7
Non-survey school	52.6	47.4	15.1	35.1	17.1	0.48	76.5
Non-survey school	48	52	2.6	21.4	7.1	0.76	81.4
Non-survey school	50.9	49.1	45.7	49	5.6	0.55	35.9
Non-survey school	53.2	46.8	89.6	68.4	19	0.43	0.3
Non-survey school	50.4	49.6	1.3	43	10.4	0.52	84.2
Non-survey school	51.7	48.3	17.6	42.8	7.5	0.51	36.3
Non-survey school	55.3	44.7	48.6	32.3	10.1	0.51	11.4
Non-survey school	52.9	47.1	41.1	34.8	11.6	0.77	8

Non-survey school	95.6	4.4	45	27	0.5	0.97	1.8
Non-survey school	56.5	43.5	79.4	79.4	10.2	0.56	5.8
Non-survey school	51	49	2.7	37.3	21.1	0.41	97.8
Non-survey school				MISS	MISS	0.53	17
Non-survey school	66.1	33.9	52	56.3	9.6	0.47	7.4
Non-survey school	52.4	47.6	87.4	79.8	12.5	0.66	1.7
Non-survey school	56	44	5.3	MISS	MISS	MISS	83
Non-survey school	49.7	50.3	4	49.5	8.7	0.43	74.8
Non-survey school	50.2	49.8	2.9	8.6	3.1	0.73	90.8
Non-survey school	51.5	48.5	3.2	36.1	8.2	0.66	64.4
Non-survey school	100	0	35.8	18.6	2.4	0.98	21.9
Non-survey school	0	100	27.7	13.4	0	1	23.1
Non-survey school	100	0	63.7	68.4	9.1	0.65	5.9
Non-survey school	100	0	5.5	25.3	12.8	0.59	71.6
Non-survey school	55.4	44.6	28.8	55.9	14	0.5	34.2
Non-survey school	60.9	39.1		MISS	MISS	0.7	0
Non-survey school	52.7	47.3	9.9	34.6	9.6	0.57	65.9
Non-survey school	50.1	49.9	7.1	23	10.8	0.62	70.8
Non-survey school	50.1	49.9	1.3	18.2	7.7	0.48	98
Non-survey school	50.2	49.8	10.3	24.6	9.5	0.5	68.3
Non-survey school	50.2	49.8	10.3	24.6	9.5	0.5	68.3
Non-survey school	47	53	4	64.1	12.6	0.56	78.5
Non-survey school	54.2	45.8	3.8	31.6	9.3	0.63	95.9
Non-survey school	55.5	44.5	31	47.2	10.6	0.72	29.9
Non-survey school	51.1	48.9	2.6	34	11.1	0.5	78.3
Non-survey school	50.1	49.9	2.4	27.6	3	0.59	93.1
Non-survey school	51.7	48.3	0.8	10.3	8.2	0.48	96.6
Non-survey school	49.7	50.3	6.3	17.3	7.4	0.71	75.5
Non-survey school	50.1	49.9	4.5	34.9	5.3	0.42	87.5
Non-survey school	57	43	5.5	65.3	19.7	0.41	80.1
Non-survey school	50.3	49.7	1.3	27.8	5.2	0.66	92.1
Non-survey school	55.5	44.5	64.7	60.2	8.5	0.47	13.5
Non-survey school	56.9	43.1	92.1	59.1	6.1	0.61	0.5
Non-survey school	50.1	49.9	31.6	61.7	12.1	0.27	64.3
Non-survey school	48.3	51.7	9.9	31.6	9.6	0.39	88.9
Non-survey school	53.6	46.4	12.1	42.3	5.4	0.65	56
Non-survey school	46.9	53.1	2.5	14	5.2	0.62	89.6
Non-survey school	47.4	52.6	8.8	8.3	4	0.65	93.7
Non-survey school	0	100	17.1	30.5	3.6	0.63	0
Non-survey school	49.5	50.5	3.1	8.8	2.9	0.78	0
Non-survey school	54.2	45.8	1.7	44	16.9	0.42	0
Non-survey school	0	100	32.6	10.6	0.5	0.99	0
Non-survey school	0.2	99.8	55.9	45.5	4.2	0.66	14.7
Non-survey school	52.1	47.9	2.9	40.4	9.1	0.39	0
Non-survey school	46.3	53.7	5.2	17.3	4.8	0.75	0
Non-survey school	49.9	50.1	6.4	35.6	12	0.55	0

Non-survey school	53	47	1.4	41.9	14.9	0.38	0
Non-survey school	49.5	50.5	1.9	21.6	5.3	0.76	0
Non-survey school	48.2	51.8	0.6	25.9	8.7	0.56	0
Non-survey school	48.7	51.3	3.1	42.4	9.8	0.47	0
Non-survey school	100	0	1.6	46	10.9	0.44	87.1
Non-survey school	52.7	47.3	88.2	66	25.1	0.67	3.3
Non-survey school	53.7	46.3	6	22.4	5.6	0.61	0
Non-survey school	55.5	44.5	81.4	59.3	28.2	0.61	8

All data sourced from DfE 2012. No data was available for five non-survey schools.

Appendix 8: Multiple logistic regression for the controlled estimated effects of mentoring and summer schools on HE entry

	Mentoring (Model 1a)	*Summer School (Model 1b)*
	Odds ratios P>[z]	
Treatment	1.17, n.s.	2.15, p<0.001
Pupil level controls (socio-economic, demographic and attainment)		
Gender male *(base female)*	0.60, p<0.001	0.52, p<0.001
EFSM6 *(base not EFSM6)*	0.81, p<0.001	0.91, n.s.
Black	1.23, n.s.	0.97, n.s.
Mixed	0.63, p<0.05	0.61, n.s.
White	0.49, p<0.001	0.55 p<0.01
(base Asian)		
SEN *(base not SEN)*	0.68, p<0.01	0.72, p<0.05
English first language (Base EAL)	0.68, p<0.05	0.67, p<0.05
IDACI disadvantaged (base advantaged)	0.79, n.s.	0.92, n.s.
POLARYPR disadvantaged (base advantaged)	1.07, n.s.	1.03, n.s.
POLARAHE disadvantaged (base advantaged)	0.92, n.s.	0.96, n.s.
KS2 not achieved level 4 (*Base KS2 achieved level 4)*	0.45, p<0.001	0.45, p<0.001
Cons_	1.88, n.s.	3.00, n.s.

All p values are based on the chi2 statistic. Unclassified EAL and any other ethnic group have been excluded from models due to small numbers.

Appendix 9: Multiple controlled interacted logistic regression showing the estimated effects of mentoring and summer schools on HE entry

	Mentoring (Model 1a)	*Summer School (Model 1b)*	*Mentoring frequency of engagement (Model 1d)*			
			1-5	*6-10*	*11-15*	*More than 15*
	Odds ratios P>[z]					
Treatment (from controlled model)	1.17, n.s.	2.15, p<0.001	0.94, n.s.	1.10, n.s.	1.34, p<0.05	1.54, p<0.05
Pupil level controls (socio-economic, demographic and attainment)						
Male#treatment *(base male non-treatment)*	1.43, p<0.01	2.52, p<0.001	1.12, n.s.	1.35, n.s.	1.53, p<0.05	2.04, p<0.05
Female#treatment (female non-treatment)	0.95, n.s.	2.16, p<0.001	0.77, n.s.	0.78, n.s.	1.11, n.s.	1.35, n.s.
Efsm6#treatment (base efsm6 non-treatment)	0.94, n.s.	2.07, p<0.001	0.72, n.s.	0.96, n.s.	1.02, n.s.	1.24, n.s.
Not efsm6#treatment (base not efsm6 non-treatment)	1.38, p<0.05	2.33, p<0.001	1.12, n.s.	1.12, n.s.	1.66, p<0.01	1.92, p<0.05
Asian#treatment (base Asian non-treatment)	1.07, n.s.	1.80, p<0.01	0.84, n.s.	1.01, n.s.	1.11, n.s.	1.25, n.s.
Black#treatment (base Black non-treatment)	1.43, n.s.	1.21, n.s.	0.88, n.s.	1.87, n.s.	1.12, n.s.	1.24, n.s.
Mixed#treatment (base Mixed non-treatment)	1.10, n.s.	1.55, n.s.	Small samples – removed			
White#treatment (base White non-treatment)	1.21, n.s.	3.31, p<0.001	0.90, n.s.	0.94, n.s.	1.78, p<0.01	1.65, n.s.
SEN#treatment (base SEN non-treatment)	1.34, n.s.	2.13, n.s. p = 0.054	1.02, n.s.	1.36, n.s.	1.27, n.s.	2.17, n.s.
Not SEN#treatment (base not SEN non-treatment)	1.12, n.s.	2.07, p<0.001	0.88, n.s.	1.00, n.s.	1.30, n.s. p = 0.058	1.43, n.s.
English as a 1st Lang#treatment (base Eng 1st non-treatment)	1.23, n.s.	2.93, p<0.001	1.01, n.s.	0.99, n.s.	1.56, p<0.01	2.04, p<0.01
EAL#treatment (base EAL non-treatment)	1.13, n.s.	1.59, p<0.05	0.75, n.s.	1.21, n.s.	1.14, n.s.	1.31, n.s.
IDACI Disadvantaged#treatment (base disadvantaged non-treatment)	1.06, n.s.	2.04, p<0.001	0.89, n.s.	0.94, n.s.	1.18, n.s.	1.47, n.s.
IDACI Advantaged#treatment (base advantaged non-treatment)	1.41, n.s.	2.69, p<0.001	0.61, n.s.	1.48, n.s.	1,69, n.s. p = 0.057	1.74, n.s.
POLARYPR Disadvantaged#treatment (base disadvantaged non-treatment)	1.05, n.s.	2.04, p<0.001	1.20, n.s.	0.79, n.s.	1.23, n.s.	1.38, n.s.

POLARYPR Advantaged#non-treatment (base advantaged non-treatment)	1.28, n.s.	2.10, p<0.001	0.63, n.s.	1.39, n.s.	1.39, n.s.	1.73, n.s.
POLARAHE Disadvantaged#treatment (base disadvantaged non-treatment)	1.06, n.s.	1.97, p<0.001	0.99, n.s.	0.88, n.s.	1.26, n.s.	1.27, n.s.
POLARAHE Advantaged#non-treatment (base advantaged non-treatment)	1.53, p<0.05	2.89, p<0.001	0.66, n.s.	1.88, p<0.05	1.51, n.s.	3.00, p<0.05
KS2 achieved level 4#treatment *(base KS2 achieved lev 4 non-treatment)*	1.17, n.s.	2.13, p<0.001	0.91, n.s.	0.99, n.s.	1.37, p<0.05	1.69, p<0.01
KS2 not achieved level 4#non-treatment *(base KS2 not achieved lev 4 non-treatment)*	1.18, n.s.	2.45, p<0.01	0.74, n.s.	1.32, n.s.	1.44, n.s.	0.74, n.s.

All p values are based on the chi2 statistic.
Unclassified EAL and any other ethnic group have been excluded from models due to small numbers. For mentoring frequency of engagement results are not provided for pupils from a Mixed ethnic group due to small numbers.

Appendix 10: KS2 level 4 (achieved / not achieved) and mean survey scores

Survey measure	KS2 level 4	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (did not achieve level 4)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Achieved	M 3.58 SD 0.83 (311/811)	M 3.54 SD 0.78 (500/811)	M 3.56 SD 0.80 (811)	n.s.	M 3.55 SD 0.85 (311/811)	M 3.44 SD 0.75 (500/811)
	Did not achieve	M 3.80 SD 0.88 (44/215)	M 3.56 SD 0.83 (171/215)	M 3.60 SD 0.85 (215)		M 3.87 SD 0.83 (44/215)	M 3.49 SD 0.77 (171/215)
HE attitudes	Achieved	M 4.0 SD 0.84 (311/811)	M 3.52 SD 0.89 (500/811)	M 3.70 SD 0.90 (811)	t = 2.45 p<0.01	M 4.0 SD 0.83 (311/811)	M 3.53 SD 0.88 (500/811)
	Did not achieve	M 3.91 SD 0.88 (44/215)	M 3.42 SD 0.92 (171/215)	M 3.53 SD 0.93 (215)		M 3.9 SD 0.89 (44/215)	M 3.33 SD 0.90 (171/215)
HE expectations	Achieved	M 4.56 SD 0.66 (311/811)	M 4.18 SD 0.83 (500/811)	M 4.32 SD 0.79 (811)	t = 4.92 p<0.001	M 4.54 SD 0.70 (311/810)	M 4.12 SD 0.88 (499/810)
	Did not achieve	M 4.39 SD 0.69 (44/213)	M 3.91 SD 0.95 (169/213)	M 4.01 SD 0.92 (213)		M 4.38 SD 0.70 (44/213)	M 3.87 SD 0.98 (169/213)
Academic motivation	Achieved	M 4.56 SD 0.66 (311/811)	M 4.16 SD 0.84 (500/811)	M 4.31 SD 0.80 (811)	t = 4.69 p<0.001	M 4.56 SD 0.67 (311/810)	M 4.15 SD 0.84 (499/810)
	Did not achieve	M 4.41 SD 0.66 (44/213)	M 3.90 SD 0.98 (169/213)	M 4.01 SD 0.94 (213)		M 4.42 SD 0.63 (44/213)	M 3.92 SD 0.95 (169/213)

Numbers in brackets = proportion that went to HE

Appendix 11: Gender and mean survey scores

Survey measure	Gender	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (male)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	F	M 3.54 SD 0.86 (209/498)	M 3.55 SD 0.78 (289/498)	M 3.54 SD 0.81 (503)	n.s.	M 3.53 SD 0.88 (209/498)	M 3.38 SD 0.76 (289/498)
	M	M 3.71 SD 0.81 (151/538)	M 3.55 SD 0.79 (387/538)	M 3.60 SD 0.80 (546)		M 3.70 SD 0.82 (151/538)	M 3.51 SD 0.74 (387/538)
HE attitudes	F	M 3.96 SD 0.85 (209/498)	M 3.49 SD 0.93 (289/498)	M 3.68 SD 0.92 (503)	n.s.	M 3.96 SD 0.84 (209/498)	M 3.51 SD 0.92 (289/498)
	M	M 4.05 SD 0.85 (151/538)	M 3.50 SD 0.88 (387/538)	M 3.66 SD 0.90 (546)		M 4.06 SD 0.84 (151/538)	M 3.51 SD 0.87 (387/538)
HE expectations	F	M 4.55 SD 0.88 (209/497)	M 4.22 SD 0.88 (288/497)	M 4.35 SD 0.82 (502)	t =3.33 p<0.001	M 4.53 SD 0.71 (209/497)	M 4.17 SD 0.93 (299/497)
	M	M 4.54 SD 0.65 (151/537)	M 4.04 SD 0.84 (386/537)	M 4.18 SD 0.83 (545)		M 4.51 SD 0.69 (151/536)	M 3.98 SD 0.89 (385/536)
Academic motivation	F	M 4.56 SD 0.66 (209/497)	M 4.22 SD 0.87 (288/497)	M 4.36 SD 0.81 (502)	t = 3.87 p<0.001	M 4.56 SD 0.67 (209/497)	M 4.22 SD 0.86 (288/497)
	M	M 4.53 SD 0.66 (155/537)	M 4.01 SD 0.88 (386/537)	M 4.16 SD 0.86 (545)		M 4.53 SD 0.65 (151/536)	M 4.0 SD 0.88 (385/536)

Numbers in brackets = proportion that went to HE

Appendix 12: EFSM6 and mean survey scores

Survey measure	EFSM6	Comparison Group 3 (NT) Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (EFSM6 – yes)	Comparison Group 3 (NT) **Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Yes	M 3.71 SD 0.84 (103/299)	M 3.55 SD 0.85 (196/299)	M 3.60 SD 0.84 (301)	n.s.	M 3.66 SD 0.84 (103/299)	M 3.55 SD 0.79 (196/299)
	No	M 3.57 SD 0.84 (257/732)	M 3.54 SD 0.77 (475/732)	M 3.55 SD 0.79 (736)		M 3.57 SD 0.86 (257/732)	M 3.41 SD 0.73 (475/732)
HE attitudes	Yes	M 4.04 SD 0.86 (103/299)	M 3.51 SD 0.94 (196/299)	M 3.69 SD 0.94 (301)	n.s.	M 4.05 SD 0.85 (103/299)	M 3.51 SD 0.93 (196/299)
	No	M 3.98 SD 0.84 (257/732)	M 3.50 SD 0.88 (475/732)	M 3.67 SD 0.90 (736)		M 3.98 SD 0.84 (257/732)	M 3.51 SD 0.86 (475/732)
HE expectations	Yes	M 4.61 SD 0.60 (103/298)	M 4.12 SD 0.90 (195/298)	M 4.29 SD 0.84 (300)	n.s.	M 4.61 SD 0.61 (103/298)	M 4.07 SD 0.95 (195/298)
	No	M 4.52 SD 0.69 (257/731)	M 4.11 SD 0.86 (474/731)	M 4.25 SD 0.83 (735)		M 4.49 SD 0.73 (257/730)	M 4.06 SD 0.90 (473/730)
Academic motivation	Yes	M 4.62 SD 0.58 (103/298)	M 4.12 SD 0.89 (195/298)	M 4.29 SD 0.84 (300)	n.s.	M 4.62 SD 0.58 (103/298)	M 4.11 SD 0.89 (195/298)
	No	M 4.52 SD 0.69 (257/731)	M 4.09 SD 0.88 (474/731)	M 4.24 SD 0.85 (735)		M 4.52 SD 0.69 (257/730)	M 4.09 SD 0.87 (473/730)

Numbers in brackets = proportion that went to HE

Appendix 13: IDACI and mean survey scores

Survey measure	IDACI	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (IDACI)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Advantaged	M 3.56 SD 0.81 (126/342)	M 3.54 SD 0.75 (216/342)	M 3.54 SD 0.77 (343)	n.s.	M 3.47 SD 0.84 (126/342)	M 3.36 SD 0.72 (216/342)
	Disadvantaged	M 3.64 SD 0.86 (233/687)	M 3.55 SD 0.81 (454/687)	M 3.58 SD 0.83 (692)		M 3.67 SD 0.86 (233/687)	M 3.50 SD 0.76 (454/687)
HE attitudes	Advantaged	M 3.92 SD 0.78 (126/342)	M 3.49 SD 0.88 (216/342)	M 3.65 SD 0.87 (343)	n.s.	M 3.93 SD 0.78 (126/342)	M 3.47 SD 0.89 (216/342)
	Disadvantaged	M 4.03 SD 0.88 (233/687)	M 3.51 SD 0.91 (454/687)	M 3.69 SD 0.93 (692)		M 4.04 SD 0.87 (233/687)	M 3.53 SD 0.88 (454/687)
HE expectations	Advantaged	M 4.57 SD 0.65 (126/342)	M 4.24 SD 0.79 (216/342)	M 4.36 SD 0.76 (343)	t = 2.56 p<0.01	M 4.56 SD 0.67 (126/342)	M 4.21 SD 0.83 (216/342)
	Disadvantaged	M 4.53 SD 0.68 (233/685)	M 4.05 SD 0.90 (452/685)	M 4.22 SD 0.86 (690)		M 4.51 SD 0.71 (233/684)	M 3.99 SD 0.94 (451/684)
Academic motivation	Advantaged	M 4.59 SD 0.62 (126/342)	M 4.23 SD 0.81 (216/342)	M 4.36 SD 0.77 (343)	t = 2.87 p<0.01	M 4.58 SD 0.63 (126/342)	M 4.23 SD 0.80 (216/342)
	Disadvantaged	M 4.53 SD 0.68 (233/685)	M 4.04 SD 0.91 (452/685)	M 4.20 SD 0.88 (690)		M 4.53 SD 0.68 (233/684)	M 4.03 SD 0.90 (451/684)

Numbers in brackets = proportion that went to HE

Appendix 14: POLAR YPR and mean survey scores

Survey measure	POLAR YPR	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (POLAR YPR)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Advantaged	M 3.56 SD 0.90 (148/397)	M 3.52 SD 0.74 (249/397)	M 3.54 SD 0.80 (401)	n.s.	M 3.55 SD 0.83 (148/397)	M 3.39 SD 0.72 (249/397)
	Disadvantaged	M 3.65 SD 0.80 (212/634)	M 3.56 SD 0.82 (422/634)	M 3.59 SD 0.82 (637)		M 3.63 SD 0.87 (212/634)	M 3.49 SD 0.77 (422/634)
HE attitudes	Advantaged	M 3.97 SD 0.82 (148/397)	M 3.44 SD 0.88 (249/397)	M 3.64 SD 0.90 (401)	t = -5.50 p<0.001	M 3.98 SD 0.82 (148/397)	M 3.44 SD 0.87 (249/397)
	Disadvantaged	M 4.01 SD 0.86 (212/634)	M 3.54 SD 0.91 (422/634)	M 3.96 SD 0.92 (637)		M 4.02 SD 0.85 (212/634)	M 3.56 SD 0.89 (422/634)
HE expectations	Advantaged	M 4.54 SD 0.83 (148/396)	M 4.19 SD 0.83 (248/396)	M 4.32 SD 0.79 (400)	t = 1.89 p<0.05	M 4.53 SD 0.71 (212/633)	M 4.01 SD 0.93 (421/633)
	Disadvantaged	M 4.55 SD 0.68 (212/633)	M 4.06 SD 0.88 (421/633)	M 4.22 SD 0.85 (636)		M 4.52 SD 0.68 (148/395)	M 4.15 SD 0.88 (247/395)
Academic motivation	Advantaged	M 4.55 SD 0.64 (148/396)	M 4.18 SD 0.85 (248/396)	M 4.31 SD 0.80 (400)	t = 1.67 p<0.05	M 4.55 SD 0.64 (148/395)	M 4.18 SD 0.84 (247/395)
	Disadvantaged	M 4.55 SD 0.68 (212/633)	M 4.05 SD 0.90 (421/633)	M 4.22 SD 0.87 (636)		M 4.54 SD 0.68 (212/633)	M 4.05 SD 0.89 (421/633)

Numbers in brackets = proportion that went to HE

Appendix 15: POLAR AHE and mean survey scores

Survey measure	POLAR AHE	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (POLAR AHE)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Advantaged	M 3.61 SD 0.85 (79/219)	M 3.54 SD 0.74 (140/219)	M 3.56 SD 0.78 (223)	n.s.	M 3.59 SD 0.79 (79/219)	M 3.36 SD 0.69 (140/219)
	Disadvantaged	M 3.62 SD 0.84 (281/812)	M 3.55 SD 0.80 (531/812)	M 3.57 SD 0.82 (814)		M 3.60 SD 0.87 (281/812)	M 3.48 SD 0.76 (531/812)
HE attitudes	Advantaged	M 3.94 SD 0.87 (79/219)	M 3.44 SD 0.80 (140/219)	M 3.62 SD 0.86 (223)	n.s.	M 3.95 SD 0.85 (79/219)	M 3.43 SD 0.79 (140/219)
	Disadvantaged	M 4.01 SD 0.84 (281/812)	M 3.52 SD 0.92 (531/812)	M 3.69 SD 0.93 (814)		M 4.02 SD 0.84 (281/812)	M 3.53 SD 0.91 (531/812)
HE expectations	Advantaged	M 4.58 SD 0.59 (79/218)	M 4.13 SD 0.91 (139/218)	M 4.29 SD 0.84 (222)	n.s.	M 4.56 SD 0.62 (79/218)	M 4.08 SD 0.95 (139/218)
	Disadvantaged	M 4.53 SD 0.69 (281/811)	M 411 SD 0.86 (530/811)	M 4.25 SD 0.83 (813)		M 4.51 SD 0.72 (281/810)	M 4.06 SD 0.91 (529/810)
Academic motivation	Advantaged	M 4.57 SD 0.61 (79/218)	M 4.11 SD 0.93 (139/218)	M 4.27 SD 0.86 (222)	n.s.	M 4.58 SD 0.59 (7/218)	M 4.12 SD 0.90 (139/218)
	Disadvantaged	M 4.54 SD 0.68 (281/811)	M 4.10 SD 0.87 (530/811)	M 4.25 SD 0.84 (813)		M 4.54 SD 0.68 (281/810)	M 4.09 SD 0.87 (529/810)

Numbers in brackets = proportion that went to HE

Appendix 16: Ethnicity and mean survey scores

Survey measure	Ethnicity	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (advantaged Asian)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Asian	M 3.81 SD 0.86 (70/137)	M 3.64 SD 0.92 (67/137)	M 3.72 SD 0.89 (138)	Na	M 3.96. SD 0.81 (12/22)	M 4.30 SD 0.43 (10/22)
	Black	M 3.45 SD 0.97 (33/65)	M 3.97 SD 0.59 (32/65)	M 3.71 SD 0.84 (65)	n.s.	M 3.63 SD 1.07 (5/14)	M 3.88 SD 0.85 (9/14)
	Mixed	M 3.21 SD 0.92 (19/49)	M 3.5 SD 0.94 (30/49)	M 3.39 SD 0.93 (49)	t =2.20 p<0.05	M 2.94 SD 0.08 (<5/10)	M 4.33 SD 0.42 (8/10)
	Any other	M 3.88 SD 0.60 (17/34)	M 3.59 SD 0.87 (17/34)	M 3.68 SD 0.78 (37)	n.s.	M 4.19 SD 0.22 (<5/9)	M 4.02 SD 1.07 (6/9)
	White	M 3.57 SD 0.83 (209/697)	M 3.52 SD 0.75 (488/697)	M 3.54 SD 0.77 (699)	t =3.44 p<0.01	M 3.69 SD 1.06 (21/127)	M 3.65 SD 0.79 (106/127)
HE attitudes	Asian	M 414 SD 0.82 (70/137)	M 3.82 SD 0.90 (67/137)	M 3.98 SD 0.86 (138)	Na	M 4.35 SD 0.63 (12/22)	M 3.8 SD 0.61 (10/22)
	Black	M 4.12 SD 0.89 (33/65)	M 3.88 SD 0.91 (32/65)	M 4.0 SD 0.90 (65)	n.s.	M 4.28 SD 0.54 (5/14)	M 4.07 SD 0.93 (9/14)
	Mixed	M 3.58 SD 0.96 (19/49)	M 3.3 SD 1.09 (30/49)	M 3.41 SD 1.04 (49)	t=3.77 p<0.001	M 3.4 SD 0.57 (<5/10)	M 3.83 SD 1.11 (8/10)
	Any other	M 4.18 SD 0.81 (17/34)	M 3.52 SD 1.07 (17/34)	M 3.78 SD 1.00 (37)	n.s.	M 4.33 SD 0.61 (<5/9)	M 3.97 SD 0.78 (6/9)
	White	M 3.94 SD 0.83 (209/697)	M 3.45 SD 0.87 (488/697)	M 3.60 SD 0.89 (699)	t = 4.61 p<0.001	M 3.95 SD 0.78 (21/127)	M 3.39 SD 0.89 (106/127)
HE expectations	Asian	M 4.59 SD 0.65 (70/136)	M 4.21 SD 0.94 (66/136)	M 4.39 SD 0.83 (137)	Na	M 4.08 SD 1.00 (12/22)	M 4.0 SD 0.78 (10/22)
	Black	M 4.67 SD 0.54 (33/65)	M 4.34 SD 0.75 (32/65)	M 4.51 SD 0.66 (65)	n.s.	M 4.0 SD 1 (5/14)	M 4.33 SD 0.87 (9/14)
	Mixed	M 4.42 SD 0.77 (19/49)	M 4.13 SD 0.97 (30/49)	M 4.24 SD 0.90 (49)	n.s.	M 4.5 SD 0.71 (<5/10)	M 3.56 SD 0.94 (8/10)
	Any other	M 4.59 SD 0.62 (17/34)	M 3.94 SD 1.09 (17/34)	M 4.22 SD 0.95 (37)	n.s.	M 3.67 SD 1.15 (<5/9)	M 4.33 SD 0.82 (6/9)
	White	M 4.50 SD 0.69 (209/696)	M 4.09 SD 0.85 (487/696)	M 4.21 SD 0.83 (698)	t =2.23 p<0.05	M 4.38 SD 0.71 (21/125)	M 3.81 SD 0.88 (104/125)
Academic motivation	Asian	M 4.6 SD 0.62 (70/136)	M 4.21 SD 0.94 (66/136)	M 4.40 SD 0.82 (137)	Na	M 4.25 SD 0.77 (12/22)	M 4.0 SD 0.77 (10/22)
	Black	M 4.67 SD 0.54 (33/65)	M 4.31 SD 0.78 (32/65)	M 4.49 SD 0.69 (65)	n.s.	M 4.13 SD 0.69 (<5/14)	M 4.37 SD 0.86 (9/14)
	Mixed	M 4.42 SD 0.77 (19/49)	M 4.17 SD 0.83 (30/49)	M 4.27 SD 0.81 (49)	n.s.	M 4.5 SD 0.71 (<5/10)	M 3.71 SD 0.81 (8/10)
	Any other	M 4.59 SD 0.62 (17/34)	M 4.06 SD 0.97 (17/34)	M 4.24 SD 0.93 (37)	n.s.	M 3.89 SD 1.02 (3/9)	M 4.20 SD 0.83 (6/9)
	White	M 4.50 SD 0.69 (209/696)	M 4.07 SD 0.88 (487/696)	M 4.19 SD 0.85 (698)	t =2.66 p<0..01	M 4.44 SD 0.67 (21/125)	M 3.87 SD 0.83 (104/125)

Numbers in brackets = proportion that went to HE

Appendix 17: SEN and mean survey scores

Survey measure	SEN	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (SEN)	**Follow-up mean survey scores** (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Yes	M 3.93 SD 0.78 (30/134)	M 3.44 SD 0.85 (104/134)	M 3.55 SD 0.85 (135)	n.s.	M 3.67 SD 1.03 (30/134)	M 3.40 SD 0.72 (104/134)
	No	M 3.59 SD 0.84 (329/889)	M 3.56 SD 0.78 (560/889)	M 3.57 SD 0.80 (894)		M 3.59 SD 0.84 (329/889)	M 3.46 SD 0.75 (560/889)
HE attitudes	Yes	M 3.97 SD 0.93 (30/134)	M 3.45 SD 0.83 (104/134)	M 3.56 SD 0.88 (135)	n.s.	M 3.95 SD 0.94 (30/134)	M 3.47 SD 0.82 (104/134)
	No	M 4.00 SD 0.84 (329/889)	M 3.50 SD 0.91 (560/889)	M 3.69 SD 0.92 (894)		M 4.01 SD 0.83 (329/889)	M 3.51 SD 0.89 (560/889)
HE expectations	Yes	M 4.27 SD 0.91 (30/133)	M 3.89 SD 0.94 (103/133)	M 3.97 SD 0.94 (134)	t = 4.50 p<0.001	M 4.23 SD 0.94 (30/133)	M 3.84 SD 0.99 (103/133)
	No	M 4.57 SD 0.63 (329/888)	M 4.16 SD 0.84 (559/888)	M 4.31 SD 0.80 (893)		M 4.56 SD 0.66 (329/887)	M 4.10 SD 0.89 (558/887)
Academic motivation	Yes	M 4.27 SD 0.91 (30/133)	M 3.89 SD 0.94 (103/133)	M 3.94 SD 0.99 (134)	t = 4.65 p<0.001	M 4.26 SD 0.91 (30/133)	M 3.90 SD 0.93 (103/133)
	No	M 4.57 SD 0.63 (329/888)	M 4.16 SD 0.84 (559/888)	M 4.30 SD 0.81 (893)		M 4.58 SD 0.62 (329/887)	M 4.13 SD 0.86 (558/887)

Numbers in brackets = proportion that went to HE

Appendix 18: First language and mean survey scores

Survey measure	EAL	Baseline mean survey scores (brackets % entered HE) [sample size survey]		Baseline mean score (all)	Baseline t-tests (are advantaged pupils means scores sig higher than disadvantaged pupils (Eng 1st lang)	Follow-up mean survey scores (brackets % entered HE) [sample size survey]	
		Entered HE	Did not enter HE			Entered HE	Did not enter HE
Knowledge of HE	Eng. as an add. Lang	M 3.75 SD 0.91 (76/155)	M 3.75 SD 0.81 (79/155)	M 3.75 SD 0.86 (155)	t = 2.98 p<0.01	M 3.88 SD 0.76 (76/155)	M 3.71 SD 0.85 (79/155)
	Eng. as a 1st lang	M 3.58 SD 0.82 (283/877)	M 3.51 SD 0.78 (594/877)	M 3.54 SD 0.80 (877)		M 3.52 SD 0.87 (283/877)	M 3.42 SD 0.73 (594/877)
	Unclass	M 4.0 SD 0 (<5/<5)	M 4.0 SD 1 (<5/<5)	M 4.0 SD 0.82 (<5)	Small sample	M 4.63 SD 0 (<5/<5)	M 3.96 SD 0.71 (<5/<5)
HE attitudes	Eng. as an add. Lang	M 4.17. SD (76/155)	3.78 SD 0.94 (79/155)	M 3.97 SD 0.90 (155)	t = 4.46 p<0.001	M 4.18 SD 0.81 (976/155)	M 3.81 SD 0.91 (79/155)
	Eng. as a 1st lang	M 3.95 0.85 (283/877)	M 3.46 0.89 (594/877)	M 3.62 SD 0.90 (877)		M 3.95 SD 0.84 (283/877)	M 3.47 SD 0.88 (594/877)
	Unclass	M 5.0 SD 0 (<5/<5)	M 3.33 SD 0.58 (<5/<5)	M 3.75 SD 0.96 (<5)	Small sample	M 5.0 SD 0 (<5/<5)	M 3.47 SD 0.50 (<5/<5)
HE expectations	Eng. as an add. Lang	M 4.59 SD 0.61 (76/154)	M 4.14 SD 0.98 (78/154)	M 4.36 SD 0.85 (154)	n.s.	M 4.59 SD 0.62 (76/154)	M 4.10 SD 1.01 (78/154)
	Eng. as a 1st lang	M 4.53 SD 0.68 (283/876)	M 4.11 SD 0.85 (593/876)	M 4.25 SD 0.82 (876)		M 4.51 SD 0.72 (283/875)	M 4.05 SD 0.90 (592/875)
	Unclass	M 5.0 SD 0 (<5/<5)	M 4.33 SD 0.58 (<5/<5)	M 4.5 SD 0.58 (<5)	Small sample	M 5.0 SD 0 (<5/<5)	M 4.33 SD 0.58 (<5/<5)
Academic motivation	Eng. as an add. Lang	M 4.59 SD 0.61 (76/154)	M 4.15 SD 0.95 (78/154)	M 4.37 SD 0.83 (154)	t = 1.91 p<0.05	M 4.60 SD 0.60 (76/154)	M 4.15 SD 0.94 (78/154)
	Eng. as a 1st lang	M 4.53 SD 0.67 (283/876)	M 4.09 SD 0.87 (593/876)	M 4.23 SD 0.84 (876)		M 4.53 SD 0.68 (283/875)	M 4.08 SD 0.87 (592/875)
	Unclass	M 5.0 SD 0 (<5/<5)	M 4.33 SD 0.58 (<5/<5)	M 4.5 SD 0.58 (<5)	Small sample	M 5.0 SD 0 (<5/<5)	M 4.22 SD 0.69 (<5/<5)

Numbers in brackets = proportion that went to HE

Appendix 19: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **HE knowledge outcome** are **observed**

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	M	SS	NT	Percentage point difference		t G1 & G3	t G2 & G3
		Group 1	Group 2	Group 3	G1 & G3	G2 & G3		
Mentoring engagements	Mean	M 9.5 (194), SD 4.0	Na	Na	Na	Na	Na	Na
	1-5	31 (16%)	Na	Na	Na	Na	Na	Na
	6 to 10	93 (47.9%)	Na	Na	Na	Na	Na	Na
	11 to 15	54 (27.8%)	Na	Na	Na	Na	Na	Na
	15+	14 (7.2%)	Na	Na	Na	Na	Na	Na
KS2 level 4	Achieved	65.6% (124)	68.8% (22)	79.0% (811)	-13.4%	10.2%		n.s.
	Did not achieve	34.4% (65)	31.2% (10)	21.0% (215)	13.4%	10.2%	t = -4.05, p< 0.001	
Gender	Male	52.4% (100)	46.9% (15)	51.9% (538)	0.4%	-5.1%		
	Female	47.6% (91)	53.1% (17)	48.1% (498)	-0.4%	5.1%	n.s.	n.s.
Ever FSM6	Yes	63.2% (120)	68.8% (22)	29.0% (299)	34.2%	39.7%		t = 4.87, p<0.001
	No	36.8% (70)	31.3% (10)	71.0% (732)	-34.2%	-39.7%	t = 9.5-, p< 0.001	
	White	69.8% (127)	21.9% (7)	71.0% (697)	-1.2%	-49.1%	n.s.	t = -2.60, p< 0.01
	Asian	12.1% (22)	37.5% (12)	14.0% (137)	-1.9%	23.5%	n.s.	t = 2.61, p< 0.01
Ethnicity	Black	7.7% (14)	21.9% (7)	6.6% (65)	1.1%	15.3%	n.s.	t =3.52, p< 0.001
	Mixed	5.5% (10)	18.8% (6)	5% (49)	0.5%	13.8%	n.s.	t = 3.59, p< 0.001
	Other	4.9% (9)	0% (0)	3.5% (34)	1.5%	-3.5%	n.s.	n.s.
	English 1st lang.	80.0% (157)	59.4% (19)	85.0% (877)	-2.5%	-25.3%	n.s.	
First language	English add. lang.	17.0% (31)	40.6% (13)	15% (155)	1.3%	25.7%		t = -4.00, p< 0.001
	Unclassified	<2.0% (<5)	0% (0)	<1.0% (<5)	1.2%	-0.4%		
SEN	Yes	18.9% (36)	<13.0% (<5)	13.1% (134)	5.8%	-0.6%		n.s.
	No	81.1% (154)	88.0% (28)	86.9% (889)	-5.8%	0.6%	t = 2.07, p< 0.05	
POLARYPR	Disadvantaged	75.7% (143)	84.4% (27)	61.5% (634)	14.2%	22.9%		t = 2.65, p< 0.01
	Advantaged	24.3% (46)	15.6% (5)	38.5% (397)	-14.2%	-22.9%	t = 3.68, p< 0.001	
POLARAHE	Disadvantaged	85.8% (163)	91.0% (29)	78.8% (812)	7.0%	11.9%		n.s.
	Advantaged	14.2% (27)	<10.0% (<5)	21.2% (219)	-7.0%	-11.9%	t = 2.16, p< 0.05	
IDACI	Disadvantaged	87.9% (1670	100% (32)	66.8% (687)	21.1%	33.2%		t = 3.98, p< 0.001
	Advantaged	12.1% (23)	0% (0)	33.2% (342)	-21.1%	-33.2%		
							t = 5.93, P< 0.001	
HE Knowledge		M 3.59 (194), SD 0.8	M 3.91 (32), SD 0.8	M 3.57 (1049), SD 0.8	0.02	0.34	n.s.	t = 2.37, p< 0.05
HE attitudes	Baseline mean scores	M 3.62 (194), SD 0.9	M 4.34 (32), SD 0.9	M 3.67 (1049), SD 0.9	-0.05	0.67	n.s.	t = 4.15, p< 0.001
HE expectations		M 4.04 (193), SD 0.9	M 4.73 (32), SD 0.5	M 4.26 (1047), SD 0.8	-0.22	0.47	t = -3.44, p<0 001	t = 3.30, p< 0.001
Academic motivation		M 4.0 (193), SD 0.9	M 4.69 (32), SD 0.5	M 4.25 (1047), SD 0.8	-0.25	0.44	t = -3.90, p<0 001	t = 3.09. p<0.01

Appendix 20: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **HE expectation outcome** are **observed**

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	M	SS	NT	Percentage point difference		t G1 & G3	t G2 & G3
		Group 1	Group 2	Group 3	G1 & G3	G2 & G3		
Mentoring engagements	Mean	M 9.4 (191), SD 4.0	Na	Na	Na	Na	Na	Na
	1-5	31 (16.2%)	Na	Na	Na	Na	Na	Na
	6 to 10	92 (48.2%)	Na	Na	Na	Na	Na	Na
	11-15	53 (27.7%)	Na	Na	Na	Na	Na	Na
	15 +	13 (6.8%)	Na	Na	Na	Na	Na	Na
KS2 level 4	Achieved	65.8% (123)	68.8% (22)	79.2% (810)	-13.4%	-10.4%	t = -4.03, p<0.001	n.s.
	Did not achieve	34.2% (64)	31.2% (10)	20.8% (213)	13.4%	10.4		
Gender	Male	51.9% (98)	46.6% (15)	51.9% (536)	0.0%	-5.0%	n.s.	n.s.
	Female	48.1% (91)	53.1% (17)	48.1% (497)	0.0%	5.0%		
Ever FSM6	Yes	63.8% (120)	68.8% 22)	29.0% (298)	34.8%	39.8%	t = 9.58, p< 0.001	t = 4.87, p<0.001
	No	36.2% (68)	31.3% (10)	71.0% (730)	-34.8%	-39 8%		
Ethnicity	White	69.4% (125)	21.9% (7)	71.0% (695)	-1.5%	-49.1%	n.s.	t = 2.61, p< 0.01
	Asian	12.2% (22)	37.5% (12)	13.9% (136)	-1.7%	23.6%	n.s.	t =2.62, p< 0.01
	Black	7.8% (14)	21.9% (7)	6.6% (65)	1.1%	15.2%	n.s.	t = 3.51, p< 0.001
	Mixed	5.6% (10)	18.8% (6)	5.0% (49)	0.6%	13.7%	n.s.	t = 3.58, p< 0.001
	Other	5.0% (9)	0% (0)	3.5% (34)	1.5%	-3.5%	n.s.	n.s.
First language	English 1st lang.	82.0% (155)	59.4% (19)	85.0% (875)	-2.7%	-25 3%	n.s.	t = 4.02, p< 0.001
	English add. lang.	16.0% (31)	40.6% (13)	15.0% (154)	1.5%	25.7%		
	Unclassified	<2.0% (<5)	0% (0)	<1.0% (<5)	1.2%	-0.4%		
SEN	Yes	18.6% (35)	<13.0% (<5)	13.0% (133)	5.6%	-0.5%	t = 1.99, p <0.05	n.s.
	No	81.4% (153)	88.0% (28)	87.0% (887)	-5.6%	0.5%		
POLARYPR	Disadvantaged	75.4% (141)	84.4% (27)	61.6% (633)	13.8%	22.8%	t = 3.67, p <0.001	t = 2.64, p< 0.001
	Advantaged	24.6% (46)	15.6% (5)	38.4% (395)	-13.8%	-22 8%		
POLARAHE	Disadvantaged	85.6% 161)	91.0% (29)	78.8% (810)	6.8%	11.8%	t = 2.23, p< 0.05	n.s.
	Advantaged	14.4% (27)	<10.0% (<5)	21.2% (218)	-6.8%	-11 8%		
IDACI	Disadvantaged	87.8% (165)	100% (32)	66.7% (684)	21.1%	33.3%	t = 5.85, p< 0.001	t = 3.99, p< 0.001
	Advantaged	12.2% (23)	0% (0)	33.3% (342)	-21.1%	-33 3%		
Knowledge of HE	Baseline survey mean	M 3.60 (191), SD 0.8	M 3.90 (32), SD 0.8	M 3.57 (1046), SD 0.8	0.03	0.33	n.s.	t = 2.30, p< 0.05
Attitudes to HE		M 3.63 (191), SD 0.9	M 4.34 (32), SD 0.9	M 3.67 (1046), SD 0.9	-0.04	0.67	n.s.	t = 6.57, p< 0.001
HE Expectations		4.04 (191), SD 0.9	M 4.72 (32), SD 0.5	M 4.26 (1046), SD 0.8	-0.22	0.46	t = -3.43, p< 0.001	t = 3.23, p< 0.01
Academic Motivation		M 4.0 (191), SD 0.8	M 4.69 (32), SD 0.5	M 4.25 (1046), SD 0.8	-0.25	0.44	t = -3.97, p< 0.001	t = 3.09, p<0.01

Appendix 21: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **HE attitude outcome** are **observed**

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	M	SS	NT	Percentage point difference		t G1 & G3	t G2 & G3
		Group 1	Group 2	Group 3	G1 & G3	G2 & G3		
Mentoring engagements	Mean	M 9.5 (194), SD 4.0	Na	Na	Na	Na	Na	Na
	1-5	31 (16%)	Na	Na	na	Na	na	na
	6 to 10	93 (47.9%)	Na	Na	na	Na	na	na
	11-15	54 (27.8%)	Na	Na	na	Na	na	na
	15 +	14 (7.2%)	Na	Na	na	Na	na	na
KS2 level 4	Achieved	65.6% (124)	68.8% (22)	79.0% (811)	-13.4%	-10.2%	t = -4.05, p< 0 001	n.s.
	Did not achieve	34.4% (65)	31.2% (10)	21.0 (215)	13.2%	10.2%		
Gender	Male	52.4% (100)	46.6% (15)	51.9% (538)	0.4%	-5.1%	n.s.	n.s.
	Female	47.6% (91)	53.1% (17)	48.1% (498)	-0.4%	5.1%		
Ever FSM6	Yes	63.2% (120)	68.8% (22)	29.0% (299)	34.2%	39.7%	t = 9.50, p< 0.001	t = 4.87, p<0.001
	No	36.8% (70)	31.3% (10)	71.0% (732)	-34 2%	-39.7%		
Ethnicity	White	69.8% (127)	21.9% (7)	71.0% (697)	-1.2%	-49.1%	n.s.	t = -2.60, p< 0.01
	Asian	12.1% (22)	37.5% (12)	14.0% (137)	-1.9%	23.5%	n.s.	t = 2.61, p< 0.01
	Black	7.7% (14)	21.9% (7)	6.6% (65)	1.1%	15.3%	n.s.	t = 3.52, p< 0.001
	Mixed	5.5% (10)	18.8% (6)	5.0% (49)	0.5%	13.8%	n.s.	t = 3.59, p< 0.01
	Other	4.9% (9)	0% (0)	3.5% (34)	1.5%	-1.5%	n.s.	n.s.
First language	English 1st lang.	82.0% (157)	59.4% (19)	85.0% (877)	-2.5%	-25.3%	n.s.	t = 4.00, p< 0.001
	English add. lang.	16.0% (31)	40.6% (13)	15.0% (155)	1.3%	25.7%		
	Unclassified	<2.0% (<5)	0% (0)	<1.0% (<5)	1.2%	-0.4%		
SEN	Yes	18.9% (36)	<13.0% (<5)	13.1% (134)	5.8%	-0.6%	t = 2.07, p< 0.05	n.s.
	No	81.1% (154)	88.0% (28)	86.9% (889)	-5.8%	0.6%		
POLARYPR	Disadvantaged	75.7% (143)	84.4% (27)	61.5% (634)	14.2%	22.9%	t = 3.68, p, 0.001	t = 2.65, p< 0.01
	Advantaged	24.3% (46)	15.6% (5)	38.5% (397)	-14 2%	-22.9%		
POLARAHE	Disadvantaged	85.8% 163)	91.0% (29)	78.8% (812)	7.0%	11.9%	t = 2.16, p< 0.05	n.s.
	Advantaged	14.2% (27)	<10.0% (<5)	21.2% (219)	-7.0%	-11.9%		
IDACI	Disadvantaged	87.9% (167)	100% (32)	66.8% (687)	21.1%	33.2%	t = 5.93. p< 0.001	t = 3.98. p< 0.01
	Advantaged	12.1% (23)	0% (0)	33.2% (342)	-21.1%	-33.2%		
Knowledge of HE	Baseline survey mean	M 3.59 (194), SD 0.8	M 3.90 (32), SD 0.8	M 3.56 (1049), SD 0.8	0.03	0.34	n.s.	t = 2.37, p< 0.05
Attitudes to HE		M 3.62 (194), SD 0.9	M 4.34 (32), SD 0.9	M 3.67 (1049), SD 0.9	-0.05	0.67	n.s.	t = 4.15, p< 0.001
HE Expectations		M 4.04 (193), SD 0.9	M 4.72 (32), SD 0.5	M 4.26 (1047), SD 0.8	-0.22	0.46	t = -3.44, p< 0.001	t =3.23, p< 0.05
Academic Motivation		M 4.0 (193), SD 0.9	M 4.69 (32), SD 0.5	M 4.25 (1047), SD 0.8	-0.25	0.44	t = -3.91, p< 0.001	t = 3.09, p< 0.01

Appendix 22: Sample characteristics – pairwise comparison between treatment and non-treatment groups where pupil controls and the **academic motivation outcome** are **observed**

Key: M = mentoring, SS = Summer school, NT = non-treatment group

Control variable	Category	M	SS	NT	Percentage point difference		t G1 & G3	t G2 & G3
		Group 1	Group 2	Group 3	G1 & G3	G2 & G3		
Mentoring engagements	Mean	M 9.4 (191), SD 4.0	Na	Na	Na	Na	Na	Na
	1-5	31 (16.2%)	Na	Na	Na	Na	Na	Na
	6 to 10	92 (48.2%)	Na	Na	Na	Na	Na	Na
	11-15	53 (27.7%)	Na	Na	Na	Na	Na	Na
	15+	13 (6.8%)	Na	Na	Na	Na	Na	Na
KS2 level 4	Achieved	65.8% (123)	68.8% (22)	79.2% (810)	-13.4%	-10.4%	t = -4.03, p< 0 001	n.s.
	Did not achieve	34.2% (64)	31.2% (10)	20.8% (213)	13.4%	10.4%		
Gender	Male	47.6% (91)	46.9% (15)	51.9% (536)	16.9%	-5.0%		n.s.
	Female	52.4% (100)	53.1% (17)	48.1% (497)	-16.9%	5.0%	n.s.	
Ever FSM6	Yes	63.8% (120)	68.8% (22)	29.0% (298)	34.8%	39.8%	t = 9.58, p< 0.001	t = 4.87, p< 0.001
	No	36.2% (68)	31.3% (10)	71.0% (730)	-34.8%	-39.8%		
Ethnicity	White	69.4% (125)	21.9% (7)	71.0% (695)	-1.5%	-49.1%	n.s.	t = -2 60, p< 0.01
	Asian	12.2% (22)	37.5% (12)	13.9% (136)	-1.7%	23.6%	n.s.	t = 2.62, p< 0.01
	Black	7.8% (14)	21.9% (7)	6 6% (65)	1.1%	15.2%	n.s.	t = 3.51, p< 0.01
	Mixed	5.6% (10)	18.8% (6)	5 0% (49)	0.6%	13.7%	n.s.	t = 3.58, p< 0.001
	Other	5.0% (9)	0% (0)	3 5% (34)	1.5%	-3.5%	n.s.	n.s.
First language	English 1st lang.	82.0% (155)	59.4% (19)	85.0% (875)	-2.7%	-25.3%	n.s.	t = 4.02, p< 0.001
	English add. lang.	16.0% (31)	40.6% (13)	15.0% (154)	1.5%	25.7%		
	Unclassified	<2.0% (<5)	0% (0)	<1.0%% (<5)	1.2%	-0.4%		
SEN	Yes	18.6% (35)	<13 0% (<5)	13.0% (133)	5.6%	-0.5%	t = 1.99, p <0.05	n.s.
	No	81.4% (153)	88.0% (28)	87.0% (887)	-5.6%	0.5%		
POLARYPR	Disadvantaged	75.4% (141)	84.4% (27)	61.6% (633)	13.8%	22.8%	t = 3.66, p< 0.001	t = 2.64, p< 0.01
	Advantaged	24.6% (46)	15.6% (5)	38.4% (395)	-13.8%	-22.8%		
POLARAHE	Disadvantaged	85.6% (161)	91.0% (29)	78.8% (810)	6.8%	11.8%	t = 2.23, p< 0.05	n.s.
	Advantaged	14.4% (27)	<10 0% (<5)	21.2 (218)	-6.8%	-11.8%		
IDACI	Disadvantaged	87.8% (165)	100% (32)	66.7% (684)	21.1%	33.3%	t = 5.86, p< 0.001	t = 3.99, p< 0.001
	Advantaged	12.2% (23)	0% (0)	33.3% (342)	-21.1%	-33.3%		
Knowledge of HE	Baseline survey mean	M 3.60 (191), SD 0.8	M 3.91 (32), SD 0.8	M 3.57 (1046), SD 0.8	0.03	0.34	n.s.	t = 2.37, p< 0.05
Attitudes to HE		M 3.63 (191), SD 0.9	M 4.34 (32), SD 0.9	M 3.67 (1046), SD 0.9	-0.04	0.67	n.s.	t = 7.72, p<0.001
HE Expectations		M 4.04 (191), SD 0.9	M 4.72 (32), SD 0.5	M 4.26 (1046), SD 0.8	0.22	0.46	t= -3.43, p< 0.001	t = 3.23, p< 0.01
Academic Motivation		M 4.0 (191), SD 0.9	M 4.69 (32), SD 0.5	M 4.25 (1046), SD 0.8	-0.25	0.44	*t = -3.89, p< 0.001*	*t = 3.09, p< 0.01*

Appendix 23: Multiple controlled linear regression showing the effect of Mentoring and Summer Schools on AABs outcomes by pupil characteristics

	Mentoring (model 1a)				*Summer School (model 1b)*			
	HE knowledge	*HE expectations*	*HE attitudes*	*Academic motivation*	*HE knowledge*	*HE expectations*	*HE attitudes*	*Academic motivation*
	Coef. P>[t]							
Treatment	0.248, $p<0.001$	0.010, n.s.	0.122, n.s.	-0.035, n.s.	0.252, n.s.	-0.007, n.s.	0.263, n.s.	-0.032. n.s.
Pupil level controls (baseline surveys)								
HE knowledge	-0.506, $p<0.001$	-0.036, n.s.	-0.002, n.s.	-0.030, n.s.	-0.486, $p<0.001$	-0.057. n.s.	-0.006, n.s.	-0.055, n.s.
HE expectations	-0.065, n.s.	-0.418, $p<0.001$	0.008, n.s.	-0.218, n.s.	-0.010 n.s.	-0.198, n.s.	-0.07, n.s.	-0.033, n.s.
HE attitudes	0.037, n.s.	0.235 $p<0.001$	-0.582, $p<0.001$	0.222, $p<0.001$	0.032, n.s.	0.230, $p< 0.001$	-0.584, $p<0.001$	0.218, $p<0.001$
Academic motivation	0.090, n.s.	-0.285, $p<0.05$	0.077, n.s.	-0.468, $p<0.001$	0.029, n.s.	-0.485, $p<0.01$	0.130, n.s.	-0.635, $p<0.001$
Pupil level controls (socio-economic, demographic and attainment)								
Male (*base female*)	0.105, $p<0.05$	-0.061, n.s.	0.065, n.s.	-0.065, n.s.	0.077, n.s.	-0.071, n.s.	0.077, n.s.	-0.077, n.s..
EFSM6 (base not EFSM6)	-0.036, n.s.	0.003, n.s.	-0.020, n.s.	-0.015, n.s.	0.005, n.s.	-0.069, n.s.	-0.063, n.s.	-0.082, n.s.
Black (base Asian)	-0.074, n.s.	0.017, n.s.	0.0009, n.s.	0.045, n.s.	0.020, n.s.	0.086, n.s.	0.105, n.s.	0.126, n.s.
Mixed (base Asian)	-0.105, n.s.	-0.279, n.s.	-0.196, n.s.	-0.253, n.s.	-0.082, n.s.	-0.360, $p<0.05$	-0.170, n.s.	-0.347, $p<0.05$
White (base Asian)	-0.118, n.s.	-0.228, n.s.	-0.241, n.s.	-0.255, n.s.	-0.010, n.s.	-0.217, n.s.	-0.145, n.s.	-0.202, n.s.
SEN (base not SEN)	0.008, n.s.	-0.036, n.s.	-0.145, n.s.	-0.013, n.s.	-0.035, n.s.	0.002, n.s.	-0.221, $p<0.05$	0.032, n.s.
English as a 1st lang (base EAL)	-0.078, n.s.	-0.007, n.s.	-0.316, $p<0.05$	-0.071, n.s.	-0.063, n.s.	-0006, n.s.	-0.238, n.s.	-0.022, n.s.
IDACI disadvantaged (base advantaged)	0.092, n.s.	0.077, n.s.	0.149, n.s.	0.092, n.s.	0.087, n.s.	0.020, n.s.	0.130, n.s.	0.034, n.s.
POLAR YPR disadvantaged (base advantaged)	0.050, n.s.	0.013, n.s.	0.053, n.s.	0.016, n.s.	-0.011, n.s.	0.010, n.s.	0.024, n.s.	0.024, n.s.
POLAR AHE disadvantaged (base advantaged)	0.019, n.s.	0.044, n.s.	0.155, n..s.	0.041, n.s.	0.092, n.s.	0.053, n.s.	-0.134, n.s.	0.048, n.s.
KS2 did not achieve level 4 (base KS2 achieved level 4)	-0.039, n.s.	-0.180, $p<0.05$	-0.284, $p<0.001$	0.193, $p<0.05$	-0.005, n.s.	-0.163, $p<0.05$	-0.281, $p<0.001$	-0.188, $p<0.05$
Cons_	1.278, $p<0.001$	1.83, $p<0.001$	2.53, $p<0.001$	1.84, $p<0.001$	1.11, $p<0.01$	1.65, $p<0.001$	2.42, $p<0.001$	1.63, $p<0.001$

The following factors have been excluded as the sample sizes were zero: mentoring and summer schools - any other ethnic group and unclassified first language. Summer school only IDACI.

Appendix 24: Multiple controlled interacted linear regression showing the effect of mentoring and summer school treatments on AAB outcomes by pupil characteristics

	Mentoring (model 1a)				*Summer School (model 1b)*			
	HE knowledge	*HE expectations*	*HE attitudes*	*Academic motivation*	*HE knowledge*	*HE expectations*	*HE attitudes*	*Academic motivation*
	Coef. P>[t]							
Pupil level controls (socio-economic, demographic and attainment)								
Male#treatment survey *(base male non-treatment survey)*	0.308, p<0.001	0.007, n.s.	0.072, n.s.	-0.025, n.s.	0.172, n.s.	0.127, n.s.	0.382, n.s.	0.125, n.s.
Female#treatment survey (female non-treatment survey)	0.221, p<0.05	0.003, n.s.	0.163, n.s.	-0.052, n.s.	0.557, p<0.01	-0.022, n.s.	0.353, n.s.	-0.055, n.s.
Efsm6#treatment survey (base efsm6 non-treatment survey)	1.49, n.s.	0.194, n.s.	0.213, p<0.05	0.146, n.s.	0.418, p<0.05	0.071, n.s.	0.374, n.s.	0.041, n.s.
Not efsm6#treatment survey (base not efsm6 non-treatment survey)	0.340, p<0.001	-0.243, p<0.05	0.030, n.s.	-0.268, p<0.05	0.307, n.s.	0.055, n.s.	0.497, n.s.	0.048, n.s.
Asian#treatment survey (base Asian non-treatment survey)	0.316, p= 0.57	0.003, n.s.	0.017, n.s.	0.041, n.s.	0.092, n.s.	-0.059, n.s.	-0.115, n.s.	-0.099, n.s.
Black#treatment survey (base Black non-treatment survey)	-0.211, n.s.	-0.123, n.s.	-0.198, n.s.	-0.380, n.s.	0.460, n.s.	0.331, n.s.	0.784, p= 0.058	0.439, n.s.
Mixed#treatment survey (base Mixed non-treatment survey)	0.660, p<0.001	0.434, n.s.	0.204, n.s.	0.322, n.s.	0.988, p<0.01	-0.884, n.s.	0.123, n.s.	-1.094, n.s.
White#treatment survey (base White non-treatment survey)	0.274, p<0.001	0.014, n.s.	0.144, n.s.	-0.022, n.s.	0.340, n.s.	0.266, n.s.	0.855, p< 0.05	0.278, n.s.
SEN#treatment survey (base SEN non-treatment survey)	0.488, p<0.05	-0.029, n.s.	0.389, n.s.	-0.045, n.s.	0.165, n.s.	0.692, n.s.	0.503, n.s.	0.686, n.s.
Not SEN#treatment survey (base not SEN non-treatment survey)	0.185, p<0.05	-0.008, n.s.	0.039, n.s.	-0.082, n.s.	0.297, p<0.05	-0.084, n.s.	0.250, n.s.	-1.040, n.s.
English as a 1st Lang#treatment survey (base Eng 1st non-treatment survey)	0.276, p<0.001	0.010, n.s.	0.138, n.s.	-0.040, n.s.	0.52 p<0.013,	0.056, n.s.	0.645, p< 0.01	0.051, n.s.
EAL#treatment survey (base EAL non-treatment survey)	0.180, n.s.	0.001, n.s.	0.012, n.s.	0.002, n.s.	0.279, n.s.	0.051, n.s.	-0.220, n.s.	0.008, n.s.

IDACI Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.253, p<0.001	0.082, n.s.	0.135, n.s.	0.037, n.s.	0.376, p<0.01	0.059, n.s.	0.371, p< 0.05	0.042, n.s.
IDACI Advantaged#non-treatment survey (base advantaged non-treatment survey)	0.166, n.s.	-0.536, p< 0.05	-0.022, n.s.	-0.551, p < 0.05	No data	No data	No data	No data
POLARYPR Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.291, p<0.001	0.072, n.s.	0.166, n.s.	0.026, n.s.	0.420, p<0.01	0.043, n.s.	0.346, p= 0.056	0.022. n.s.
POLARYPR Advantaged#treatment survey (base Advantaged non-treatment survey)	0.124, n.s.	-0.193, n.s.	-0.002, n.s.	-0.222, n.s.	0.370, n.s.	0.187, n.s.	0.597, n.s.	0.187, n.s.
POLARAHE Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.227, p<0.01	0.049, n.s.	0.140, n.s.	-0.375, n.s.	0.416, p<0.01	0.067, n.s.	0.344, n.s.	0.047 n.s.
POLARAHE Advantaged#non-treatment survey (base advantaged non-treatment survey)	0.402, p<0.05	-0.332, n.s.	0.012, n.s.	-0.283, n.s.	0.159, n.s.	0.105, n.s.	0.643, n.s.	0.107, n.s.
KS2 achieved level 4#treatment survey *(base KS2 achieved lev 4 non-treatment suevey)*	0.221, p<0.01	0.036, n.s.	0.127, n.s.	-0.016, n.s.	0.471, p<0.05	0.167, n.s.	0.371, p= 0.058	0.140, n.s.
KS2 not achieved level 4#treatment survey *(base KS2 not achieved lev 4 non-treatment survey)*	0.296, p<0.01	-0.096, n.s.	0.126, n.s.	-0.112, n.s.	0.220, n.s.	-0.191, n.s.	0.475, n.s.	-0.171, n.s.

Any other ethnic group and unclassified first language have been removed due to small numbers.

Appendix 25: Multiple controlled interacted linear regression showing the effect of mentoring engagement frequency on HE knowledge outcomes by pupil characteristics

	HE knowledge				*HE expectations*				*HE attitudes*				*Academic motivation*			
	Mentoring frequency (dosage)															
	1-5	*6-10*	*11-15*	*15 +*	*1-5*	*6-10*	*11-15*	*15 +*	*1-5*	*6-10*	*11-15*	*15 +*	1-5	6-10	11-15	15 +
	Coef. P>[t]															
Pupil level controls (socio-economic, demographic and attainment)																
Male#treatment survey *(base male non-treatment survey)*	0.142, n.s.	0.291, p<0.05	0.480, p<0.01	0.060, n.s.	0.003, n.s.	-0.037, n.s.	0.010, n.s.	0.596, n,s,	0.097, n.s.	-0.036, n.s.	0.150, n.s.	0.561, n.s.	0.013, n.s.	-0.087, n.s.	-0.030, n.s.	0.628, n.s.
Female#treatment survey (female non-treatment survey)	0.319, n.s.	0.140, n.s.	0.274, n.s.	0.270, n.s.	0.203, n.s.	-0.101, n.s.	-0.107, n.s.	-0.105, n.s.	0.171, n.s.	0.183, n.s.	0.209, n.s.	-0.118, n.s.	0.127, n.s.	-0.067, n.s.	-0.129, n.s.	-0.241, n.s.
Efsm6#treatment survey (base efsm6 non-treatment survey)	0.098, n.s.	0.089, n.s.	0.380, p<0.05	0.213, n.s.	0.136, n.s.	0.143, n.s.	0.255, n.s.	0.508, n.s.	0.084, n.s.	0.283, p<0.05	0.148, n.s.	0.448, n.s.	0.120, n.s.	0.069, n.s.	0.237, n.s.	0.437, n.s.
Not efsm6#treatment survey (base not efsm6 non-treatment survey)	0.329, n.a.	0.362, p<0.05	0.373, p<0.05	-0.932, n.s.	0.206, n.s.	-0.312, n.s.	-0.309, n.s.	-0.150, n.s.	0.434, n.s.	-0.266, n.s.	0.214, n.s.	-0.368, n.s.	0.118, n.s.	-0.315, n.s.	-0.344, n.s.	-0.122. n.s.
Asian#treatment survey (base Asian non-treatment survey)	0.420, n.s.	0.494, n.s.	0.331, n.s.	-0.172, n.s.	0.304, n.s.	-0.190, n.s.	0.266, n.s.	0.424, n.s.	0.406, n.s.	0.071, n.s.	-0.074, n.s.	0.257, n.s.	0.321, n.s.	-0.248, n.s.	0.186, n.s.	0.490, n.s.
Black#treatment survey (base Black non-treatment survey)	No data	-0.192, n.s.	0.535, n.s.	No data	No data	-0.184, n.s.	0.059, n.s.	No data	No data	0.083, n.s.	-0.203, n.s.	No data	No data	-0.269, n.s.	0.070, n.s.	No data
Mixed#treatment survey (base Mixed non-treatment survey)	No data	0.716, p<0.01	0.204, p<0.001	0.037, n.s.	no data	0.083, n.s.	1.230, n.s.	1.363, n.s.	No data	-0.128, n.s.	0.817, n.s.	1.779, n.s.	No data	-0.117, n.s.	1.05, n.s.	1.29, n.s.
White#treatment survey (base White non-treatment survey)	0.225, n.s.	0.283, p<0.01	0.329, p<0.05	0.149, n.s.	0.159, n.s.	0.057, n.s.	-0.193, n.s.	0.114, n.s.	0.125, n.s.	0.082, n.s.	0.323, n.s.	0.030, n.s.	0.122, n.s.	0.018, n.s.	-0.200 n.s.	0.062, n.s.
SEN#treatment survey (base SEN non-treatment survey)	0.722, n.s.	0.311, n.s.	0.579, p<0.05	0.087, n.s.	-0.300, n.s.	-0.028, n.s.	0.048, n.s.	0.135, n.s.	0.213, n.s.	0.344, n.s.	0.528, n.s.	0.385, n.s.	-0.566, n.s.	-0.055, n.s.	0.033, n.s.	-0.122, n.s.
Not SEN#treatment survey (base not SEN non-treatment survey)	0.153, n.s.	0.157, n.s.	0.295, p<0.05	0.128, n.s.	0.128, n.s.	-0.058, n.s.	-0.059, n.s.	0.243, n.s.	0.093, n.s.	-0.011, n.s.	0.059, n.s.	0.200, n.s.	0.106, n.s.	-0.115, n.s.	-0.095, n.s.	0.267, n.s.

English as a 1st Lang#treatment survey (base Eng 1st non-treatment survey)	0.216, n.s.	0.232, p<0.05	0.390, p<0.01	0.168, n.s.	0.148, n.s.	-0.003, n.s.	-0.119, n.s.	0.210, n.s.	0.132, n.s.	0.081, n.s.	0.244, n.s.	0.187, n.s.	0.102, n.s.	-0.062, n.s.	-0.156, n.s.	0.158, n.s.
EAL#treatment survey (base EAL non-treatment survey)	0.281, n.s.	0.072, n.s.	0.410, n.s.	-0.582, n.s.	0.259, n.s.	-0.416, n.s.	0.331, n.s.	0.463, n.s.	0.196, n.s.	0.158, n.s.	-0.248, n.s.	0.302, n.s.	0.284, n.s.	-0.441, n.s.	0.366, n.s.	0.547, n.s.
IDACI Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.185, n.s.	0.241, p<0.05	0.339, p<0.05	0.118, n.s.	0.150, n.s.	0.055, n.s.	0.075, n.s.	0.207, n.s.	0.141, n.s.	0.146, n.s.	0.151, n.s.	0.029, n.s.	0.131, n.s.	0.0004, n.s.	0.021, n.s.	0.236, n..s.
IDACI Advantaged#non-treatment survey (base advantaged non-treatment survey)	0.179, n.s.	-0.274, n.s.	0.525, n.s.	0.228, n.s.	-0.008, n.s.	-1.084, p<0.01	-0.669, p<0.05	0.366, n.s.	-0.007, n.s.	-1.063, p<0.01	0.520, n.s.	0.694, n.s.	-0.077, n.s.	-1.079, p<0.01	-0.570, n.s.	0.139, n.s.
POLARYPR Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.188, n.s.	0.272, p<0.01	0.418, p<0.01	0.177, n.s.	0.156, n.s.	0.064, n.s.	0.041, n.s.	0.128, n.s.	0.141, n.s.	0.153, n.s.	0.201, n.s.	0.171, n.s.	0.130, n.s.	0.011, n.s.	-0.025, n.s.	0.152, n.s.
POLARYPR Advantaged#treatment survey (base Advantaged non-treatment survey)	0.307, n.s.	-0.051, n.s.	0.227, n.s.	0.208, n.s.	0.015, n.s.	-0.381, n.s.	-0.219, n.s.	0.471, n.s.	0.048, n.s.	-0.298, n.s.	0.272, n.s.	0.452, n.s.	-0.087, n.s.	-0.428, n.s.	-0.164, n.s.	0.317, n.s.
POLARAHE Disadvantaged#treatment survey (base disadvantaged non-treatment survey)	0.200, n.s.	0.198, p<0.05	0.357, p<0.01	0.077, n.s.	1.07, n.s.	0.014, n.s.	0.018, n.s.	0.283, n.s.	0.142, n.s.	0.081, n.s.	0.234, n.s.	0.322, n.s.	0.088, n.s.	0.041, n.s.	-0.033, n.s.	0.131, n.s.
POLARAHE Advantaged#non-treatment survey (base advantaged non-treatment survey)	0.421, n.s.	0.323, n.s.	0.507, p =0.054	1.134, n.s.	0.702, n.s.	-0.497, n.s.	-0.215, n.s.	-0.238, n.s.	0.069, n.s.	-0.080, n.s.	0.157, n.s.	-0.579, n.s.	0.371, n.s.	-0.494, n.s.	-0.175, n.s.	-1.212, n.s.
KS2 achieved level 4#treatment survey *(base KS2 achieved lev 4 non-treatment survey)*	0.204, n.s.	0.213, p<005	0.300, n.s.	0.122, n.s.	0.170, n.s.	0.002, n.s.	-0.098, n.s.	0.149, n.s.	0.242, n.s.	0.083, n.s.	0.113, n.s.	0.138, n.s.	0.138, n.s.	-0.057, n.s.	-0.158, n.s.	0.068, n.s.

KS2 not achieved level 4#treatment survey *(base KS2 not achieved lev 4 non-treatment survey)*	0.337, n.s.	0.300, n.s.	0.454, $p<0.05$	0.171, n.s.	0.012, n.s.	-0.103, n.s.	0.006, n.s.	0.074, n.s.	-0.143, n.s.	0.139, n.s.	0.309, n.s.	0.711, n.s.	-0.065, n.s.	-0.124, n.s.	0.014, n.s.	0.897, n.s.

Any other ethnic group and unclassified first language have been removed due to small numbers.

Appendix 26: KS2 level 4 (achieved / not achieved) survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	achieved level	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Achieved lev 4			M 0.21, SD 0.92 (n124)			M 0.47, SD 0.68 (n22)			M -0.04, SD 0.83 (n811)	0.25	0.51
	Not achieved			M 0.27, SD 0.89 (n65)			M 0.04, SD 0.56 (n10)			M -0.02, SD 0.90 (n215)	0.29	0.06
HE attitudes	Achieved lev 4			M 0.09, SD 1.01 (n124)			M 0.19, SD 0.96 (n22)			M -0.07, SD 0.99 (n811)	0.16	0.26
	Not achieved			M -0.05, SD 1.12 (n65)			M -0.20, SD 0.42 (n10)			M-0.23, SD 1.18 (n215)	-0.18	0.03
HE expectations	Achieved lev 4			M 0.07, SD 1.02 (n123)			M 0, SD 0.53 (n22)			M -0.14, SD 0.96 (n810)	0.21	0.14
	Not achieved			M -0.03, SD 1.15 (n64)			M -0.50, SD 1.27 (n10)			M -0.07, SD 1.12 (n213)	-0.04	-0.43
Academic motivation	Achieved lev 4			M 0.03, SD 1.04 (n123)			M -0.02, SD 0.58 (n22)			M -0.14, SD 0.96 (n810)	0.17	0.12
	Not achieved			M -0.08, SD 1.12 (n64)			M -0.50, SD 1.27 (n10)			M -0.09, SD 1.11 (n213)	0.01	-0.41

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 27: Gender survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	Gender	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	M			M 0.29, SD 0.89 (n103)			M 0.19, SD 0.71 (n15)			M-0.008, SD 0.85 (n546)	0.29	0.19
	F			M 0.16, SD 0.92 (n91)			M 0.47, SD 0.61 (n17)			M-0.06, SD 0.83 (n503)	0.10	0.41
HE attitudes	M			-0.02, SD 1.00 (n103)			M 0.09, SD 0.43 (n15)			M-0.07, SD 1.05 (n546)	0.05	0.16
	F			M 0.10, SD 1.09 (n91)			M 0.05, SD 1.10 (n17)			M-0.12, SD 1.02 (n503)	0.22	0.17
HE expectations	M			M 0.08, SD 1.17 (n100)			M 0.07, SD 0.59 (15)			M -0.11, SD 1.09 (n544)	0.12	0.18
	F			M-0.05, SD 0.93 (n91)			M -0.35, SD 1.00 (n17)			M-0.14, SD 0.92 (n502)	0.09	-0.21
Academic motivatio	M			M 0.04, SD 1.17 (n100)			M 0.08, SD 0.56 (n15)			M-0.12, SD 1.08 (n544)	0.16	0.20
	F			M-0.06, SD 0.93 (n91)			M -0.39, SD 1.04 (n17)			M -0.14, SD 0.92 (n502)	0.15	-0.25

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 28: EFSM6 survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	EFSM6	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Yes			M 0.18, SD 0.86 (n121)			M 0.43, SD 0.63 (n22)			M 0.01, SD 0.91 (n301)	0.19	0.44
	No			M 0.34, SD 0.97 (n70)			M 0.14, SD 0.72 (n10)			M -0.05, SD 0.81 (n736)	0.39	0.19
HE attitudes	Yes			M 0.06, SD 0.94 (n121)			M 0.009, SD 0.86 (n22)			M -0.08, SD, 1.05 (n301)	0.14	0.09
	No			M 0.003, SD 1.22 (n70)			M 0.20, SD 0.82 (n10)			M -0.11, SD 1.02 (n736)	0.11	0.31
HE expectations	Yes			M 0.15, SD 1.02 (n120)			M -0.14, SD 0.94 (n22)			M -0.15, SD 0.93 (n300)	0.30	0.01
	No			M -0.15, SD 1.12 (n68)			M -0.20, SD 0.63 (n10)			M -0.11, SD 1.04 (n734)	0.04	-0.09
Academic motivation	Yes			M 0.08, SD 1.01 (n68)			M -0.15, SD 0.94 (n22)			M -0.15, SD 0.92 (n300)	0.23	0
	No			M -0.16, SD 1.15 (n120)			M -0.22, SD 0.71 (n10)			M -0.12, SD 1.03 (n734)	-0.04	-0.10

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 29: IDACI survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	IDACI	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Disadv			M 0.26, SD 0.91 (n168)			M 0.34, SD 0.67 (32)			M 0.06, SD 0.87 (692)	0.20	0.28
	Advant.			M 0.11, SD 0.85 (n23)			No data			-0.11, SD 0.77 (343)	0.22	Na
HE attitudes	Disadv			M 0.08, SD 1.01 (n168)			M 0.07, SD 0.84 (32)			M -0.06, SD 1.05 (n692)	0.14	0.13
	Advant.			M -0.31, SD 1.24 (n23)			No data			-0.18, SD 0.98 (n343)	-0.13	Na
HE expectatio	Disadv			M 0.09, SD 1.00 (n165)			-0.16, SD 0.85 (32)			-0.08, SD 1.04 (n689)	0.17	-0.08
	Advant.			M -0.30, SD 1.40 (n23)			No data			-0.22, SD 0.95 (n343)	0.08	Na
Academic motivation	Disadv			M 0.04, SD 1.10 (n165)			-0.17, SD 0.86 (32)			M -0.08, SD 1.04 (n689)	0.12	-0.09
	Advant.			M -0.36, SD 1.38 (n23)			No data			M -0.24, SD 0.93 (n343)	-0.12	Na

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 30: POLAR (YPR) survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	POLAR (YPR)	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Disadv			M 0.27, SD 0.92 (n143)			M 0.40, SD 0.64 (n27)			M -0.02, SD 0.86 (n637)	0.29	0.42
	Advant.			M 0.14, SD 0.88 (n47)			M 0, SD 0.78 (n5)			M -0.04, SD 0.82 (n401)	0.18	0.82
HE attitudes	Disadv			M 0.07, SD 1.02 (n143)			M 0.04, SD 0.90 (n27)			M -0.09, SD 1.07 (n637)	0.16	0.13
	Advant.			M -0.13, SD 1.04 (n47)			M 0.20, SD 0.45 (n5)			M -0.12, SD 0.97 (n401)	0.01	0.32
HE expectations	Disadv			M 0.09, SD 0.99 (n141)			M -0.15, SD 0.91 (n27)			M -0.10, SD 1.02 (n636)	0.19	-0.05
	Advant.			M -0.14, SD 1.26 (n46)			M -0.20, SD 0.45 (n5)			M -0.17, SD 1.00 (n399)	0.03	-0.03
Academic motivation	Disadv			M 0.05, SD 1.01 (n141)			M -0.17, SD 0.93 (n27)			M -0.10, SD 1.01 (n636)	0.15	-0.07
	Advant.			M -0.20, SD 1.23 (n46)			M -0.20, SD 0.45 (n5)			M -0.18, SD 0.99 (n399)	-0.02	-0.02

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 31: POLAR (AHE) survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	POLAR (AHE)	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Disadv			M 0.21, SD 0.92 (n163)			M 0.39, SD 0.62 (n29)			M -0.01, SD 0.84 (n814)	0.22	0.40
	Advant.			M 0.40, 0.82 (n28)			M -0.13, SD 1.07 (n<5)			M -0.09, SD 0.83 (n223)	0.49	-0.04
HE attitudes	Disadv			M 0.06, SD 1.05 (n162)			M 0.04, SD 0.87 (n29)			M -0.12, SD 1.06 (n814)	0.18	0.16
	Advant.			M -0.08, SD 1.04 (n28)			M 0.33, SD 0.58 (n<5)			M -0.05, SD 0.93 (n223)	-0.03	0.38
HE expectations	Disadv			M 0.07, SD 1.03 (n161)			M -0.14, SD 0.88 (n29)			M -0.12, SD 1.07 (n812)	0.19	-0.02
	Advant.			M -0.15, SD 1.25 (n27)			M -0.33, SD 0.58 (n<5)			M -0.17, SD 0.99 (n222)	0.02	-0.16
Academic motivation	Disadv			M 0.03, SD 1.04 (n161)			M – 0.16, SD 0.90 (n29)			M -0.12, SD 1.01 (n812)	0.15	-0.04
	Advant.			M -0.21, SD 1.22 (n27)			M -0.33, SD 0.58 (n<5)			M -0.18, SD 0.97 (n222)	-0.03	-0.15

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 32: Ethnicity survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	Ethnicity	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	White			M 0.20, SD 0.93 (n127)			M -0.03, SD 0.38 (n7)			M -0.07, SD 0.80 (n699)	0.27	0.04
	Asian			M 0.34, SD 0.70 (n23)			M 0.46, SD 0.70 (n12)			M 0.10, SD 0.93 (n138)	0.24	0.36
	Black			M -0.16, SD 0.99 (n14)			M 0.11, SD 0.70 (n7)			M 0.08, SD 0.94 (n65)	-0.24	0.03
	Mixed			M 0.67, SD 0.60 (n10)			M 0.78, SD 0.63 (n6)			M -0.07, SD 0.88 (n49)	0.60	0.85
	Any other			M 0.27, SD 1.09 (n9)			No data			M 0.08, SD 0.77 (n37)	0.19	Na
HE attitudes	White			M 0.05, SD 1.08 (n127)			M 0.14, SD 0.38 (n7)			M -0.14, SD 1.04 (n699)	0.19	0.28
	Asian			M 0.02, SD 0.36 (n23)			M 0.1, SD 1.30 (n12)			M 0.02, SD 0.96 (n138)	0	0.1
	Black			M -0.37, SD 0.78 (n14)			M 0.03, SD 0.08 (n7)			M 0.08, SD 1.16 (n65)	-0.45	-0.05
	Mixed			M 0.1, SD 1.30 (n10)			M -0.03, SD 0.70 (n6)			M 0.01, SD 1.04 (n49)	0.09	-0.04
	Any other			M 0.09, SD 1.07 (n9)			No data			M -0.02, SD 0.92 (n37)	0.07	Na
HE expectations	White			M 0, SD 1.05 (n125)			M 0.14, SD 0.38 (n7)			-0.15, SD 1.04 (n697)	0.15	0.29
	Asian			M 0.18, SD 0.75 (n22)			M -0.08, SD 0.51 (n12)			M 0.05, SD 0.89 (n137)	0.13	-0.13
	Black			M -0.14, SD 1.28 (n14)			M -0.14, SD 0.38 (n7)			M -0.08, SD 0.92 (n65)	-0.06	-0.06
	Mixed			M 0.40, SD 0.88 (n10)			M -0.67, SD 1.75 (n6)			M -0.32, SD 0.94 (n49)	0.72	0.99
	Any other			M -0.06, SD 1.42 (n9)			No data			M 0.07, SD 1.08 (n37)	-0.13	Na
Academic motivation	White			-0.05, SD 1.05 (n125)			M 0.14, SD 0.38 (n7)			M -0.16, SD 1.03 (n697)	0.11	0.30
	Asian			M 0.12, SD 0.81 (n22)			M -0.11, SD 0.52 (n12)			M 0.03, SD 0.88 (n137)	0.09	-0.14
	Black			M -0.21, SD 1.20 (n14)			M -0.07, SD 0.19 (n7)			M 0.01, SD 0.93 (n65)	-0.20	-0.08
	Mixed			M 0.37, SD 1.07 (n10)			M -0.78, SD 1.80 (n6)			M -0.31, SD 0.95 (n49)	0.68	-0.47
	Any other			M -0.15, SD 1.24 (n9)			No data			M 0.03, SD 1.05 (n37)	-0.18	Na

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 33: SEN status survey scores across the treatment and non-treatment groups

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	SEN	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Yes			M 0.53, SD 0.86 (n38)			M 0.93, SD 0.76 (n<5)			M -0.09, SD 0.90 (n155)	0.62	1.02
	No			M 0.16, SD 0.90 (n156)			M 0.25, SD 0.62 (n28)			M -0.02, SD 0.83 (n894)	0.18	0.27
HE attitudes	Yes			M 0.16, SD 1.21 (n38)			M 0.30, SD 0.50 (n<5)			M -0.29, SD 1.15 (n155)	0.45	0.59
	No			M 0.006, SD 1.00 (n156)			M 0.04, SD 0.88 (n28)			M -0.06, SD 1.01 (n894)	-0.05	0.10
HE expectations	Yes			M 0.31, SD 0.90 (n37)			M 0.30, SD 0.50 (n<5)			M -0.02, SD 1.23 (n154)	0.33	0.32
	No			M -0.03, SD 1.09 (n154)			M -0.21, SD 0.88 (n28)			M -0.14, SD 0.97 (n892)	0.11	-0.07
Academic motivation	Yes			M 0.23, SD 0.94 (n37)			M 0.30, SD 0.50 (n<5)			M -0.02, SD 1.22 (n154)	0.25	0.32
	No			M -0.07, SD 1.08 (n154)			M -0.23, SD 0.90 (n28)			M -0.15, SD 0.96 (n892)	0.08	-0.08

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Appendix 34: First language **status survey scores across the treatment and non-treatment groups**

Key: B = baseline survey score, F = follow-up survey score and C = change in score from baseline to follow-up survey

Survey Variable	First language	Mentoring			Summer School			Comparison			Difference (between treatment & non-treatment change scores)	
		Group 1 (T)			Group 2 (T)			Group 3 (NT)			G1 & G3	G2 & G3
				C			C			C		
Knowledge of HE	Eng. as a 1st lang			M 0.22, SD 0.89 (n157)			M 0.27, SD 0.67 (n19)			M -0.05, SD 0.83 (n877)	0.27	0.32
	Eng. as an add. Lang			M 0.22, SD 1.00 (n31)			M 0.44, SD 0.66 (n13)			M 0.09, SD 0.87 (n155)	0.13	0.53
	Unclass			M 1.1, SD 0.36 (n<5)			No data			M 0.08, SD 0.50 (n4)	1.00	Na
Attitudes to HE	Eng. as a 1st lang			M 0.03, SD 1.12 (n157)			M 0, SD 0.50 (n19)			M 0.13, SD 1.05 (n877)	-0.10	-0.13
	Eng. as an add. Lang			M 0.06, SD 0.67 (n31)			M 0.17, SD 1.20 (n13)			M 0.08, SD 0.92 (n155)	-0.02	0.25
	Unclass			M 0.27, SD 0.50 (n<5)			No data			M 0, SD 0 (n<5)	0.27	Na
HE expectations	Eng. as a 1st lang			M 0.01, SD 1.08 (n155)			M -0.26, SD 1.05 (n19)			M -0.15, SD 1.01 (n875)	0.16	-0.11
	Eng. as an add. Lang			M 0.10, SD 0.99 (31)			M 0, SD 0.41 (n13)			M 0.01, SD 0.93 (n154)	0.11	-0.01
	Unclass			M 0.83, SD 0.29 (n<5)			No data			M 0, SD 0.82 (n<5)	0.83	Na
Academic Motivation	Eng. as a 1st lang			M -0.03, SD 1.10 (n155)			M -0.27, SD 1.07 (n19)			M -0.16, SD 1.00 (n875)	0.13	-0.11
	Eng. as an add. Lang			M 0.06, SD 0.92 (n31)			M -0.03, SD 0.42 (n13)			M 0.006, SD 0.92 (n154)	0.05	-0.04
	Unclass			M 0.56, SD 0.19 (n<5)			No data			M 0, SD 0.82 (n<5)	0.56	Na

*all significance tests are on-tailed as treatment are expected to lead to significant improvements in the survey outcome

Glossary

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[i] KS4 destinations focus on students from mainstream state-funded schools and colleges. The KS4 measure is based on activity at academic age 16 (i.e. the year after the young person finished compulsory schooling). Destinations from special schools and alternative provision institutions at KS4 and 16-18 and independent institutions for 16-18 are published in other Destination measures. The destination measures data only reports information from students who studied in schools and colleges in England. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/860136/Progression_to_higher_edu_training_2019.pdf

[ii] HE and training destinations of KS5 pupils focuses on progression from level 3 qualifications at 16 to 18 study to further education or training at level 4 or higher. Progression to higher education or training shows the percentage of students that sustain an education course or apprenticeship for a 6-month period at level 4 or higher in the two years following their 16 to 18 study. State-funded mainstream schools and colleges are included within the measure. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/860136/Progression_to_higher_edu_training_2019.pdf

[iii] Higher education (HE) students includes those on courses for which the level of instruction is above that of GCE/VCE A levels or SCE Highers/Advanced higher.

[iv] Pupils are identified as being at the end of key stage 4 if they were on roll at the school and in year 11 at the time of the January school census. Age is calculated from the 31 August at the start of the academic year, and the majority of pupils at the end of key stage 4 were age 15 at this point. Some pupils may complete this key stage in an earlier or later year group.

[v] To be counted in a destination, young people have to be recorded as having sustained participation for a 6-month period in the destination year. This means attending for all of the first two terms of the academic year (October 2017 – March 2018) at one or more education providers; spending 5 of the 6 months in employment or a combination of the two. Data includes destinations to all qualifications at level 3, level 2, level 1, entry level and other students. (DfE, 2019 - Destinations of key stage 4 and 16-18 students).

[vi] All other education includes sixth forms, sixth for colleges, independent schools, specialist post-16 institutions, special schools and education combination destination.

[vii] Includes students that studied academic qualifications such as A levels, applied general qualifications, technical levels, or other qualifications that are notionally level 3 (DfE, 2019).

[viii] Higher education (level 4 and above): Students that have gone on to degrees or other HE courses at UK universities or other Higher Education Institutions (HEIs), as identified in HESA data. This includes designated courses at higher education alternative providers (HEAPs) from 2015/16. Higher education courses at FE providers in England, identified through ILR, are also included (DfE, 2019).

[ix] For a full description of the measure, constructs and validation research see - David Rose, David J Pevalin and Karen O'Reilly (2005) Institute for Social and Economic Research Socio-economic Classification: Origins, Development and Use. Published by Palgrave Macmillan (http://ons.gov.uk/ons/index.html).

[x] Free school meals may be claimed if parents offspring attend state-funded schools in England and receive any of the following: Income Support, Income-based Jobseeker's Allowance, Income-related Employment and Support Allowance, Support under Part VI of the Immigration and Asylum Act 1999, The Guarantee element of State Pension Credit, Child Tax Credit, provided they are not entitled to Working Tax Credit and have an annual income (as assessed by HM Revenue & Customs) that does not exceed £16,190, Working Tax Credit 'run-on' - the payment someone may receive for a further four weeks after they stop qualifying for Working Tax Credit. FSM pupils are only recorded as eligible for free school meals on the school census if a claim has been made and the local authority has confirmed their eligibility.

[xi] Special educational needs / learning difficulties or disabilities (SEN for state-funded schools, LLDD for state-funded colleges Following special educational needs and disability (SEND) reforms in 2014/15, SEN pupils are categorised as 'SEN with a statement or Education, health and care (EHC) plan' and 'SEN support'. SEN support replaces school action and school action plus (grouped as SEN without a statement up to and including 2013/14) but some pupils remain with these provision types in first year of transition.

[xii] From 2015, the School Action and School Action Plus categories have combined to form one category of SEN support. This includes pupils who have a statement of special educational needs (statement) or Education, Health, and Care Plan (EHCP) or other disabilities.

[xiii] HESA definition (2020) - First degree includes first degrees (including eligibility to register to practice with a health or social care or veterinary statutory regulatory body), first degrees with Qualified Teacher Status (QTS)/registration with a General Teaching Council (GTC), postgraduate bachelors degree at level H, enhanced first degrees (including those leading towards obtaining eligibility to register to practice with a health or social care or veterinary statutory regulatory body), first degrees obtained concurrently with a diploma and intercalated first degrees.

[xiv] TUNDRA uses data-linking to track cohorts of 16 year old state-funded mainstream school pupils in MSOAs in England who completed their GCSEs (Key Stage 4) in the summer of 2010 to 2014 (via the NPD), and match them to higher education records (via HESA, ILR from academic years 2012-13 to 2017-18 when they would have been 18 or 19. The young participation rate for each local area is calculated based on cohorts of state-funded mainstream school pupils completing Key Stage 4 at age 16. If individuals in the cohort are found to be in higher education two or three years later, at age 18 or 19, they are considered to be young participants. To calculate the young participation rate of 16 year olds for each local area, the number of young participants is divided by the original number of Key Stage 4 pupils in the area. Each local area is then ranked according to its young participation rate and assigned equally across five quintiles.

[xv] Further information about the IMD and IDACI 2010 methodology can be obtained from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6320/1870718.pdf

[xvi] Free school meals may be claimed if parents offspring attend state-funded schools in England and receive any of the following: Income Support, Income-based Jobseeker's Allowance, Income-related Employment and Support Allowance, Support under Part VI of the Immigration and Asylum Act 1999, The Guarantee element of State Pension Credit, Child Tax Credit, provided they are not entitled to Working Tax Credit and have an annual income (as assessed by HM Revenue & Customs) that does not exceed £16,190, Working Tax Credit 'run-on' - the payment someone may receive for a further four weeks after they stop qualifying for Working Tax Credit'.(BIS, 2013 widening participation report). FSM pupils are only recorded as eligible for free school meals on the school census if a claim has been made and the local authority has confirmed their eligibility.