

A systematic review of evidence on the effectiveness of interventions and strategies for widening participation in higher education

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Widening participation (WP) in higher education (HE) is an increasingly important policy issue, with interventions to increase participation from minority ethnic, low-income and other under-represented groups undertaken in HE sectors in many countries. In the United Kingdom (UK) there is a large amount of WP activity but a lack of robust evidence of its effectiveness.

This paper presents a systematic review (Chalmers, Hedges, and Cooper, 2002) in the topic area of WP in HE. We included studies of systematic review, randomised controlled trial (RCT) and quasi-experimental (QE) designs and assessed evidence of the effectiveness of university access strategies and approaches on the participation of disadvantaged students at university. We searched for, quality appraised and synthesised the international evidence, i.e., evidence published in any country, in the English language.

The findings from four systematic reviews and twelve experimental studies (4 RCTs, 4 RDDs and 4 QEDs) are presented as narrative syntheses in a series of thematic sub-topics. We found some evidence of effectiveness for a number of university access interventions. ‘Black box’ WP programmes (those with multiple elements in a single programme) and financial incentives were found to be effective. However, much of the evidence had design limitations and the majority was conducted in the United States (US). The paper concludes with research recommendations in relation to UK interventions, including suggested designs for future quasi-experimental evaluation.

1 Introduction

This paper presents a systematic review of evidence on the effectiveness of interventions designed to widen participation in higher education (HE) for prospective students from under-represented groups, including lower income students, those who would be the first generation in their family to attend university and students from ethnic minority groups. We located international evidence from studies published in any country, written in the English language, in order to make recommendations for the next steps in UK-based intervention and robust evaluation. This work was funded by the Sutton Trust (Sutton Trust 2016) to inform their delivery and evaluation of interventions in the UK, and the findings were originally published in a report to the Sutton Trust (Torgerson et al. 2014).

2 Background

Widening participation (WP) in higher education has been a policy issue in the United Kingdom (UK) for the past 50 years. The seminal Robbins Report articulated the principle that higher education should be accessible to all those suitably qualified, regardless of background (Committee on Higher Education 1963). As the HE sector expanded, more places were made available, and more young people are now studying to degree level in the UK. In the 1960s, student numbers were around 40,000 (Greenaway and Haynes 2003); in 2015/16 numbers exceeded 2,280,000 (Higher Education Statistics Agency 2017). This translates to an increase in the rate of HE participation for the UK population, from 5% participation in 1960 to around 40% in recent years (Boliver 2013).

However, despite an increase in participation, it is not clear that places are available equally and fairly for all; HE participation is not evenly distributed across all social groups in the population. Those from disadvantaged backgrounds and areas of low HE participation

(defined in the UK by POLAR3¹ quintile [Higher Education Funding Council for England 2012]) are less likely to go on to HE than their more advantaged counterparts, especially to the most prestigious, research-led universities (Universities and Colleges Admissions Service [UCAS] 2016). Previous reviews have found that prospective students from lower-income households, those who would be the first in their family to enter HE and those from some (but not all) minority ethnic groups, are less likely to apply and gain a place in HE, particularly in ‘research intensive’ institutions (Gorard, See, and Davies 2012, Gorard et al. 2006, Torgerson et al. 2008). Boliver (2011) argued that social inequalities in HE enrolment have declined only because the enrolment of most advantaged social class has reached ‘saturation point’. This finding is supported by UCAS’ analysis of their most recent admissions cycle, which showed that 18 year olds living in areas with the highest rates of HE participation are 2.4 times more likely to enter higher education than 18 year olds in areas with the lowest participation rates, with a larger difference for ‘higher tariff’ institutions² (UCAS 2016, p.14). Additionally, Boliver (2011) showed that social inequalities persist in enrolment to UK universities which were granted their university status before 1992³ (perceived as higher status and tending to be more research-focussed and requiring higher grades for admission).

Prior academic attainment is certainly a factor in HE participation, but the causal process is not straightforward. Gorard et al. (2006) found that prior success in school examinations was

¹ Participation Of Local AREas, third version

² An institution where the average UCAS tariff score (which represents the applicants pre-HE qualifications, usually those gained at the end of formal schooling) is in the top third of all institutions.

³ A significant point of change in the UK HE sector when many non-university higher education institutions were awarded university status via the Further and Higher Education Act 1992.

the main predictor of whether students remained in education. Chowdry et al. (2013) also found that poor achievement in secondary school accounted for the majority of variation in attendance at high status institutions, although they suggested that low attainment could be linked to the perception of barriers to HE progression and subsequent lack of engagement, indicating that the causal process is complex. Harris (2010) demonstrated that less advantaged pupils were less likely to choose to study subjects required by the most selective universities in the phase prior to entering HE, and were less likely to perform well in these subjects. These findings indicate that there are multiple points in the ‘journey’ to HE when interventions to encourage wider participation could be put in place; and, indeed, many HE institutions in the UK are delivering interventions designed to increase knowledge and affect the behaviour of prospective students.

Boliver (2013) demonstrated that, even when students from state schools or from Black and Asian ethnic backgrounds have the same qualifications as other applicants, they are still less likely to receive an offer to study at a Russell Group⁴ institution. This could indicate that interventions may be helpful within institutions to change behaviour when making decisions about offers; or it could be that there are factors other than attainment that are impacting on the quality of applications for students from these backgrounds.

While many would agree that progress has been made in recent years, it is still broadly acknowledged that participation in HE (particularly access to research intensive institutions)

⁴ The Russell Group is a membership organisation which ‘represents 24 leading UK universities which are committed to maintaining the very best research, an outstanding teaching and learning experience and unrivalled links with business and the public sector’ (Russell Group 2016) being a Russell Group member is not a necessary indicator of institution quality or research standing, but could be considered a sufficient indicator.

is still far from 'fair' in the UK context and that the causes of this are complex (Gorard, See, and Davies 2012).

2.1 The need for research

Widening participation is a key area of focus for HE institutions, particularly with the potential introduction of WP-related performance metrics in the Teaching Excellence Framework (Department for Business, Innovation & Skills 2016). The Office for Fair Access (OFFA) and the Higher Education Funding Council for England (HEFCE) acknowledge that there are gaps in the current knowledge base about which strategies to widen access are most effective (Department for Business, Innovation and Skills 2014) and so research is needed to inform WP practitioners.

While HE institutions in England spent £842 million on WP activities in 2014/15 (HEFCE 2016, p.1), the proposed outcomes framework for evaluating activity in England is still under development, despite recognition that there is 'little evidence to date of interventions and approaches being systematically evaluated' (HEFCE 2015, p.9). Therefore, there is an urgent need for more research on which approaches are most effective and hence how this money can be used most efficiently. A systematic review in the topic area of higher education access interventions to increase participation for students from disadvantaged backgrounds provides evidence for the effectiveness of interventions and identifies gaps in the current research base (Gorard, See, and Davies 2012). Systematic reviewing is a tool for searching and synthesising evidence in a way that is as free from bias as possible. A systematic review condenses vast amounts of research literature into a 'manageable' form, giving a finding from a larger sample more reliability than from individual studies (Mulrow 1994) and mitigating the potential effect of naturally occurring Type I and Type II errors (Petticrew and Roberts 2008). Systematic reviews minimise bias when they pre-specify the design, including the methods for all stages of the review (Torgerson 2003), search a wide range of literature to

build as ‘complete’ a picture as possible with the resources available, and when they are conducted by teams they reduce the possibility of individual error or subjectivity (Moher et al. 2009).

2.2 Robust research designs for establishing causality

When considering a research question about the effectiveness of interventions, the aim is to establish the difference between what happened to those who received the intervention and what would have happened to them if they did not, known as the counterfactual condition.

The most useful kinds of studies are those that come closest to mimicking the counterfactual condition (Shadish, Cook, and Campbell 2002, p.5). Randomised studies are the most able to do so, because randomisation creates two groups that are likely to be similar to each other on average (Shadish, Cook, and Campbell 2002) on both measured and unmeasured characteristics and therefore, the effects of the intervention can be isolated from any possible confounding variables. Quasi-experiments (i.e., experiments with non-random allocation to groups) are more susceptible to *systematic* differences between groups, so researchers must carefully consider whether features of their design (for example, motivation to take part in the intervention affecting the treatment group and not the control group) could be an alternative explanation for any observed effect (Shadish, Cook, and Campbell 2002). Given this proviso, quasi-experiments can be a good substitute for modelling the counterfactual condition where randomisation is not possible, although it is necessary to be more cautious in interpreting their findings.

Regression discontinuity design (RDD) is a specific type of quasi-experiment whereby the intervention is allocated on the basis of participants’ ranking on a given covariate (such as test score, date of birth, household income), with a particular value chosen as a cut-off point above which (or below which, depending on the particular study) participants receive the intervention (Hedges 2012). The effectiveness of the intervention is measured by

investigating the ‘discontinuity’ between the regression lines for intervention and control groups on the outcome measure. The strongest inference is made around the cut-off point, on the assumption that individuals scoring very close to the cut-off on either side are very similar to each other on other observed and unobserved covariates, hence mimicking randomisation (Shadish, Cook, and Campbell 2002). This robust design avoids some of the pitfalls of other quasi-experiments; however, it does have some limitations. For example, Deke and Dragoset (2012) showed that a much larger sample size is required in an RDD to observe a given effect than would be necessary in an RCT and the design can be complicated if allocation according to the cut-off point is not adhered to (Imbens and Lemieux 2008).

2.3 The rationale for undertaking this systematic review

This systematic review informs the development of the evidence base for university access strategies in the UK by identifying the interventions that have the most evidence of promise. The critical appraisal of these studies enables us to discriminate between the studies in terms of quality and informs our recommendations for designs for future evaluations of the interventions with most evidence of promise in the UK context.

3 Design and methods

This systematic review addresses the following research questions:

- What is the international evidence of the effectiveness of university access strategies and approaches on participation and retention, attitudes and aspirations of disadvantaged students at university?
- How robust and trustworthy is the evidence about effectiveness for each strategy

Inclusion and exclusion criteria were established prior to the searching being undertaken (see Table 1 for the full list of inclusion and exclusion criteria); these criteria were developed to meet the needs of the funder and focused on the characteristics of interest in terms of participants, interventions and control conditions, outcomes and settings.

3.1 Searching and screening

Systematic searches were conducted in August 2012 for systematic reviews, RCTs and RDDs that focussed on studies reporting the results of interventions to improve access in HE. Key education and social science databases were searched systematically, based on the outcomes of preliminary test/scoping searches and their known relevance to the field. In total four databases were searched: Education Resources Information Centre (ERIC), PsycINFO, Web of Science and British Education Index (BEI). All of the systematic searches were completed within a three-month period. Records were stored and screened in Endnote (*Endnote* (version X6) 2012).

3.1.1 Search strategies

An electronic search strategy including both substantive and methodological key words was devised, and this was tested and developed in an iterative process of trial and improvement. Key words generated by the researchers based on their understanding of the research questions, were used to develop a series of test searches that were trialled in various databases including ERIC and PsycINFO, aiming to maximise the scope of the review within the given time limits. Two searches were simultaneously completed in ERIC, PsycINFO and Web of Science, one focussing on meta-analyses and systematic reviews and the other on primary studies with experimental designs. BEI was searched three months later (due to problems with access) for primary studies, as searching for meta-analyses and systematic reviews in BEI only duplicated what had already been retrieved from the other databases. The full search strategies for each database can be found in Table 2 and Table 3.

The systematic searches were updated in December 2013, to identify any new studies and add in the search strings for quasi-experiments for the full period (see Table 3). The research team had identified, but not included, quasi-experiments as part of the 2012 searches and

screening, these records were included in the screening process with the 2013 updated searches.

3.1.2 First stage screening

Study titles and abstracts were double screened to determine whether they met the inclusion criteria; studies that clearly did not were rejected, but those where more information was required (e.g., if the abstract did not make the study design sufficiently clear) were retained. Where there was disagreement about inclusion, a third member of the review team was consulted and agreement was reached.

The 2013 update searches were quality assured with double screening of a 20% sample; any disagreements were resolved by a third member of the review team. The level of agreement was calculated using Cohen's Kappa (Torgerson 2003), and as the results gave no cause for concern the 20% screening level was deemed sufficient.

3.1.3 Second stage screening

The full texts of studies and reports were obtained and either double-screened independently for inclusion (2012 searches) or a 20% sample was double screened (2013 update searches). Records were excluded at this stage based on the criteria listed in Table 1. Any disagreements were resolved in discussion with the review team.

Following full text screening (second stage), data extraction (see 3.1.4) was undertaken. A third stage of screening occurred at data extraction where the two reviewers undertaking the data extraction either confirmed inclusion or excluded at this stage.

3.1.4 Data extraction and quality appraisal

Data extraction forms were developed for systematic reviews, RCTs and RDDs. The RCT form was also used for QEDs. For systematic reviews, data on the number and design of included studies, interventions, outcomes, results and conclusions were extracted from the

reviews. For experimental designs, data on the number of participants, their relevant characteristics, balance between intervention and control groups, the nature of the intervention and control conditions, outcomes, results and conclusions were extracted. Completed data extraction forms for all included studies can be found in Torgerson et al. (2014).

The systematic reviews were quality appraised based on the recommendations of the PRISMA statement (Moher et al. 2009). All systematic reviews meeting the inclusion criteria were included in our findings, with quality issues considered in results and discussion.

The experimental studies were quality appraised using data extraction forms developed from the CONSORT statement (Schulz, Altman, and Moher 2010). Data were extracted to indicate the robustness of studies (for example, whether allocation was undertaken blind and whether the groups were balanced on key characteristics). The research team also made a judgement on the relevance of the study to the UK context. These factors were combined to give a judgement of overall quality in relation to the research questions.

The categories for the RDD data extraction form were developed based on guidance from the Institute of Education Studies (What Works Clearinghouse 2011), to reflect the design and quality requirements of this kind of study. Key areas included whether the discontinuity was 'sharp' or 'fuzzy' and whether there was opportunity to manipulate the cut-off point. Again, a judgement was made by the review team about relevance to the UK context and research questions.

4 Results

4.1 Results of searching

4.1.1 First searching

The electronic searches produced 2287 potentially relevant studies, and after screening 12 studies were included. Double data extraction and quality appraisal were undertaken and agreement between all pairs of reviewers was high.

4.1.2 Second searching

The update to the initial searches led to 452 potentially relevant ‘hits’. 949 records from the first stage of searching and screening were rescreened (1401 records in total). An additional two studies were found via citation. Following screening, four quasi-experimental studies were eligible for inclusion in the review. Figure 1 details the movement of records through the search and screening process.

4.2 Review of systematic reviews

4.2.1 Summary of findings

Table 4 shows the four systematic reviews meeting the inclusion criteria, and gives an overview of their focus and findings; Table 5 shows the quality assurance judgements for the reviews.

4.2.2 Narrative synthesis

Harvill et al. (2012) investigated the impact of college access programmes in the United States (US) and the What Works Clearinghouse (2006) looked for evidence on one of these programmes: Talent Search. The Torgerson et al. (2008) review focused on interventions to support post-16 retention in education for ethnic minority students in the UK, and the paper by See, Gorard, and Torgerson (2012) is an update of their initial review.

4.2.2.1 College access programmes

Talent Search is the focus of the What Works Clearinghouse (2006) report and is also one of 12 programmes included in Harvill et al.'s (2012) review.⁵ Almost all of these programmes could be described as ‘black box’ interventions – these are interventions with multiple components (in this case, between 2 and 6), meaning that an RCT or QED cannot by itself indicate *which* elements of each programme may have been instrumental in causing any identified effects. The exception to this is a ‘FAFSA⁶’ intervention offering support to families in completing the application to access financial support at university. There is variation in the way that programmes were delivered: four were whole-school interventions and eight were targeted at individual participants. Given the small number of studies found for inclusion in the review, no separate analysis of effectiveness could be conducted for whole-school versus individual-level interventions.

The authors conducted a meta-analysis for two outcome measures: high school graduation and HE enrolment, and found that interventions evaluated through RCTs showed a ‘sharp difference in the size of estimated impact’ (Harvill et al. 2012, p.4) compared with those evaluated with less robust QED designs. This trend indicates that the differences in impact may be partly attributable to the study designs. Harvill et al. (2012) found that, on average, ‘college access programs increase high school graduation by eight percentage points’ (p.4) – but that the estimate of impact based only on the three RCTs was not statistically significant. Similarly, for enrolment in college (HE) they found that on average, college access

⁵ The full list of included programmes is as follows: Advancement via Individual Determination; Early College; Gear Up; Sponsor-A-Scholar; ACE plus; Talent Search; FAFSA support; Quantum Opportunity Program; Excel; Upward Bound; Teach Prep and Career Academies

⁶ Free Application for Federal Student Aid

programmes increased enrolment by 12 percentage points, but the effect was only four percentage points across the three RCTs with this outcome measure.

Given the small number of studies and the large amount of variation in the content of the programmes included, the authors were reluctant to draw further conclusions from the study. The meta-analysis of two studies on Talent Search (What Works Clearinghouse 2006) found an average increase of 17 percentage points in the likelihood of completing high school. Both studies were QEDs using propensity score matching. Talent Search comprises ‘test taking and study skills assistance, academic advising, tutoring, career development, college campus visits, and financial aid application assistance’ (What Works Clearinghouse 2006, p.1) and as such can be described as a ‘black box’ intervention.

A further note of caution is that these reviews did not consider a particular population, such as participants with low socioeconomic status (measured either by family income, or other indicators such as living in a lower-income area), those from the first generation to attend HE, or those from ethnic minority groups. We know that college access programmes target under-represented students who are likely to have some or all of these characteristics, but we cannot assume (particularly for individual-level programmes) that the students who actually attended met those criteria. Depending on the nature of the particular intervention, the target population may have been difficult to reach and less likely to engage with activities related to progression to HE; the assumption that interventions reach their target population may not be valid, particularly for QEDs where self-selecting (i.e., motivated) participants were compared with matched non-participants.

4.2.2.2 Post-16 participation and retention for ethnic minority students

The research question for Torgerson et al.'s (2008) review was ‘What strategies are effective in encouraging post-16 participation of minority ethnic groups?’ They located ten studies suitable for answering this question that were of sufficiently high quality and relevance to the

UK context (including six RCTs, one cohort study, one case control study and two non-randomised experiments: Torgerson et al. 2008, p.22). A range of proxy outcome measures, including attainment, aspirations and engagement with school were used along with participation or retention rates. Partly due to the range of included outcome measures, no quantitative synthesis could take place. The study did include highly detailed information on the quality-rating procedure and the outcome of this, allowing for a detailed narrative synthesis.

Six of the studies focussed on interventions that took place in school settings and four considered interventions delivered in further education (FE) or HE settings; the authors separated their findings by setting:

‘In a post-16 school setting, consistent high quality evidence of positive effects was found for a monetary incentive intervention (monthly stipend) in helping high achieving, ethnically diverse students to maintain their academic good standing. The strategy was found to be particularly effective in a subgroup analysis of Asian students.’
(Torgerson et al. 2008, p.1)

‘In post-16 HE settings, consistent high quality evidence was found for positive effects of a faculty/student mentoring strategy in improving academic performance and retention.’
(Torgerson et al. 2008, p.1)

The study by See, Gorard, and Torgerson (2012) is an updated version of the Torgerson et al. (2008) review. New searches were undertaken to incorporate evidence that had emerged between 2006 – 2011. The update resulted in a total of 14 studies meeting the necessary inclusion standards (eight RCTs, four QEDs, one cohort study and one case-control study). The interventions were categorised as school-based or FE/HE-based but findings for both settings were synthesised.

Consistent with Torgerson et al. (2008), See, Gorard, and Torgerson (2012) found the greatest evidence of promise for interventions based around financial incentives (e.g., a weekly bursary paid for continued attendance at post-16 education). Three moderate-quality studies found that financial incentives had a positive impact, although one study (L. P. Jones, Harris, and Finnegan 2002) found a significant impact on attendance but not on completion (retention), indicating that caution should be applied when interpreting proxy indicators. All three studies were US-based; similar interventions have taken place in the UK but the studies on UK-based interventions were found to lack sufficiently clear reporting, rigorous designs and appropriate outcome measures (See, Gorard, and Torgerson 2012, p.420).

Mentoring was found to have a positive impact in both school-based and FE/HE-based studies: faculty/student mentoring had a positive impact on attainment and retention, but a peer-to-peer mentoring programme did not have a positive effect.

The problems regarding the quality of UK evidence relate to all interventions in the study, not just those addressing financial support. Torgerson et al. (2008) highlighted similar problems and it is notable that only four additional studies of sufficient quality and relevance according to the criteria applied by this study were published in the five-year period between the two searches, thereby highlighting the limited evidence base on which to form conclusions.

4.3 Review of RCTs, RDDs and other QEDs

4.3.1 Summary of findings

Table 6 shows the eight experimental studies meeting the inclusion criteria, and gives an overview of their focus and findings. Table 7 shows the quality assurance for the RCTs and QEDs and Table 8 shows the quality assurance for RDDs.

4.3.2 *Narrative synthesis*

Ten of the twelve studies meeting the inclusion criteria in this review looked at two broad categories of interventions. Six studies looked at ‘black box’-type interventions: longer-term interventions combining multiple elements, where it cannot be determined from which elements of the intervention any impact derives (Bergin, Cooks, and Bergin 2007; Myers et al. 2004; Brewer and Landers 2005; Myers, Brown, and Pavel 2010; Olsen et al. 2007; Pharris-Ciurej, Herting, and Hirschman 2012). Four studies considered financial aid (Curs and Harper 2012; Goodman 2008; Solis 2012) or an intervention supporting application for such aid (Bettinger et al. 2009). Castleman, Arnold, and Wartman (2012) investigated the impact of counselling intervention, and Niu and Tienda (2010) used regression discontinuity to investigate the impact of a guaranteed university place for students attaining grades in the top 10% of the cohort.

4.3.2.1 ‘Black box’ interventions

Two studies evaluated Upward Bound (Myers et al. 2004; Olsen et al. 2007). Upward Bound is a federally-funded programme in the US. It includes academic instruction, tutoring, counselling, mentoring, cultural enrichment, work-study programs, and education or counselling services, along with specific elements designed for students for whom English is not their first language, students with disabilities and from a range of disadvantaged circumstances (“Upward Bound Program” 2016). Olsen et al. (2007) looked at specific maths and science-focussed elements of Upward Bound, using data collected for the Myers et al. (2004) study. Brewer and Landers (2005) presented quasi-experimental studies conducted in three US states on Talent Search, a similar programme which is also federally-funded and provides a large range of support and information services (for details, see Talent Search Program 2016).

Bergin, Cooks, and Bergin (2007) conducted an RCT of EXCEL, a programme which contains many similar elements to Upward Bound such as tutoring, mentoring, activities on university campus, writing instruction and guidance through the college application process. It also includes summer schools and weekend seminars and a financial incentive for remaining on the programme. Participants received a scholarship to the sponsoring university, but only if they remained on the programme and met a range of attainment and participation requirements.

The final 'black box' programme evaluated was the Washington State Achievers (WSA) programme (Myers, Brown, and Pavel 2010; Pharris-Ciurej, Herting, and Hirschman 2012), which includes individual support in the form of mentoring, and the eligibility of lower-income participants for a scholarship. However, in contrast with the other programmes, WSA is a whole-school intervention, which encourages practices that encourage progression to college to be adopted across the school.

The results of these six studies were somewhat mixed, with some neutral findings and some positive impacts. Myers et al. (2004) found that Upward Bound had no impact on overall levels of enrolment at higher education institutions; however, there was an indication of increased enrolment in four-year college degrees compared with (less academically-focussed) two-year degrees. A subgroup analysis showed a larger effect for students whose academic expectations were lower compared with students who had high academic aspirations before taking part in Upward Bound. Given that Upward Bound has been running for many years, the size of the effects could be considered disappointing. Olsen et al. (2007) found a statistically significant difference in the likelihood of attending post-secondary education overall as well as for four-year versus two-year college, although the quasi-experimental design was less robust than the previous RCT, and could account for unmeasured differences such as motivation to take part in the programme.

In the evaluation of Talent Search, Brewer and Landers (2005) used application records for the programme to compare eligible applicants who took up a place with eligible participants who did not. While they found that there was a significantly higher enrolment rate in postsecondary education for Talent Search participants, this finding must be treated with caution due to high attrition rates (55% of the control group were lost to follow-up) and the possibility that other factors led eligible applicants to decline their place.

The evaluation of EXCEL (Bergin, Cooks, and Bergin 2007) used individual-level random allocation to create an intervention and control group. However, the trial only had 83 participants, which means it was underpowered to detect a small effect and the study found that the impact on university enrolment was not statistically significant. However, there was a statistically significant increase in enrolment at the sponsoring university (i.e., the institution offering a scholarship). There was also no detectable impact on self-esteem or educational aspirations for participants.

With regard to WSA, the two studies took quite different approaches to evaluating the programme. For Myers, Brown, and Pavel (2010), all participants were in WSA schools, so the control condition received the school-level elements of WSA. The intervention groups were those who received the full programme (including a financial scholarship) and those who were accepted to the programme but did not continue and take up the scholarship. The study found that WSA-funded participants were significantly more likely to attend a high quality (four-year) college. This study was limited by substantial attrition, with a 52% non-response rate in the control group.

Pharris-Ciurej, Herting, and Hirschman (2012) focussed their analysis on the school-wide reform element of the programme, exploiting data from an independently-conducted survey of self-reported college aspirations and attendance. They compared outcomes at school level for students in three WSA schools with two non-WSA schools and found that the programme

was effective, although these effects were accounted for by the outcomes of students receiving the full WSA intervention; no ‘spill over’ effect was observed from the school-wide reform.

We cannot have full confidence in the moderate positive impacts found here, as most of the studies had some design limitations. The most robust RCT (Myers et al. 2004) had a large number of participants, but moderate levels of attrition (19% by the final follow-up point) and the study did not fully detail randomisation methods. The other RCT in this group (Bergin, Cooks, and Bergin 2007), although well-designed, had only 83 participants. The authors acknowledge that it was underpowered and there was up to 10% attrition in one of the outcome measures.

All included quasi-experiments made retrospective comparisons between students who had received interventions and students who had not, often using administrative data and/or pre-existing surveys. The studies were all judged to be of moderately low quality, generally due to selection bias. Brewer and Landers (2005) and Olsen et al. (2007) compared students who had chosen to take up an intervention (and therefore were likely to be more self-motivated and more likely to have pre-existing HE aspirations) with those who chose not to take up the intervention. Myers, Brown, and Pavel (2010) compared applicants who were chosen for an intervention after a competitive application process with applicants who applied but were not chosen (accounting for self-motivation, but not for other observable and unobservable differences leading to non-selection for the intervention). Selection bias operated at cluster level in Pharris-Ciurej, Herting, and Hirschman's study (2012): schools that were offered the WSA intervention due to the low socio-economic status (defined in this study as ‘low to modest income high schools’) and traditionally low HE progression rates of their student population were compared with schools that were not offered the intervention, as their student population did not meet the same criteria.

4.3.2.2 Financial aid and financial information

One RCT and three RDDs investigated the impact of financial aid (Curs and Harper 2012; Goodman 2008; Solis 2012), or in the case of Bettinger et al. (2009) an intervention to encourage uptake of financial aid. Bettinger et al. (2009) used tax records to select a population of households where a family member aged between 15 – 30 years did not have an undergraduate degree, and where the annual household income was below \$45,000.

Households were randomly allocated to one of three conditions: tailored advice on higher education finances (including substantial support with completing a financial aid application) from a tax professional; tailored written information about the financial aid available and instructions on how to apply; or no intervention. The study benefitted from a large sample size ($n = 24,204$), and their findings were split into subgroups: dependents (i.e., those whose enrolment in HE would follow directly from normal schooling) and two adult groups: those with prior experience of HE and those without. The study found positive effects for all subgroups that received the full intervention: enrolment rates for dependent participants increased from 26.8% among the control group and to 34.5% in the financial aid support group. There was also a positive effect on application for, and receipt of, financial aid.

Curs and Harper (2012) investigated an intervention that is not targeted specifically at under-represented or minority populations; however, their study analysed the effects for these subgroups. The intervention in question is a financial scholarship, awarded on attainment prior to entering university and ranging from \$2000 - \$5000 depending on the level of attainment.

The study measured the impact on attainment at university and found that each additional \$1000 awarded increased grade point average by 0.06 for the population overall; the increase for low-income students was around 0.1 and for students of colour 0.11 (although this last effect was not statistically significant). One point represents a letter grade; 0.33 represents the difference, for example, between an A and an A+, so these increases were relatively small.

Goodman (2008) used RDD to investigate the impact of a scholarship awarded based on prior attainment. In this case, the scholarship is awarded to the top 25% of performers in each school district, but it covers less than 25% of the cost of attending the awarding institutions. Goodman found that being awarded a scholarship did have some impact on which institution students attended, but that scholarships were rarely awarded to low-income students and thus did not have a positive impact on their HE participation.

The third RDD investigating financial support (Solis 2012) looked at a programme whereby tuition loans were made available to households below a given income threshold (and above an attainment threshold) in Chile. The study found that students with loan access increased their enrolment probability by 21 percentage points (equivalent to a 133% increase in the enrolment rate of the group without access to loans). The impact was larger for the poorest group of students. The study also found a positive impact on staying enrolled for a second and third year of college.

4.3.2.3 Counselling

Castleman, Arnold, and Wartman (2012) evaluated the impact of a summer counselling programme using an RCT design. The participants were mostly from minority ethnic groups (around 45% Hispanic and 29% black). The counselling provided addressed both practical barriers to higher education such as financial aid application, and emotional or aspirational barriers.

The study found a positive impact on college enrolment (47% of treatment group enrolled full-time compared with 32% of the control group) and on attending four-year college (41% of the treatment group compared with 26% of the control group). This effect was potentially diluted by crossover: 21% of the control group also met at least once with a counsellor.

A limitation of the study is that all participating schools were ‘Big Picture’ high schools, i.e., schools with a particular focus on personal growth and ‘real-world learning’. The findings of this study may not be generalizable to schools with a more standard ethos and curriculum.

4.3.2.4 Guaranteed university places for high-attaining students

The final included study was an RDD investigating the impact of a ‘natural experiment’ brought about by a change of legislation in Texas (Niu and Tienda 2010). A law was introduced guaranteeing a place at state university for the top 10% of academic performers in high school, with the intention that this would increase university attendance for ethnic minority groups. The study found evidence of an impact for the whole population, but no impact for three sub-groups: Hispanic students; students from predominantly minority high schools; and students from high schools with average shares of economically disadvantaged students.

4.3.2.5 General observations

An emerging pattern from the findings is that interventions were more likely to have an impact on *which* institution participants attended, rather than overall attendance versus non-attendance. Bergin, Cooks, and Bergin (2007) found a significant impact on whether participants attended the sponsoring institution, but did not find a significant impact on university attendance in general. Myers et al. (2004) found that Upward Bound was particularly effective in encouraging the choice of four-year (more academically prestigious) over two-year institutions, and was more effective for those whose pre-programme aspirations were lower. Goodman (2008) found a larger impact on attendance at public versus private HE college than on overall attendance and concluded that the primary effect of the scholarship was to shift students from one type of institution to another.

5 Discussion and conclusions

5.1 *Generalisability to the UK context*

Almost all of the evidence included in this review focussed on interventions delivered in the US. A key issue for interpreting the findings of this review is how similar (or otherwise) the UK context is to the US. The minority ethnic groups included in the US-studies were ‘of limited generalizability to the UK context’ (p. 6). Minority ethnic groups in the US and UK are different: 77% of the US population identify as white (United States Census Bureau 2016) compared with 86% of the UK population (Office for National Statistics 2012). Additionally, 18% of those identifying as white (race) and 6.8% of those identifying as black (the next largest racial group) in the US also identify as Hispanic (ethnicity)⁷. The complex mix of racial and ethnic identification in the US, and the large distinct populations within Hispanic groups, has no clear parallel in the UK.

Additionally, interventions to widen participation in HE have been embedded in the US context for many years. The US federal government passed legislation in 1965 that led directly to the establishment of ‘TRIO’ programmes to encourage equality in educational participation among students from low income, first-generation to go to HE college, and ethnic/racial minority backgrounds (Cowan Pitre and Pitre 2009). Two of the programmes included in the review were among the three TRIO programmes established in 1965: Upward Bound (Harvill et al. 2012; Myers et al. 2004) and Talent Search (What Works Clearinghouse 2006; Brewer and Landers 2005), with Upward Bound Maths-Science (Olsen et al. 2007) established in 1990. Their longevity is likely to affect their impact, for example through the

⁷ The US Census Bureau treat race and ethnicity as separate concepts; ‘Hispanic origin can be viewed as the heritage, nationality group, lineage, or country of birth of the person or [their ancestors]. People who identify their origin as Hispanic, Latino, or Spanish may be any race.’ (United States Census Bureau, 2011)

programmes being refined and improved over many years, and through their becoming more well-known and socially acceptable. The effectiveness of other, more recent US interventions may well be affected by the long-term culture of intervention and range of examples of good practice. While widening participation is now an explicit policy issue in the UK, this has only been targeted with funding and interventions in the last ten to fifteen years (R. Jones and Thomas 2005), and this difference in context may limit the generalizability of findings from the US.

These differences do not necessarily mean that the evidence is not useful in understanding which interventions may work in a UK context. However, it does mean that any interventions introduced should be piloted and robustly evaluated at each stage of expansion to learn how and whether they are effective in a UK context. When translating interventions from the US to the UK context, policy-makers and practitioners should use their substantive knowledge of their local context to evaluate the evidence presented here or to conduct a further small review of particularly pertinent issues. A review that is not restricted to RCTs and other comparative studies may be the most appropriate tool to support specific decisions of this type, as the research questions are likely to include the experiences, perceptions and choices of potential students in a given context. Given the variation likely to be found in specific local contexts, the broad scope of contexts covered in this review can function as a good starting point for local interpretation.

5.2 *Black box interventions*

‘Black box’ interventions with multiple components are of particular interest in the UK context as interventions of this kind are delivered by many HE institutions. Programmes are run by multiple institutions (e.g. Realising Opportunities [Realising Opportunities 2016]; Reach Scotland [University of Aberdeen 2016]) and by individual institutions (e.g. K+ at Kings College London [Kings College London 2016]; Ambition Nottingham at the

University of Nottingham [University of Nottingham 2016]). These programmes typically span around two years, and offer campus visits, mentoring, application support and other components.

The black box interventions evaluated were all complex and made up of several components; academic support and test-taking practice was provided alongside university familiarisation, careers/subject choice advice and financial advice and for one intervention (Washington State Achiever) this was also combined with financial aid and school-wide reform. Interventions were delivered in multiple sites and it was not within the scope of the studies to investigate variations in delivery. It is therefore impossible to derive from these studies *which* elements of each programme may have been instrumental in causing the positive effects. Similar issues could pertain to attempts at evaluating black box interventions in the UK. It may be possible to use Qualitative Comparative Analysis (QCA; Ragin 2008) to understand which combinations of intervention elements and target population characteristics might be necessary or sufficient to achieve the desired outcomes (using a similar methodology to that used by Blackman (2013) in investigating the reduction of teenage pregnancy rates in differing local contexts). Alternatively, the most acceptable way to introduce robust RCTs to evaluate WP in the UK may be trials of individual elements within a programme, randomly allocating participants to receive, for example, different intensities of mentoring, using the findings to gradually refine the effectiveness of what is offered.

The UK could adapt some of the evaluation methods used in the US to enhance understanding of the impact of similar UK interventions. The quasi-experiments included in the What Works Clearinghouse (2006) review of Talent Search exploit pre-existing administrative data to conduct good quality quasi-experimental analysis, demonstrating that including covariates for self-reported attitudinal measures alongside attainment and

background characteristics can give a control group with a low level of potential bias for evaluating effectiveness.

It should be noted that the judgement of moderately low quality evidence for the quasi-experiments in this review was made in the context of the full range of potential experimental methods. Whilst the studies were moderately low quality compared to large-scale, methodologically-sound RCTs, they represent good quality quasi-experiments and there are strong pragmatic reasons that such designs should be replicated in evaluating UK interventions.

One such evaluation study could be conducted with little need to disrupt the normal running of a WP programme. Data on relevant factors such as ethnicity, household income and attainment is already collected by many programmes to assess participant eligibility. If programmes are over-subscribed, these data will also be available for unsuccessful applicants. Attitudinal data could also be collected at application (although steps would need to be taken to ensure this data was not biased by the perception that it might affect the application outcome). Additional contextual data could be collected if necessary from the National Pupil Database (Department for Education 2013). Propensity score matching could then be utilised to create a matched control group from unsuccessful applicants. Outcome data could be collected via the Higher Education Access Tracker (HEAT 2016). A design of this kind is likely to have a high level of acceptability, as it need not interfere with the running of a programme. By drawing the control group from the pool of unsuccessful applicants to a programme, there would be reasonable confidence that the groups are equal in terms of their motivation and ability to seek out beneficial interventions. As the Higher Education Access Tracker develops, studies of this nature could be conducted more widely to draw comparisons between interventions.

5.3 *Financial interventions*

How the findings on financial interventions such as those tested by Bettinger et al. (2009) would translate to a UK context is less clear. On the one hand, the process for applying for financial aid in the US is notoriously complicated, requiring more detailed information than the UK system. However, the UK system is becoming increasingly complicated, as in recent years UK universities have each set their own rules and arrangements for the allocation of bursaries (Office for Fair Access 2016) and the level of support available can vary greatly between institutions (Wyness 2016). Therefore, an information-based intervention to support families in navigating the available information may have impact in the UK. Such an intervention could be randomly assigned and evaluated using methodology based on Bettinger et al. (2009). A cost-effective method of rolling this out could be to build the intervention into a pre-existing black box programme, and randomly allocate programme participants to receive it.

5.4 *Strengths and limitations of the systematic review*

The strengths of this systematic review are that it addressed an important research question for policy and practice in WP in HE; it is robustly designed, conducted and reported which enables confidence in its results; and it synthesised results and conclusions about a limited range of effective interventions. The main limitation of the systematic review is that restrictions in the parameters of the review (e.g., date, language, study design) may have led to potentially useful studies being excluded, i.e., those published outside our date limits, in a different language or which used a less rigorous design but which could have added to the evidence base.

5.5 Conclusions

In conclusion, this systematic review found no robust evaluations of UK-based interventions. It found some evidence of effectiveness for ‘black box’ WP programmes (those with multiple elements in a single programme) and financial incentives, but these interventions were almost all developed for the US context and tested in that setting. The limitations of many of the studies in this review, such as the potential biases for matched comparison groups, would also be likely to apply to studies designed in the UK. There is a pressing need for evidence on widening participation interventions in the UK context, and nuanced interpretation and development is required to ensure that HEIs develop interventions appropriate to their own context. Researchers could adapt the methodology used in WP evaluation in the US to build a more robust evidence base in the UK, and they should also be mindful of the importance of supporting evidence-users in interpreting findings for their own context.

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8 Tables

Table 1: Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Participants	Young people up to the ‘traditional’ age for attending HE in their country Disadvantaged or underrepresented groups with regards to race/ethnicity or socio-economic status	Mature students Disabled students as the sole focus of the study
Interventions	Interventions explicitly targeted at increasing HE participation at undergraduate level for disadvantaged or underrepresented groups Interventions conducted in the UK; or sufficiently relevant to the UK context that they could be replicated in the UK in some form	Interventions where increased HE participation for disadvantaged or underrepresented groups was not the specified outcome, e.g. interventions targeted at attainment or wellbeing where increased HE participation may be an indirect consequence Policy-level interventions where differential outcomes for disadvantaged or underrepresented groups were not the specified aim
Comparison	‘Business as usual’ or alternative interventions	None
Outcomes	HE participation as measured by attendance at an HE institution	Proxy outcomes for HE participation, e.g. attitudinal outcomes, self-reported intentions, indicative behaviour such as pre-HE test taking (although outcomes like these were reported if they were included in studies where HE participation was also an outcome)
Study designs	Randomised controlled trials, regression discontinuity designs and other quasi-experiments where baseline equivalence on appropriate factors could be demonstrated Systematic reviews of the effectiveness of HE participation interventions, where at least some of the included studies meet the above criteria	Non-experimental studies, i.e. studies without a comparison group Experimental studies where baseline equivalence on appropriate factors is not demonstrated. Non-systematic reviews.

Table 2: Search strategies for each database – original searches

Database	Date of searches	Date range	Number of hits (before de-duplication)	Number of hits (after de-duplication)	Search String
ERIC (Education Resources Information Centre) [ProQuest]	20 Sept 2012	1 January 1992 – current	372	372	Search 1 - Meta-analysis, Systematic reviews, etc. ab(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
ERIC	20 Sept 2012	1 January 1992 – current	223	184	Search 2 - RCTs, etc. ab(experiment* OR quasi experiment* OR control OR allocat* OR randomi#ed controlled trial OR RCT OR regression discontinuity design OR RDD) AND (ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate)) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
PsycINFO	20 Sept 2012	1992 – 2012	204	186	Search 1 - Meta-analysis, Systematic reviews, etc. ab(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND (ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate)) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
PsycINFO	20 Sept 2012	1992-2012	148	89	Search 2 - RCTs, etc. AB (experiment* OR quasi experiment* OR control OR allocat* OR randomi#ed controlled trial OR RCT OR Regression discontinuity design OR RDD) AND AB (participation OR access OR admission OR enrol#ment) AND AB (higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND AB (outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
Web of Science	21 Sept 2012	1992-2012	702	635	Search 1 - Meta-analysis, Systematic reviews, etc. Topic=(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND Topic=(participation OR access OR

					admission OR enrol\$ment) AND Topic=(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND Topic=(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation) Timespan=1992-01-01 - 2012-09-21. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH. Lemmatization=On
Web of Science	21 Sept 2012	1992-2012	701	446	Search 2 - RCTs, etc. Topic=(experiment* OR quasi experiment* OR control OR allocat* OR randomi\$ed controlled trial OR RCT OR Regression discontinuity design OR RDD) AND Topic=(participation OR access OR admission OR enrol\$ment) AND Topic=(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND Topic=(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation) Timespan=1992-01-01 - 2012-09-21. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH. Lemmatization=On
British Education Index (BEI)	11 Dec 2012	1 January 1992 - current	375	375	Search 1- UK-based interventions ab(intervention OR programme OR program) AND ab(participation OR access OR admission OR enrol*ment OR widen* access OR widen* participation) OR ab(outreach OR summer school*) AND ab(higher education OR HE OR post compulsory OR student OR university OR undergraduate) AND pd(>19920101)
TOTAL:			2725	2287	

Table 3: Search strategies for each database - updated searches

Database	Date of searches	Date range	Number of hits (before de-duplication)	Number of hits (after de-duplication)	Search String
ERIC (Education Resources Information Centre) [ProQuest]	11 December 2013	1 December 2012 – current	8	7	Search 1 update - Meta-analysis, Systematic reviews, etc. ab(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
ERIC	11 December 2013	1 December 2012 – current	6	4	Search 2 update - RCTs, etc. ab(experiment* OR quasi experiment* OR control OR allocat* OR randomi#ed controlled trial OR RCT OR regression discontinuity design OR RDD) AND (ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate)) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
PsycINFO	11 December 2013	2012 – 2013	29	27	Search 1 update - Meta-analysis, Systematic reviews, etc. ab(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND (ab(participation OR access OR admission OR enrol#ment) AND ab(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate)) AND ab(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
PsycINFO	11 December 2013	2012 – 2013	20	10	Search 2 update - RCTs, etc. AB (experiment* OR quasi experiment* OR control OR allocat* OR randomi#ed controlled trial OR RCT OR Regression discontinuity design OR RDD) AND AB (participation OR access OR admission OR enrol#ment) AND AB (higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND AB (outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)
Web of Science	11 December 2013	2012 – 2103	215	200	Search 1 update - Meta-analysis, Systematic reviews, etc. Topic=(systematic review OR comparative analysis OR research review OR meta analy* OR effect size OR intervention) AND Topic=(participation OR access OR admission OR enrol\$ment) AND Topic=(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND Topic=(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation)

					Timespan=1992-01-01 - 2012-09-21. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH. Lemmatization=On
Web of Science	11 December 2013	2012 – 2013	166	102	Search 2 update - RCTs, etc. Topic=(experiment* OR quasi experiment* OR control OR allocat* OR randomi\$ed controlled trial OR RCT OR Regression discontinuity design OR RDD) AND Topic=(participation OR access OR admission OR enrol\$ment) AND Topic=(higher education OR HE OR post compulsory OR college OR student OR university OR undergraduate) AND Topic=(outreach OR summer school* OR achievement gap OR low income OR minority OR widen* access OR widen* participation) Timespan=1992-01-01 - 2012-09-21. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH. Lemmatization=On
British Education Index (BEI)	11 December 2013	1 December 2012 – current	105	102	Search 3 update - UK-based interventions ab(intervention OR programme OR program) AND ab(participation OR access OR admission OR enrol*ment OR widen* access OR widen* participation) OR ab(outreach OR summer school*) AND ab(higher education OR HE OR post compulsory OR student OR university OR undergraduate) AND pd(>19920101)
TOTAL			549	452	

Table 4: Findings of systematic reviews

Review	Intervention(s)	Number and design of studies	Participants ; settings	Outcome(s)	Judgement of relevance of context	Judgement of overall quality of evidence in answering research questions	Results
Harvill <i>et al</i>, 2012	The review looked for evidence on the effectiveness of school-based HE access programmes that identified college readiness and/or college enrolment as a primary goal. Interventions included whole-school reform initiatives and targeted support programmes. Most provided academic enrichment and counselling; some involved personal enrichment and social integration, mentoring, parental involvement and scholarships.	14 studies: 6 RCTs 8 QEDs	Studies where at least 75% of participants are in grades 6 to 12. Interventions tend to be targeted at low income students. Schools.	Readiness for HE Enrolment in HE	Moderate	Moderately high	Statistically significant positive effects for the ‘black box’ interventions included On average college access programs increase high school graduation by 8 percentage points, although average effect sizes from 3 RCTs not statistically significant. On average the impact of college access programs on enrolment in 2-year or 4-year college is an increase of 12 percentage points and the average effect sizes from the 3 RCTs is 4 percentage points.
See <i>et al</i>, 2012	School-based and HE-based access programmes	14 (mix of RCTs and QEDs)	Students in minority ethnic groups (minority in whichever country the study is set)	Increased participation of ethnic minority students from disadvantaged backgrounds	Moderate	Moderately high	The best evidence was on the effectiveness of monetary interventions, although studies were of moderate quality and effects were inconsistent, with variations year-on-year and positive impact on some outcomes but not others (e.g. a positive impact on school attendance but not on completion of studies). There was also some evidence for the effectiveness of mentoring schemes, although the quality of evidence was not robust.

Torgerson <i>et al</i>, 2008	'...interventions that improve post-16 participation or that increase pupils' chances of staying on in education, and thus their likelihood of participating in higher education and enrolment in a higher-status research-active university. This includes interventions to improve retention and pupils' attainment at age 16.' (Torgerson <i>et al</i> , 2008, p. 409)	10 (mix of RCTs and QEDs)	Students in minority ethnic groups (minority in whichever country the study is set)	Increased participation of ethnic minority students from disadvantaged backgrounds	Moderate	Moderately high	One included study claimed consistent high-quality evidence of effectiveness for monetary incentive and sanction interventions (e.g. students receiving a bursary for continuing to attend school), whereas another found results to be more mixed and less robust. Mentoring interventions were found to have consistent, high-quality evidence for effectiveness.
WWC, 2006	'Talent Search': a school-based HE access programme that combines several elements, including support with study skills and exam skills, academic advice, tutoring, careers advice, visits to HE institutions and assistance with completing applications for financial support.	2 QEDs	Low-income 9 th grade students in US high schools (Texas and Florida)	Completion of high school; access to college	Moderately low	Moderately high	The review included two QEDs (propensity score matching participants with non-participants) and found significant positive effects on high school completion in both studies.

Table 5: Quality assurance of systematic reviews

Review	Title identifies as systematic review	Introduction describes rationale for review	Methods: Eligibility – specified study characteristic (e.g. PICOS), giving rationale	Methods: Search and info sources – described replicable search strategy	Methods: Study selection – fully stated process	Methods: Risk of bias – addressed within and across studies	Results: Study selection – gives number included/excluded with reasons at each stage	Results: Study characteristic – PICOS, study size, results	Discussion – summarises key findings and discusses limitations
Harvill et al, 2012	Y	Y	Y	Y	Y	Y (within - brief) NS (across)	Y	Y (brief)	Y
See et al, 2012	Y	Y	Y	Y	Y	Y (within) NS (across)	Y	Y	Y
Torgerson et al, 2008	Y	Y	Y	Y	Y	Y (within) NS (across)	Y	Y	Y
WWC, 2006	Y	Y	Y	Y (technical appendices)	Y	Y (within) NS (across)	Y (technical appendices)	Y	Y

Table 6: Findings of experimental studies

Study and design	Intervention	Outcome(s)	Judgement of study quality	Relevance of intervention and context	Judgement of overall quality of evidence in answering research questions	Results
Bergin et al, 2007 (RCT)	Tailored support programme (<i>EXCEL</i>)	HE enrolment Post- secondary enrolment Academic achievement (school)	Moderately high	Moderate	Moderately high	Modest increased enrolment in sponsoring university
Bettinger et al, 2009 (RCT)	Tailored financial advice	Likelihood of applying for a grant HE enrolment Receipt of grant	High	Moderate	Moderately high	Increased likelihood of applying for financial aid, HE enrolment and financial aid receipt
Castleman et al, 2012 (RCT)	‘Active ‘ summer counselling	HE enrolment	Moderately high	Moderately low	Moderate	Increased enrolment in HE
Myers et al, 2004 (RCT)	Comprehensive preparation programme (<i>Upward Bound</i>)	Enrolment in HE	Moderately high	Moderately low	Moderate	Modest increased HE enrolment; Increased number of high school math credits earned by participants; no effect on other measures of high school achievement
Curs and Harper, 2012 (RDD)	Financial aid	First year grade point average (GPA)	Moderate	Moderately low	Moderate	Increased HE GPA
Goodman, 2008 (RDD)	Merit-based financial aid	Intention to enrol in HE	Moderately high	Moderately low	Moderate	Increased intention to attend HE
Niu and Tienda, 2010 (RDD)	Top 10% law	Enrolment in HE	Moderately high	Moderately low	Moderate	Evidence of effect for Hispanic students, those from predominantly minority high schools and those from high schools with average shares of

						economically disadvantaged students
Solis, 2011 (RDD)	Financial aid (tuition loans)	HE enrolment and progress Drop-out rates	Moderately high	Moderately low	Moderate	Significant increase in HE enrolment rate (students eligible for tuition loans increased their enrolment rate by 21 %points from the enrolment rate of students without access to loans)
Brewer and Landers, 2005 (QED)	Career and academic advice and support; financial aid advice. (Talent Search)	Post-secondary enrolment	Moderately low	Moderate	Moderately low	Increased likelihood of enrolment in post-secondary education and 4-year college
Myers, Brown and Pavel 2010 (QED)	Financial scholarship, mentoring and school reform programme (Washington State Achiever)	College enrolment (including 2-year vs 4 year and quality of college)	Moderately low	Moderately low	Moderately low	Increased likelihood of enrolment in college (and high quality college), especially for those in receipt of scholarship
Olsen et al, 2007 (QED)	Academic support, college familiarisation and career support with a maths/science focus (Upward Bound Math-Science)	Academic performance in high school, college attendance, quality of college, retention/ completion, studying a maths/science field	Moderately low	Moderately low	Moderately low	Increased participation in college and four-year college, increased rate of maths/science participation
Pharris-Cierej, Herting and Hirschman, 2012 (QED)	Financial scholarship, mentoring and school reform programme (Washington State Achiever)	Planning to attend HE; taking entrance exam; enrolment in HE/institution quality	Moderately low	Moderately low	Moderately low	Increased likelihood of enrolment in HE mostly attributed to scholarship/ mentoring over school reform

Table 7: Quality assurance of RCTs and QEDs

Study	Design	Method of assignment to condition	Blinded assessment of outcome	Attrition	Implementation fidelity	Participant characteristics	Intervention: number and type of participants	Control: number and type of participants
Bergin et al, 2007	Individual RCT; two groups; stratified by attainment, gender, ethnicity and tested for equivalence on relevant variables	NS	Varies – primary outcome N/A, others no, N/A or NS	Intervention: 3/43 (7%) Control 3-6/40 (varied across measures) (8-15%)	NS	83. Nominated by school staff from groups underrepresented in HE; selection criteria included approx. 'B' grade average, performance on standardised test & 200 word essay on 'Why I want to go to college'	43 (32 African American, 7 Latino, 4 Asian American; 29 female)	40 (31 African American, 6 Latino, 3 Asian American; 25 female)
Bettinger et al, 2009	Individual RCT; unequal allocation to 2 interventions & control group	Random assignment based on social security number (using computer software). Implementers did not have access to allocation algorithm.	N/A	Some practical issues with collection of signed consent meant that some participants were excluded. Attrition evenly spread across treatment groups.	Monitored using tracking software and field visits to implementation sites. No reports of serious deviation from intervention.	24204 potential participants, data included for 16740. Selection criteria included annual general income less than \$45,000, a family member between 17 & 30 who did not already have a Bachelor's degree and expressed an interest in learning more about college.	Intervention 1 FAFSA assistance: 10634 assigned to group (data for 7864) Intervention 2 (Information only treatment): 1654 assigned to group (data for 1319) ⁸	Control: 11916 assigned to group (data for 7557)

⁸ Study gives participant characteristics for 3 sub-groups; see (Torgerson et al. 2014) Appendix I for full details

						(Torgerson et al. 2014)		
Castleman et al, 2012	Individual RCT, stratified by school, equal allocation to intervention and control; groups tested for equivalence on gender, ethnicity, income, college plans	NS	NS	NS	NS	162 students from 7 high schools	Number NS (assume 81) 43% male; 29% black; 49% Hispanic; 21% white; 68% FSL; Best ACT level 14.6	Number NS (assume 81) 45% male; 29% black; 40% Hispanic; 21% white; 62% FSL; Best ACT level 14.5
Myers et al, 2004	RCT with individual randomisation within randomly selected clusters. Staff in each cluster could request stratification (e.g., by sex, racial or ethnic group) to ensure balance of participants in intervention.	NS	NS	Baseline survey had 99% response rate, first follow up had 97% response rate, second follow up had 86% response rate and third follow up had 81% response rate. (Torgerson et al. 2014)	NS	2292 (To be eligible for participation students had to be either low-income or first generation)	1265 (79% low-income <i>and</i> first-generation, 4% low-income only, 16% first-generation only; 22% Hispanic, 22% White, 49% African American; 29% Male)	1027 (79% low-income <i>and</i> first generation, 4% low-income only, 17% first-generation only; 22% Hispanic, 20% White, 52% African American; 28% Male)
Brewer and Landers, 2005	QED: Post hoc comparison between intervention and control	Systematic sample (around 10%) of TS applicants who were eligible and chose to take up a place; compared	N/A	24% attrition from intervention; 55% attrition from control	NS	TS applicants assessed as eligible for TS, i.e. low-income, first-generation). Grades 7-12 at	758 participating TS applicants	450 TS applicants choosing not to participate

		with equal number of systematically sampled TS applicants who were eligible but chose not to take up a place.				time of (eligibility for) participation.		
Myers, Brown and Pavel 2010	QED: generalized multinomial logistic regression modelling between three groups: 'funded' intervention participants; 'non-funded' participants and unsuccessful applicants (controls)	Admission to the programme	Yes – web survey with no researcher interference	Intervention: 61% return of survey, i.e. 39% attrition (219 out of 564 students) Control: 48% return of survey, i.e. 52% attrition (254 out of 488 students) Overall: 55% return of survey, i.e. 45% attrition	Administrative records were used to identify WSA funded achievers and non-funded achievers, so receipt of some treatment can be assumed. Otherwise NS.	Applicants to WSA, attending WSA schools. Applicants must be in lowest 35% of Washington state income levels based on family size, have the academic potential and intention to go to college in-state.	345 participants; an unspecified mix of funded and non-funded.	234 unsuccessful applicants.
Olsen et al, 2007	QED: retrospective comparison of UBMS participants with non-participants, using propensity score matching and regression analysis.	Matched students who had chosen to participate in the UBMS programme with those who had not.	Yes	Intervention: 334/1759 (19%) Control: 684/2830 (24%)	Intervention is described but no monitoring data used in analysis.	Participants must be from low income households and first-generation to attend HE to be eligible for UBMS	1759 Female: 59%, African American: 37%, White: 25%, Hispanic: 18%, Other race: 20%, Native English speaker: 80%	2830 Female: 59%, African American: 37%, White: 30%, Hispanic: 16%, Other race: 17%, Native English speaker: 86%

Pharris-Cierej, Herting and Hirschman, 2012	Clustered retrospective quasi-experimental comparison between WSA and non-WSA schools.	Study participants either attended a WSA school or not.	Yes	Estimated at 25% of school population missing from baseline. 8% attrition between baseline and follow-up. Random single imputation regression methods were used to replace missing data. (p.923)	NS	US high school seniors (age 17-18)	2876 completed baseline survey (3 low income schools)	2742 completed baseline survey (2 middle income schools)
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[NS = not stated; N/A = not possible, e.g. if outcome is administrative data and not directly collected by researchers]

Table 8: Quality assurance of RDDs

Study	Assignment variable / appropriate	True discontinuity	No manipulation of cut-off	Composition of treatment and comparison groups	Blinded assessment of outcome	Attrition	Participant characteristics	Intervention: number and type of participants	Control: number and type of participants
Curs and Harper, 2012	High school grade point average. Appropriate: GPA is continuous and assignment was done before intervention	'Fuzzy' discontinuity (p.636). Four cut-off points.	NS	NS	NS	NS	'Out of state' first year students at University of Oregon between 1999-2000 and 2003-2004. 55% of sample female, 23% students of colour and average age at application 17.8. (p.634)	3.6-3.69 GPA (\$2000): n=182 3.7-3.79 GPA (\$3000): n=141 3.8-3.99 GPA (\$4000): n=213 4.0+ GPA (\$5000): n=78	Less than 3.6 GPA (\$0): n=1524
Goodman, 2008	Massachusetts Comprehensive Assessment System. Appropriate, but with some caution as cut-off points vary by district.	Yes	Yes (exams taken before knowledge of intervention)	NS	NS	6% of students were excluded if they were missing MCAS scores, school district identifiers or post-graduation plans.	54,499. Participants include all graduates in Massachusetts in 2005 (51% female; 7% black, 7% Hispanic; 16% poor; 11% from medium poverty district; 15% from high poverty district; 11% in special education; 4% with limited English proficiency; 11% had English as a second language).	NS	NS
Niu and Tienda, 2010	Class rank within individual Texan high	Yes	There does not appear to have been any 'gaming' of	There is no 'clumping' of achievement	NS	30%	5,836 were sampled; 4939 were included in the analysis	725: 45% white, 11% black, 28% Hispanic, 15% Asian, 38% had	4214: 37% white, 19% black, 38% Hispanic, 5% Asian, 21% had

	schools. Cut-point at 10%. Appropriate.		the assignment variable, as this was known in advance.	around the cut-point.				parental education of college or higher, 82% owned home, 11% rented.	parental education of college or higher, 70% owned home, 15% rented.
Solis, 2011	Sharp RD design based on a natural experiment with analysis done for range of 4 points around the cut point.	Yes	Yes (tested whether PSU scores are not subject to manipulation around the cut off by looking at frequency distribution of scores)	Yes	NS	NS	For full sample 666,535. For sample around cut point 3,438. Participants had to apply for benefits and belong to the lowest four income quintiles.	NS	NS