

Higher Education access: Evidence of effectiveness of university access strategies and approaches

A report to The Sutton Trust

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Contents

1. Executive Summary	4
1.1 Headline findings	4
1.2 Headline conclusions	8
1.3 Recommendations	8
2. Introduction	9
2.1. Background	9
2.2 Research designs.....	11
2.3 Systematic review designs	11
2.4 Randomised controlled trial, regression discontinuity and other quasi-experimental designs .	11
2.5 Summary	13
3. Aims and research questions	14
4. Design and methods	15
5. Results: Summary	19
6. Results: Tertiary review (review of systematic reviews).....	21
6.1 Results	21
6.2 Synthesis	21
7. Results: Systematic review of experimental, regression discontinuity and quasi-experimental literature	24
7.1 Results	24
7.2 Synthesis	25
7.3 Design option 1: Trial of financial counselling to increase enrolment into research intensive universities.....	30
8. Results: Systematic review of UK-based interventions.....	32
8.1 Results	32
8.2 Annotated bibliography	32
8.3: Design option 2: Trial of <i>STAR</i> intervention to increase enrolment into research intensive universities.....	35
8.4 Design option 3: Trial of the most promising interventions embedded within delivery of the <i>Sutton Trust Summer Schools</i>	36
9. Results: Review of Narrative Reviews	37
9.1 Results	37
9.2 Annotated bibliography	37
10. Conclusions and recommendations	44
10.1 Headline conclusions	44

10.2 Recommendations	44
12. APPENDICES	50

List of tables	Page
Table 1.1: Meta-synthesis of most promising interventions	4
Table 6.1: Interventions, outcomes, quality, relevance and overall judgements and results of included reviews	21
Table 7.1: Interventions, outcomes, quality, relevance and overall judgements and results of included RCTs and RDDs	25
Table 7.2: Interventions, outcomes, quality, relevance and overall judgements and results of included quasi-experiments	28

1. Executive Summary

1.1 Headline findings

We found evidence of effectiveness for a number of university access strategies and approaches. In particular, we found evidence of effectiveness for ‘black box’ widening participation programmes and specific interventions (e.g., financial incentives and advice; academic mentoring). The interventions were delivered in school-based and university-based settings. The robust research which tested out these strategies used systematic review, meta-analysis, experimental, regression discontinuity and other quasi-experimental designs and was undertaken mainly in the United States (US), where the context and sample populations in the topic area of university access are different from those in the United Kingdom (UK). The design and conduct of this research was of generally high quality.

In addition, we found a limited number of university access strategies developed in the UK with limited evidence of their promise from studies using weaker experimental designs. We found no UK-based evaluations of university access strategies and approaches using randomised experimental designs.

In Table 1.1 we present descriptions of the most promising interventions, with quality and strength of evidence, effects and research needed.

Table 1.1: Meta-synthesis of the most promising interventions

Intervention	Quality of evidence and context	Strength of evidence (5* rating, see note below); effect size	Effects	Research needed
School-based financial incentives (monthly stipend)	Moderately high (2 high quality systematic reviews of experimental and quasi-experimental) research; total 14 studies including one high quality RCT; US context)	4*	Positive effects on academic performance and participation and retention at school ; positive effects on enrolment in HE	Development of UK context-specific similar intervention(s); followed by testing using rigorous RCT design
University-based academic mentoring: research partnerships (students and mentors ‘matched’ on academic interests); research activities included workshops and presentations	Moderately high (2 high quality systematic reviews of experimental and quasi-experimental research; total 14 studies including one high quality RCT; US context)	4*	Positive effects on retention and academic performance	Development of UK context-specific similar intervention(s); followed by testing using rigorous RCT design

Assistance with completing application for financial aid and information about post-secondary options	Moderately high (1 high quality RCT)	3*	Positive effects on likelihood of applying for financial aid, college enrolment and financial aid receipt	UK-based RCT of tailored financial advice (see design option 1) AND Cluster RCT evaluating financial advice within delivery of STSS (see design option 3)
'Black box' mix of some or all of the following components: academic and social enrichment; counselling; mentoring; parental involvement; and scholarships	Moderately high (1 high quality systematic review, 1 moderately high quality meta-analysis of experimental and quasi-experimental research, two moderately low quality quasi-experiments: total 16 studies; US context)	3* Effect size for meta-analysis = 0.13 (confidence intervals 0.12 to 0.14)	Statistically significant positive effects for the 'black box' interventions; potential effects on school completion rates; positive effects on HE enrolment	UK-based research using cluster RCT design to disentangle the effects of the various components (see design option 3)
Financial aid package; merit-based financial aid, tuition loans	Moderate (3 moderately high quality RDDs; US and Chile context)	3*	Increased enrolment and academic achievement	Development of UK context specific similar intervention(s); followed by testing using rigorous RCT design
Tailored support programme and guaranteed scholarship to sponsoring university	Moderate (1 small-scale RCT)	2*	Modest effect of increased enrolment in sponsoring university	UK-based RCT evaluation of STAR (see design option 2)
Financial scholarship, academic and social mentoring and school-wide reform intervention	Moderately low (2 moderately low quality quasi-experimental studies; US context)	1*	Increased enrolment in college and high quality college, especially for students who take up financial scholarship	Initially, longer-term follow-up of US programmes; if more evidence of promise, development of UK context-specific similar intervention(s) followed by testing using rigorous RCT design

[Note: 5 rating on a 5 point scale takes into account quality of evidence, relevance of context and strengths of effects; these criteria may vary in individual rating, for example: 5* high quality evidence relevant to UK context*

with strong effects; 4 moderately high quality evidence with some generalisability to UK context and strong to medium effects; 3* moderately high quality evidence, limited generalisability to UK context, medium effects; 2* moderate quality evidence, limited generalisability to UK context, low or no effects; 1* moderate quality evidence, low generalisability, low or no effects]*

Effective interventions in the US context: the evidence from systematic reviews and meta-analyses

Moderate evidence of effectiveness was found for school-based whole-school and individual student widening access programmes to increase the post-16 school and higher education (HE) enrolment of disadvantaged, low-socio-economic students (SES) with a mix of the following components: academic and social enrichment interventions; counselling interventions; mentoring; parental involvement; scholarships. This finding is based on the results of two meta-analyses (Harvill *et al*, 2012; What Works Clearinghouse, 2006). In these meta-analyses the individual components of the strategies were described briefly but in the results were not disentangled from the 'black box' of the interventions, which included some or all of the components.

Moderately high quality evidence from two systematic reviews was found for school-based financial incentive interventions to maintain high academic performance and increase participation and retention at school of high achieving students from some minority ethnic groups. A moderator analysis found that the effects were particularly high for Asian students. **Moderately high quality evidence was also found for school- and university-based adult mentoring interventions to increase participation and retention at university of students from some high achieving minority ethnic groups.** Moderate quality evidence was found for a school engagement intervention but generalisability to the UK context was not possible. The minority ethnic groups which predominated the research in the studies included in the two reviews were of limited generalisability to the UK context. These findings are based on the results of two systematic reviews undertaken by the same team of researchers (a systematic review and update, Torgerson *et al*, 2008; See *et al*, 2012). Torgerson *et al* (2007) and See *et al* (2012) did not find any UK-based evaluations which fulfilled their criteria of being robust evaluations using designs that can be used to establish effectiveness.

Effective interventions in the US context: the evidence from experimental and regression discontinuity designs

Moderately high quality evidence from one RCT was found for tailored financial advice on likelihood of applying for financial aid, college enrolment and financial aid receipt. Moderate quality evidence was also found for a tailored support programme on increasing enrolment at the sponsoring university. These findings are based on the results of two RCTs (Bettinger *et al*, 2009; Bergin *et al*, 2007). The minority ethnic groups which predominated in the two RCTs were of limited generalisability to the UK context.

Moderate quality evidence of effectiveness from three RDDs was found for financial aid packages on college enrolment and academic achievement. This finding is based on the results of three RDDs (Curs and Harper, 2012; Goodman, 2008; Solis, 2011). The minority

ethnic groups which predominated in the three RDDs were of limited generalisability to the UK context.

Effective interventions in the US context: the evidence from quasi-experimental designs

Moderately low quality evidence of effectiveness from four quasi-experiments was found for multi-faceted ‘black box’ interventions on college enrolment and enrolment in high-quality colleges. This finding is based on three individually allocated quasi-experimental comparisons (Brewer and Landers, 2005; Myers, Brown and Pavel, 2010; Olsen *et al*, 2007) and one clustered quasi-experimental comparison (Pharris-Cierej, Herting and Hirschman, 2012). As with the more robust studies, the minority ethnic groups which predominated in the studies were of limited generalisability to the UK context.

Promising interventions in the UK context

Six UK-based programmes were evaluated using weak experimental designs (e.g., comparing students who participated in a programme with similar students who did not participate in the programme). One of these programmes was discontinued in 2011 (*Aimhigher*). Of the remaining 5 programmes, two are considered ready for evaluation using robust designs: *Sutton Trust Academic Routes (STAR)* and *Sutton Trust Summer Schools (STSS)*. Two design options have been presented: a stand-alone trial which could be used to evaluate *STAR* and an embedded trial which could be used to evaluate the most promising interventions within *STSS* [see below and design options 2 and 3].

The school-based intervention *STAR* is considered to be ready for evaluation using a robust design, due to evidence of promise of effectiveness and evidence of feasibility of random allocation of schools to intervention or control condition. In addition, a US-based intervention with similar components has been evaluated using a robust RCT design with similar outcomes and found to be effective (Bergin *et al*, 2007, see below) [see design option 2].

The university-based intervention *Sutton Trust Summer Schools (STSS)* is considered an appropriate intervention within which to embed a RCT evaluation of the most promising interventions from the US-based literature [see design option 3].

Match between effective interventions (US context) and promising interventions (UK context)

Bergin *et al* (2007) evaluated the school-based tailored support intervention *EXCEL* using an individually randomised controlled trial and found it was effective in improving enrolment to the sponsoring university for disadvantaged minority ethnic students. This intervention contains some components similar to components in the school-based UK intervention *STAR*. The *EXCEL* widening access programme selects students during the summer after the end of US 8th grade (after the end of Year 9 in UK). The intervention included enrichment activities and a requirement that students undertake HE preparation coursework. Students who complete the programme receive a scholarship from the sponsoring university.

1.2 Headline conclusions

We found no UK-based studies evaluating access strategies and approaches using robust designs to establish effectiveness. However, the following strategies and approaches have been tested out in the US using robust designs and found to be promising: financial incentives; financial assistance; close personal mentoring; academic mentoring; 'black box' programmes containing a variety of components including financial incentives and scholarships and close personal mentoring, but also academic and social enrichment, counselling and parental involvement interventions. More UK-based research is needed to test out interventions previously tested in the US. However, the US-based interventions found to be effective or with evidence of promise were developed in a HE context which is different from the UK context. The interventions themselves and the populations of disadvantaged students are also different. Therefore, UK-context specific interventions need to be developed and tested within the UK HE context and with UK-specific populations of disadvantaged students.

1.3 Recommendations

A number of US-based intervention evaluations of high quality were encountered in the systematic reviews undertaken for this report. Many of these studies are of limited generalisability to the UK context because both the school and university settings and the nature of the student populations are different, for example, the specific mix of minority ethnic students in the US is very different from the specific mix of minority ethnic students in the UK context. We recommend that strategies and approaches found to be effective in the US, in particular financial and mentoring strategies, should be developed and adapted for the UK context and then tested out using robust designs. Where a match already exists between an effective US-based intervention and a UK-based intervention this intervention should be a priority for carefully testing using a robust design. We recommend the following evaluations as a priority: an evaluation of financial counselling to increase enrolment into research intensive universities using a randomised controlled trial (RCT) design (design option 1); and an evaluation of *STAR* using RCT design (design option 2). Finally, we recommend an embedded cluster RCT evaluation of the most promising interventions – for example, financial advice and school-based academic mentoring - within the delivery of the *Sutton Trust Summer Schools* (design option 3).

2. Introduction

In this report, commissioned by the Sutton Trust, we provide an up-to-date synthesis of the international evidence from rigorous research designs on the effectiveness of university access strategies and approaches for disadvantaged students. The rigorous designs included in this report are high quality systematic review designs and meta-analyses, and experimental and quasi-experimental designs: randomised controlled trials (RCTs), regression discontinuity designs (RDDs) and other quasi-experimental designs, such as cohort studies and controlled trials.

We provide an annotated bibliography of narrative reviews meeting inclusion criteria. Such reviews cannot be used to provide evidence of effectiveness due to the limitations in their designs, but they can provide useful background and contextual information.

We also provide an annotated bibliography of UK-specific strategies and approaches to increase university access which have not yet been evaluated using RCT or RDD design, but which have some evidence of promise from previous empirical studies, together with a series of design options for evaluating these interventions using experimental designs.

2.1. Background

Despite the expansion of higher education (HE) in the United Kingdom (UK) in the last twenty years, some disadvantaged students still face challenges in accessing HE (Gorard *et al*, 2012; Gorard *et al*, 2006). Students from disadvantaged backgrounds experience higher levels of attrition from HE, compared with students from more advantaged backgrounds (Higher Education Funding Council England HEFCE, 2000). Low-income students, students who are potentially in the first generation of their family to access HE and students from some minority ethnic groups face particular barriers in applying and being admitted to HE institutions (particularly research intensive universities), and in persisting to the end of their degree courses (Gorard *et al*, 2012; Gorard *et al*, 2006; Torgerson *et al*, 2008). A similar situation exists in the United States (US) where disadvantaged students have lower rates of enrolment and retention at university (Tierney *et al*, 2009).

Concern about these issues in HE access in the UK and the US has led to a wide diversity of university access interventions (policy and practice strategies and approaches) being set up by individual universities and by charitable organisations. The aims of such access interventions are to impact on student retention, progression and success in HE. Previous overviews, undertaken in both the UK and the US, looking at the state of intervention effectiveness research in the topic areas of: participation in HE of minority ethnic groups; the relationships between attitudes and aspirations and educational outcomes including participation in higher education; and navigation of the pathway from school to higher education have all found limited evidence from robust research designs (Torgerson *et al*, 2008; Gorard *et al*, 2012; Tierney *et al*, 2009).

These reviews found few individual studies investigating the effectiveness of university access interventions using robust designs that can establish causality between the intervention and the outcomes of interest: application and admission to university and retention (Gorard *et al*, 2012) (see below in 2.2 Research designs). In addition, a review of the impact of UK-based pre-entry interventions (such as *Aimhigher*) on student retention and success in 2011 (Thomas, 2011) found only two studies that looked at this issue, and both were undertaken in Scotland. Thomas concluded that there was very little research about the impact of UK-based interventions. A number of reviews by the National Audit Office (NAO, 2002; 2007; 2008) have expressed concern about lack of evidence of impact of HE access interventions on student outcomes, particularly retention.

The overviews found that studies using robust evaluation designs were mainly undertaken in the US with no such studies existing in the UK. Evidence of effective university access strategies and approaches from high quality US-based evaluations can provide evidence of promise of those interventions in a US setting. However, the local context (in particular US strategies and approaches, university settings and populations) is unique and the results from such US-based studies are not directly transferable to the UK setting and populations. Rather they can provide evidence of promise for similar UK-based strategies and approaches, settings and populations.

Torgerson *et al* (2008) and See *et al* (2011), in their syntheses of UK-based studies which explored the factors driving high HE participation of many minority ethnic groups, found that two factors – the influence of family and individual aspirations – stood out as being the major determinants. They also found that low parental value of education, parental influence against participation, and being in a lower social class could be factors which act as barriers to participation. Individual aspirations and motivations for participation were major drivers for HE participation – not only in terms of aspiration for education as an end in itself and for economic gain and better job opportunities, but also in simply placing a high personal value on education and a belief that this would lead to personal satisfaction. In terms of strategies to improve HE access, Torgerson *et al* (2008) found that financial assistance may be more important among those groups with low expectations and low emphasis on the value of HE. However, this review of UK-based evaluations found *no* studies using an experimental (RCT) design or a regression discontinuity design (RDD) to evaluate HE access strategies or interventions.

Tierney *et al*'s (2009) practice guide on helping students navigate the path to university found moderate evidence from RCTs for two sets of US-context specific strategies: engaging and assisting students in completing critical steps for university entry and increasing families' financial awareness; and helping students to apply for financial aid.

Gorard *et al*'s (2012) critical review in the broad topic area of HE explored causal relationships between attitudes and aspirations and educational outcomes (academic attainment and participation in HE). They found little robust research on the causes of post-compulsory participation in education or the impact of access and retention interventions (Gorard *et al*, 2012). They found the research in the field to be generally small-scale and to have used designs which cannot establish a causal pathway between intervention and

outcome. The area with the most complete causal model, according to Gorard *et al* (2012), was parental involvement in their children's education.

2.2 Research designs

Establishing the effectiveness of an intervention requires the use of a limited range of specific research designs. Such designs need to use an appropriate control or comparison group in order to establish what would have happened to students in the absence of an intervention, for example randomised controlled trial (RCT) or regression discontinuity (RD) designs (Shadish *et al*, 2002) or a rigorous synthesis of the studies using RCT and RD designs. Systematic review designs provide a rigorous synthesis of the literature by avoiding a selective or biased overview of the literature. RCT and regression discontinuity (RD) designs are generally accepted as the most robust experimental or quasi-experimental designs (i.e. those with a control or comparison group) which can therefore be used to establish causal effects. Studies using appropriate designs also need to have been designed and conducted to high standards of rigour in order to minimise bias and therefore rule out any alternative explanations for the results observed. Methodologists have provided consensus checklists for the robust reporting of systematic review, experimental, quasi-experimental and RD designs. These checklists have been used in our report to quality appraise included studies, and are discussed in detail below and in Chapter 4.

2.3 Systematic review designs

Systematic reviews are rigorously designed, conducted and reported literature reviews that aim to exhaustively search for, identify, quality appraise, and synthesize all the high quality research evidence in a topic area in order to answer a specific research question. The philosophy underpinning systematic review design is based on the scientific principle of replication and systematic reviews are designed to limit all potential sources of bias in reviewing a body of literature. Systematic reviews are explicit, transparent and replicable in their methods to overcome many potential problems associated with the design of traditional reviews. Systematic reviews also seek to search exhaustively for all the relevant studies, whether formally published or listed in the 'grey' literature, and to include the 'totality' of studies in a field (Chalmers *et al*, 2002; Torgerson, 2003; Torgerson *et al*, 2012). The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement was developed to provide guidance in the rigorous reporting of systematic reviews and meta-analyses (Moher *et al*, 2009; <http://www.prisma-statement.org/>).

2.4 Randomised controlled trial, regression discontinuity and other quasi-experimental designs

Most education evaluations use the pre- and post-test design. In this design, a group of students (or institutions) is given a pre-test, an intervention is implemented with all of the students, and a post-test is administered. Any change in, for instance, the number of

students going on to HE, may then be ascribed to the intervention. This design, however, has a number of problems, which means that it is difficult to confidently ascribe a causal relationship between any changes observed and the effectiveness of the intervention. The main problems with this form of evaluation include regression to the mean (RTM) effects and temporal changes. Because interventions are so often given to either individuals or institutions at the extreme of a distribution (e.g., individuals with the lowest attainment or performance) the statistical phenomenon of RTM ensures that any post-test measurement of results will tend to show an improvement irrespective of the effectiveness of the intervention. Temporal changes are another threat to the validity of the pre- and post-test method of evaluation. Unless there is a contemporaneous control group the effects of any other factors, for example due to maturation of the students, cannot be disentangled from any putative effects of the intervention.

Consequently, a robust evaluation needs to use a design that employs a control or comparison group. There are two rigorous designs which can establish causal links between an intervention and an outcome. These designs enable the outcomes for an intervention group (which receives an intervention) and a control or comparison group (which does not receive an intervention or receives an alternative intervention) to be compared. In order of their rigour to provide the causal links between intervention and outcome these are: randomised controlled trial (RCT) design; and regression discontinuity design (RDD). The Consolidated Standards for the Reporting of Trials (CONSORT) statement was developed to provide guidance in the rigorous reporting of randomised controlled trials (Schultz *et al*, 2010; <http://www.consort-statement.org/>). The US Institute of Education Sciences (IES) provides guidance on developing rigorous RCT and RD designs (<http://ies.ed.gov/resourcesforresearchers.asp>).

Randomised controlled trial (RCT) design

Randomised controlled trial (RCT) designs offer the most robust approach for establishing a causal link between an intervention and an outcome (Shadish, Cook and Campbell, 2002; Boruch, 1997). The RCT is generally held to be the best method of dealing not only with regression to the mean effects and temporal changes but also selection bias. By forming the intervention and control or comparison groups by random allocation, balance of the groups at baseline in all known and unknown variables is ensured. Other methods of forming control groups are susceptible to selection bias. Selection bias is where the groups that are being compared may differ in some known or unknown variable or variables associated with outcome, for example those that volunteer to take part in an intervention may be more motivated than those that choose not to. Furthermore, analysis of RCTs is relatively straightforward and statistically more powerful than in other designs.

Regression discontinuity (RD) design

In the regression discontinuity (RD) design individuals or institutions are allocated based upon some continuous pre-test scores. The analysis of the RD involves the post-test values being regressed against the pre-test values. If there is no effect of the intervention then the regression line will be a straight correlation between the pre- and post-test. However, if the intervention is effective then the regression line will have a discontinuity at the allocation cut-off point. Because the pre-test has an error value those individuals or institutions

around the cut-off point are not significantly different and those that fall just below and those just above is determined randomly. There are weaknesses within this design. Firstly, it is not as powerful as an RCT. At least three times more participants are needed to demonstrate the same effect as in a RCT. Secondly, if the cut-point is not respected then the validity of the design is undermined. Furthermore, there is an assumption that the relationship between the pre- and post-test is linear; if it is not, then a difference may be observed that is not really there.

Matched designs

The controlled matched study is also a quasi-experimental design, like the RDD, but is weaker than the other designs discussed. In this design control individuals or institutions that have the same observable characteristics as those receiving the intervention are matched and followed up for their outcomes. If there is a difference between the matched control group and the intervention group the assumption is that the intervention has been effective. However, it is only possible to match on observable variables (e.g., size of institution; recorded socio-economic variables). It is not possible to match or statistically adjust for variables that are not measured (e.g., enthusiasm) and consequently it is never possible to discount the possibility that some unmeasured variable causes the difference observed.

Other quasi-experimental designs

Other quasi-experimental designs include: time series designs (in which a series of measurements are made pre- and post- the introduction of an intervention and the results are inspected to observe whether or not there is a discontinuity at the point at which the intervention is introduced); controlled designs with prospective or retrospective allocation; cohort studies. All of these designs have been included if they demonstrate a minimum level of rigour, for example of controlled studies with prospective allocation – if there is evidence of baseline equivalence.

2.5 Summary

In this report we provide a systematic map of the relevant literature in the topic of HE access. We present a series of four syntheses of literature: a systematic review of systematic reviews; a systematic review of RCTs, RDDs and other QEDs; and a systematic review of UK-based interventions with evidence of promise and a systematic review of narrative reviews of the HE access literature. We also provide a series of three design options for evaluating three of the UK-based interventions identified in the review.

Few RCTs, RDDs and other QEDs, particularly within the UK, are available within the education field to inform policy and practice in the topic of HE access, and even fewer large pragmatic or field trials have been undertaken. For this reason US-based RCTs, RDDs and QEDs have been included in this report. However, caution needs to be taken in generalising from the US-based literature to the UK-context, particularly in terms of HE settings. Also, many of the US interventions are specifically targeted towards minority ethnic groups which are not directly transferable to the UK-context.

3. Aims and research questions

In order to explore the evidence for effectiveness of university access strategies and approaches, the following research questions were developed:

- What is the international evidence of the effectiveness of university access strategies and approaches on participation and retention, attitudes and aspirations of disadvantaged pupils at university generally and at particular types of university specifically?
- What factors (e.g. ages of students, types of school or student, contexts, features of the implementation) moderate or mediate the effectiveness of strategies?
- How robust and trustworthy is the evidence about effectiveness for each strategy?

In order to identify UK-specific interventions with a compelling rationale for evaluation the following research questions was addressed:

- What examples are there of UK-context specific interventions (strategies or approaches) ready for robust evaluation using RCT or RD design?

To address these research questions a systematic map and four systematic reviews of the relevant literature were undertaken:

- A tertiary review to identify, quality appraise and synthesise the evidence about effective interventions to improve access in HE from previous international systematic reviews and meta-analyses undertaken in the last twenty years.
- A systematic review of international experimental and quasi-experimental research using regression discontinuity designs and other QEDs undertaken in the last twenty years. The research question would be refined following completion of the tertiary review.
- A systematic review of UK-context specific interventions published in the last twenty years, with some evidence of promise and the potential to be amenable to evaluation using randomized controlled trial (RCT) or regression discontinuity (RD) designs.
- A systematic review of narrative reviews of the HE access literature and evaluations of interventions and policies.

4. Design and methods

This report includes four systematic literature reviews. The key features of a systematic review are: replicable and transparent methods; exhaustive search strategy; quality appraisal of all included studies; and synthesis of included studies to address the research question (Chalmers *et al*, 2002). This series of three systematic reviews included all features: replicable and transparent methods; an exhaustive electronic search supplemented with citation searches and expert review; quality appraisal of the included systematic reviews and experimental studies using quality assessment tools developed from the PRISMA statement, the CONSORT statement and guidance published on the US IES website; and three narrative syntheses. In addition, we used the PRISMA guidance for the design and conduct of our reviews to ensure their quality.

We systematically and comprehensively searched for, located, quality appraised and synthesised the existing evidence relating to strategies and approaches to improve access to HE. The third narrative review synthesised the promising interventions that could be evaluated using a rigorous design. Inclusion criteria and methods for limiting bias at all stages of the review process were established before we began searching. This included methods for quality assuring all the stages in the review.

Searching and screening

Systematic electronic searches were undertaken to identify any relevant systematic or narrative reviews, experiments, regression discontinuity studies, quasi-experiments and any UK-based interventions with evidence of promise for inclusion in two stages. First we undertook searches in August 2012 and included any located systematic reviews and experiments investigating effective interventions to improve access in HE. We included any UK-based intervention if they had some evidence of promise and if similar US-based interventions had been evaluated using RCT or RDD designs. Second, we undertook further searches in December 2013 and included any located quasi-experiments and narrative reviews investigating effective interventions to improve access in HE. At the same time we also updated all the original searches for the period August 2012 – December 2013.

First searching

We undertook the searches for the effectiveness (RCT and RDD) literature and the UK-based interventions literature separately and on different databases, although we screened all searches for inclusion in any of the three reviews.

We developed search strategies using substantive and methodological terms. We identified a few key studies known to be included in the reviews, and developed the electronic search strategies in an iterative process of trial and improvement using key substantive search terms (such as higher education, achievement gap etc.) and key methodological and design search terms (such as meta-analysis, systematic review, intervention, experiment, quasi-experiment). [See Appendix B for the full search strategies on all databases.]

Once we were satisfied with the search strategies one researcher (LG) ran full electronic searches on the following databases: PsycInfo, Web of Science, ERIC, and British Education Index (BEI). The results were entered into an EndNote library and the titles and abstracts were screened by two reviewers working independently and in three pairs (CT and LG; CT and CH; CT and VM) then coming to an agreement on inclusion with arbitration by a third reviewer where necessary. All potentially relevant studies included at this stage were then obtained by CH (in some cases through Dissertation Abstracts) and the full papers were double screened at a second stage (again by pairs of reviewers). Finally, some studies were screened out at the third, data extraction, stage if they were found not to fulfil all inclusion criteria.

Second searching

At the second stage of searching one researcher (KY), under the supervision of LG, ran updates of the previous electronic searches on PsycInfo, Web of Science, ERIC and BEI. The original search terms for systematic reviews were modified to search for narrative reviews (by KY in consultation with LG and CT) [see Appendix B for details]. KY ran this search on PsycInfo, Web of Science, ERIC. The results were entered into an EndNote library. The results of the initial searches for systematic reviews were also entered into this EndNote library to be rescreened for narrative reviews. Initial searches for quasi-experiments were not rescreened as researchers had identified quasi-experiments meeting inclusion criteria in the first stage of the review; these studies were entered into the EndNote library to be considered for inclusion at this stage.

All titles and abstracts were screened by KY, with a sample of 20% of titles and abstracts from each search screened by a second researcher (LG). Agreement was generally high, with any disagreement arbitrated by a third reviewer (CT or VM) where necessary. All potentially relevant studies included at this stage were then obtained by KY and the full papers were double screened at a second stage. Again all papers were screened by KY with LG screening a sample of papers plus any papers where there was uncertainty over inclusion. Some studies were also screened out at the third, data extraction, stage if they were found not to fulfil all inclusion criteria, in consultation with CT and VM.

Inclusion criteria (systematic reviews, experiments and quasi-experiments)

We included studies evaluating interventions to improve access and retention strategies in HE and undertaken in the last twenty years. We excluded studies evaluating interventions in US 'community colleges' as these are US based with no comparable institutions in the UK. We excluded studies relating to specific training paths such as medicine, nursing or social work as these were unlikely to be generalisable to UK general undergraduate admissions.

We included studies of the following designs:

- systematic review and/or meta-analytic designs
- randomised controlled trial, regression discontinuity and other quasi-experimental designs (where baseline equivalence was established)
- narrative reviews.

Inclusion criteria (UK-based interventions)

We included studies describing interventions to improve access and retention in HE. We excluded studies describing US-based interventions.

UK-based interventions were included if they had some evidence of promise from studies using pre- and post-test or quasi-experimental designs.

We included all relevant systematic reviews (whether published or unpublished), but where we located an unpublished systematic review we citation searched the review and included all relevant RCTs, RDDs and other QEDs in our systematic review of RCTs, RDDs and other QEDs. We included all relevant RCTs, RDDs and other QEDs (whether published or unpublished) and similarly UK-based interventions.

Data extraction and quality appraisal

Data extraction forms were developed for each review. For the tertiary review we extracted data about the number and designs of the included studies, the interventions and outcomes of interest and the results and conclusions. For the systematic review of RCTs, RDDs and other QEDs we extracted data about the numbers and characteristics of participants, the intervention and control or comparison conditions, outcomes, results and conclusions. For the review of UK-based interventions we extracted data about the nature of the intervention and any evidence of promise.

The included systematic reviews were quality appraised using a tool developed from the PRISMA statement (see <http://www.prisma-statement.org/>) to address the robustness of the evidence. We looked at key items such as whether the review addressed the issue of bias within the included studies and we made a judgement about the relevance of the study in terms of context and an overall judgement of quality based on the preceding ratings. All reviews were included in the synthesis, with greater weight given to those reviews of higher quality.

The included RCTs and QEDs were quality appraised using a tool developed from the CONSORT statement (see <http://www.consort-statement.org/>) to address the robustness of the evidence. We looked at key items from the 22-item CONSORT check-list such as whether the allocation was undertaken blind and whether outcome ascertainment was undertaken blind to group allocation. We also made a judgement about the relevance of the studies in terms of context and an overall judgement of quality based on the preceding ratings. All experiments were included in the narrative synthesis, with greater weight given to those studies of higher quality. The included RDDs were quality appraised using a tool developed from the US IES guidance (<http://ies.ed.gov/ncee/wwc/>) to address the question about the robustness of the evidence. We looked at key recommended items such as whether the allocation was sharp or 'fuzzy', and made a judgement about the relevance of the study in terms of context. All included RDDs were included in the narrative synthesis, with greater weight given to those reviews of higher quality.

The first narrative review synthesised the previous systematic reviews; the second narrative review synthesised the experimental literature not previously synthesised in a systematic review or meta-analysis. In each case the synthesis took account of our assessment of risk of bias both within the included studies (quality appraisal, see above) and between studies, for example by looking at publication bias. All results and conclusions included a judgement of weight of evidence warranted by the study designs and the methodological robustness of the individual studies and by the relevance of the context of the study.

Headline findings were obtained from the syntheses by weighing up the robustness of the evidence in terms of both internal (quality of study) and external (relevance of intervention and context) validity in the overall judgements of quality. A series of three design options was developed for three UK-based interventions with similar interventions to those US-based interventions with good quality of evidence of effectiveness and with evidence of promise from evaluations using pre- and post-test or weaker quasi-experimental designs.

5. Results: Summary

First searching

The electronic searches produced 2287 potentially relevant 'hits'. These were independently double screened by pairs of reviewers using, firstly, the titles and abstracts, and, secondly, the full papers. After moderation of all decisions and arbitration where necessary by a third reviewer, 16 studies were included in the series of systematic reviews. A further 5 studies were included by consensus from citation or expert review. This led to a total of 21 studies being included for data extraction, quality appraisal and synthesis. Double data extraction and quality appraisal were undertaken; and agreement between all pairs of reviewers was high.

Second searching

After duplicates were excluded, the new electronic searches produced 501 potentially relevant 'hits'. The updated initial searches produced a further 452 hits. 949 records from the original systematic review searches were also rescreened (a total of 1902 records). Two studies were added from citation. After moderation and arbitration, 4 quasi-experimental studies were included in the review. 24 narrative reviews were identified for inclusion in the annotated bibliography.

In the tertiary review we included four systematic reviews (Harvill *et al*, 2012; See *et al*, 2012; Torgerson *et al*, 2008; What Works Clearinghouse, 2006). Two of the reviews reported a systematic review of interventions to improve post-16 outcomes for minority ethnic groups and an update of the same review (Torgerson *et al*, 2008; See *et al*, 2012). Two other reviews Harvill *et al* (2012) and What Works Clearinghouse (2006) looked at college access programs aimed at increasing college readiness and enrolment.

The narrative synthesis of this literature is presented in Chapter 6 and is based on the themes of the reviews. Where possible the interventions within the systematic reviews with evidence of promise and potential for generalisability to the UK context are highlighted for development in a series of design options.

In the systematic reviews of experimental literature we included 4 RCTs, 4 RDDs and 4 additional quasi-experimental designs (Bergin *et al*, 2007; Bettinger *et al*, 2009; Brewer and Landers, 2005; Castleman *et al*, 2012; Curs and Harper, 2012; Goodman, 2008; Myers *et al*, 2004; Myers *et al*, 2010; Niu and Tienda, 2010; Olsen *et al*, 2007; Pharris-Ciurej *et al*, 2012; Solis, 2011). The interventions evaluated in the experimental literature are: financial interventions, counselling interventions, comprehensive HE preparation and support interventions (including some programmes with a school-wide reform element alongside individual intervention) as well as a merit-based guaranteed HE acceptance policy change.

A narrative synthesis is presented in Chapter 7 and is based on the 11 interventions evaluated (two studies evaluated the same intervention). A meta-analysis was not possible due to a lack of quantified data in some of the reported evaluations and a lack of similarity between the interventions, outcomes and settings. Where possible the interventions with

evidence of promise and potential for generalisability to the UK context are highlighted for development in a series of design options.

In the review of UK-based interventions we included 9 papers about 6 interventions (Byrom, 2009; Casey *et al*, 2011; Doyle and Griffin, 2012; Hatt *et al*, 2005; Hoare and Mann, 2012; McCaig and Bowers-Brown, 2007; Pinheiro-Tores and Davies, 2008; Walker, 2000; Wiggins *et al*, 2012).

An annotated bibliography is presented in Chapter 8 based on the nature of the interventions. Where evidence from limited designs suggested the promise of an intervention a design option was developed to demonstrate how the intervention could be robustly evaluated using a RCT design.

In the review of narrative reviews we included 24 papers (Abrona, 2005; Baker and Velez, 1996; Brock, 2010; Broton, 2009; Contreras, 2011; Cowan Pitre and Pitre, 2009; Cunningham, Redmond and Merisotis, 2003; de Acosta, 1996; Dynarski and Scott-Clayton, 2013; Harrison and Hatt, 2012; Heller, 1996; Jaggars, 2011; Kim and Smerdon, 2012; Kinzie, Gonyea, Shoup and Kuh, 2008; Lerner and Brand, 2006; Martinez and Klopot, 2005; Nora, Barlow and Crisp, 2006; Pathways to College Network, 2004; Perna, 1999; Schultz and Mueller, 2006; St John, 2004; The Pell Institute, 2009; The Western Interstate Commission for Higher Education, 2006; Thomas, 2011). An annotated bibliography of the nature of these reviews is included in Chapter 9.

Headline findings focused on effective interventions in the US context as derived from the reviews of systematic reviews and experimental literature and on promising interventions in the UK context ready for evaluation as derived from the review of the UK-based interventions. Recommendations in the form of a series of three design options focused on the match between effective interventions (US context) and promising interventions (UK context).

6. Results: Tertiary review (review of systematic reviews)

6.1 Results

The tertiary review identified, quality appraised and synthesised the evidence about effective interventions to improve access in HE from four international systematic reviews and meta-analyses. The reviews varied in terms of interventions and outcomes, although all four reviews focused on disadvantaged students in terms of HE access, for example students whose parents did not participate in HE, students of lower socio-economic status (SES) and students from some minority ethnic backgrounds. The interventions varied between pre-HE access programmes to increase readiness and enrolment and HE retention programmes to prevent drop-out and improve academic outcomes. As our report is primarily concerned with enrolment and participation in HE, in our synthesis we focus on these outcomes.

6.2 Synthesis

In Table 6 we present a summary of the four included systematic reviews with interventions, outcomes, quality, relevance and overall judgments and results. All four reviews were judged to be of overall moderately high quality of evidence and were included in the meta-synthesis of evidence (see Table 1.1).

Table 6.1: Interventions, outcomes, quality, relevance and overall judgements and results of included reviews

Review	Intervention(s)	Outcome(s)	Judgement of quality of review	Judgement of relevance of context (population, intervention and outcomes)	Judgement of overall quality of evidence for this report	Results
Harvill <i>et al</i>, 2012	School-based HE access programmes	Readiness for HE Enrolment in HE	Moderately high	Moderate	Moderately high	Statistically significant positive effects for the 'black box' interventions included
See <i>et al</i>, 2012	School-based and HE-based access programmes	Participation post-16 and post-18 Retention	High	Moderate	Moderately high	Positive effects for financial incentives; school engagement; adult mentoring interventions

Torgerson et al, 2008	School-based and HE-based access programmes	Participation post-16 and post-18 Retention	High	Moderate	Moderately high	Positive effects for financial incentives; adult mentoring
WWC, 2006	School-based HE access programmes	Completion of high school	High	Moderately low	Moderately high	Potentially positive effects on completing school

Post-16 and HE participation and retention for low-SES students

Harvill *et al* (2012) examined two categories of HE access programmes delivered in US middle and high schools: whole school approaches and approaches delivered at the individual student level. They included 14 studies (6 RCTs and 8 QEDs) evaluating the impact of 12 HE access programmes with wide variation in their key programme components: 4 studies looked at whole school approaches and 8 programmes looked at supplementary programmes. All 12 programmes targeted low-SES students, although the students targeted were both high- and low-performing. The programmes were *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*. Key components of the programmes included social and academic enrichment and counselling elements. Harvill *et al* (2012) undertook two meta-analyses of the effectiveness of access programmes on high school graduation and HE enrolment and found that HE access programmes increased high school graduation and enrolment rates. The effect size observed in the meta-analysis of evaluations of the 12 programmes was 0.13 (confidence intervals 0.12 to 0.14). This is a small and statistically significant effect size.

What Works Clearinghouse (2006) examined one of these 12 programmes (*Talent Search*) in a meta-analysis of two studies. This programme has a variety of components including study skills assistance, academic advising, and financial aid assistance. The meta-analysis found potentially positive effects on completing school. However, this outcome was not central to our report.

Post-16 and HE participation and retention of minority ethnic groups

Torgerson *et al* (2008) undertook a systematic review of the most promising interventions to improve post-16 outcomes for minority ethnic students using robust designs and found ten studies. All ten studies used a robust (RCT) design to evaluate interventions to increase post-16 participation or improve retention of minority ethnic groups or they evaluated interventions to increase academic achievement or motivation.

The headline findings (as reported by Torgerson *et al*) were:

‘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. ‘

‘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.’

In 2012 See *et al* published an update of the (Torgerson *et al*, 2008) systematic review of intervention studies evaluating strategies to increase post-16 participation of minority ethnic groups. This review confirmed the findings and conclusions of the original review. See *et al* included 14 studies which used RCT or QE designs, and found six strategies that had positive effects on improving outcomes of minority ethnic students. Four interventions were school-based and two interventions were university-based. Three moderate quality school-based studies found that financial incentives improved participation and retention at high school. Five school- and university-based studies found that mentoring may have positive effects on educational outcomes in school and university. The other four interventions had limited evidence of effectiveness due to having been evaluated in only one or two studies with relatively small sample sizes. These interventions were: close monitoring of school engagement; a supportive personalised environment; de-tracking/heterogeneous streaming and a motivational and academic skills training programme. See *et al* (2012) concluded that the most promising approaches for improving outcomes for minority ethnic students were the use of financial incentives for behaviour and attendance and the close personal engagements of adult mentors.

Both reviews undertaken by UK-based review teams - Torgerson *et al* (2008) and See *et al* (2012) - highlighted the small numbers of intervention evaluation studies in this topic area using robust designs in general, and the lack of any UK-based studies in particular.

7. Results: Systematic review of experimental, regression discontinuity and quasi-experimental literature

7.1 Results

The systematic review identified, quality appraised and synthesised the evidence about effective interventions to improve access in HE from twelve international experimental and quasi-experimental studies. The experiments varied in terms of interventions and outcomes, although all twelve studies focused on disadvantaged students in terms of HE access. The interventions varied between pre-HE access programmes to increase HE enrolment and interventions designed to improve retention. As our report is primarily concerned with enrolment and participation in HE, in our synthesis we focus on these outcomes.

Four randomised controlled trials were identified (Bergin *et al*, 2007; Bettinger *et al*, 2009; Castleman *et al*, 2012; Myers *et al*, 2004). All four trials used individual allocation and their target populations were traditionally disadvantaged groups. All of the trials were undertaken in the US, and all had limited generalisability to the UK context due to the populations targeted by the programmes. For example, the small-scale trial by Bergin *et al* (2010) evaluated a programme that specifically targeted African-American and Latino students and did *not* use low income as a criterion for eligibility. The interventions evaluated were of varying limited relevance to the UK context. For this reason all four trials were judged to be of moderate relevance in terms of context. However, all four trials were judged to be of moderately high to high methodological quality, and of overall moderate to moderately high quality of evidence of effectiveness of HE access strategies and approaches. The trials judged to be of overall moderately high quality of evidence of effectiveness were included in the meta-synthesis (see Table 1.1).

Four RDD studies were identified (Curs and Harper, 2012; Goodman, 2008; Niu and Tienda, 2010; Solis, 2011). Three of the studies were undertaken in the US (Curs and Harper, 2012; Goodman, 2008; Niu and Tienda, 2010), and the fourth was undertaken in Chile (Solis, 2011). All four RDDs were judged to be of moderate or moderately high quality of evidence of effectiveness. Three out of the four studies used a 'sharp' discontinuity, whereas the fourth (Curs and Harper, 2012) used a 'fuzzy' discontinuity. One 'black box' intervention was included in the meta-synthesis of evidence, because three of the moderately high quality RDDs evaluated a financial aid package and found positive effects.

Four quasi-experiments were identified (Brewer and Landers, 2005; Myers, Brown and Pavel 2010; Olsen *et al*, 2007; Pharris-Cierej, Herting and Hirschman, 2012). All four of these studies were undertaken in the US. Three quasi-experiments were analysed at individual level (all except Pharris-Cierej *et al*) and inferences were weakened by student self-selection to the programmes. The remaining clustered (school-level) experiment had only five clusters and there were important differences between intervention and control schools. Two of the studies evaluated 'TRIO' programmes, which are multi-faceted interventions

targeted at low-income and first-generation students; these programmes can be considered generalizable to the UK context if we assume that the social context for students meeting the eligibility requirements is similar to the UK. The two remaining studies evaluate a programme that combines individual intervention with school-wide reform and financial aid which may not easily translate to the UK context.

7.2 Synthesis

In Table 7.1 we present the interventions, outcomes, quality, relevance and overall judgements and results of included RCTs and RDDs.

Table 7.1: Interventions, outcomes, quality, relevance and overall judgements and results of included RCTs and RDDs

Study (and design)	Intervention(s)	Outcome(s)	Judgement of quality	Relevance of intervention and context	Overall judgement	Results and recommendations
Bergin <i>et al</i>, 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 <i>et al</i>, 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 <i>et al</i>, 2012 (RCT)	'Active ' summer counselling	HE enrolment	Moderately high	Moderately low	Moderate	Increased enrolment in HE
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
Myers <i>et al</i>, 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

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)

One trial, the smallest, by Bergin *et al* (2007), evaluated *EXCEL*, a school-based HE access tailored support programme targeting disadvantaged minority youth. The intervention evaluated included seminars, tutoring, mentoring and a scholarship to the sponsoring university on successful completion of the programme. Primary outcomes were enrolment in HE generally and at the sponsoring university specifically. Secondary outcomes included self-esteem and academic achievement at school. Although this was a small-scale trial of only 83 participants, attrition was low. Methodologically, it was judged to be of moderate quality. Bergin *et al* found an increase in enrolment in HE, although the difference was modest and not statistically significant. However, enrolment in the sponsoring university was greater in the intervention group and this effect was statistically significant.

A second trial (Bettinger *et al*, 2009) had a very large sample size (n = 24,204); consequently, the chance of missing any worthwhile differences was small. In their study, Bettinger *et al* identified families with incomes less than \$45,000 and a family member between the ages of 15 to 30 who did not have an undergraduate degree. After identification, the individual without a degree was targeted for advice from a tax professional to help the family navigate college finances. There were three groups: tailored advice with help in completing an application for finance for the prospective student; information only with a written description of the financial aid available; no intervention. The study showed that tailored financial advice significantly increased enrolment into higher education by students from poor backgrounds.

In a third relatively small trial (n = 162), Castleman *et al* (2012), focused on students from low-income minority ethnic groups (largely African-Americans) and found a summer counselling programme had a statistically significant effect on rate and quality of enrolment

in higher education. The students were identified from a network of schools that already had a good track record of graduating ethnic minority students from disadvantaged backgrounds. The authors considered that the take up of the counselling would be greater among these students than from other schools.

In the fourth trial, Myers and colleagues (2004) undertook a randomised trial of *Upward Bound*, the largest and longest running programme in the US aimed at increasing the participation rate of students from disadvantaged backgrounds into higher education. The evaluation consisted of a large randomised controlled trial where approximately 1,500 students were randomly allocated to the programme and 1,300 students were allocated to the control group. Description of the randomisation process is sparse but in some centres unequal allocation was used to ensure all the places available were used, which explains the differential numbers. The programme had mixed effects. For the main outcome there was no difference between the groups in terms of enrolment at higher education institutions; however, there may have been an increased enrolment for four-year college degrees rather than for shorter academic programmes. In a subgroup analysis the programme appeared to have a larger effect among students with lower academic expectations compared with students who already had high academic aspirations for a four-year college programme. It was not clear, however, whether these subgroup analyses were pre-specified so these findings need to be treated with caution. Indeed, overall college attendance did not differ between subgroups; it was only when the data were further divided to look at 4 year college attendance that a subgroup effect became apparent. In summary, this long established programme seems, at best, to have only had limited effects on student enrolment into higher education. *Upward Bound* was one of the 'black box' programmes included in the Harvill *et al* (2012) meta-analysis.

Three regression discontinuity studies (two from US and one from Chile) looked at the role of improving access to finance either in the form of loans, free tuition or studentships. The Chilean study (Solis, 2011) indicated that this had a positive impact on enrolment, whilst one US-based study showed a positive impact on grade levels at the end of the first year of study and a second showed an increase in enrolment in state institutions. The US study looking at the impact of scholarships on grades, observed that the effect on academic scores was greater among lower income groups and African-Americans. The US study looking at tuition waivers for high performing students concluded that, because it was not linked to measures of student income, it mainly benefited wealthier students and recommended that it could be modified to take into account both academic achievement and income.

The remaining US regression discontinuity study looked at the impact of a law in Texas where the top 10% of high school students were guaranteed a place at a state University. This law was introduced to encourage enrolment of ethnic minority students after university preferential policies for such students were ruled illegal. The study found that the law did in fact improve access to ethnic minority students, particularly those of Hispanic origin and rather less so for African-Americans.

In Table 7.2 we present the interventions, outcomes, quality, relevance and overall judgements and results of additional included quasi-experiments.

Table 7.2: Interventions, outcomes, quality, relevance and overall judgements and results of included quasi-experiments (excepting RDDs)

Study (and design)	Intervention(s)	Outcome(s)	Judgement of quality	Relevance of intervention and context	Overall judgement	Results and recommendations
Brewer and Landers (2005)	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)	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)	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-Ciurej, Herting, and Hirschman (2012)	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

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. Most of these studies were of moderately low quality, mostly due to self-selection, where 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) were compared with those who chose not to take up the intervention.

Brewer and Landers (2005) used application records for the *Talent Search* scheme delivered by the University of Tennessee (a low intensity ‘black box’ intervention including career support, admissions test preparation and financial advice) 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 to the possibility that the factors leading eligible applicants to decline their place were also causal in their decision not to enrol in postsecondary education.

Myers, Brown and Pavel (2010) used a similar method to retrospectively create control groups (hence, their results must similarly be interpreted with caution). They used application records for the *Washington State Achiever (WSA)* programme (a 'black box' intervention including mentoring, college familiarisation visits, financial advice and financial scholarships along with a school-wide reform programme to support progression to HE) to compare students on the programme with those who were accepted and received some intervention but did not go on to take up the financial scholarship, and with those who applied but were not accepted. The study found that WSA funded participants were significantly more likely to attend college and more likely to attend a high quality (four-year) college. Again the study was affected by attrition, with a 52% non-response rate in the control group.

Pharris-Ciurej, Herting, and Hirschman (2012) also evaluated the *Washington State Achiever* programme. Their analysis focussed on the school-wide reform element of the programme, exploiting data from an unrelated 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 while they found that the programme was effective; 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. The schools in the programme were significantly different regarding the socio-economic status of their student populations.

Olsen and colleagues (2007) used the data collected by Myers and colleagues (2004) for the RCT of *Upward Bound* (see above) to evaluate the effects of the *Upward Bound Math-Science (UBMS)* programme. This sample accounted for some self-selection, in that all participants (intervention and control) had applied for regular *Upward Bound* and were therefore likely to aspire to attend college. However, participants had still self-selected for the UBMS programme and accordingly, the largest effects were found for outcomes specifically related to maths and science study. The study found significant positive effects on postsecondary attendance and four-year college attendance.

Some general lessons follow from the experimental studies. The robust evaluations of the two most expensive interventions either did not observe any effects or observed only small differences from the less expensive interventions. This reinforces the need to evaluate interventions, particularly high cost ones, early, and before they are widely rolled out. On the other hand, if an intervention is inexpensive it can be worthwhile to implement it even if the effects are relatively modest.

Our reporting on the quasi-experimental studies notes that caution should be exercised in interpretation due to the self-selection of participants. The findings can only be extrapolated to students who choose to take part in interventions (and perhaps have a higher initial level of aspiration) and not to the population of all low-income or first-generation students. However, given that the majority of UK interventions are likely to have an element of self-selection, the findings may still be relevant.

The interventions evaluated in the quasi-experimental studies were all complex interventions made up of several components; academic support was provided alongside university familiarisation, careers advice and financial advice and for one intervention this was 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. Therefore it is impossible to derive from these studies *which* elements of each programme may have been instrumental in causing the positive effects. Thus a randomised controlled trial that varies the dose of particular intervention components would be a useful next step (see design option 3).

Generalisability to the UK setting from these studies is likely to be small. The financial interventions were developed around the US system of finance and for US-specific disadvantaged populations, which do not readily map on to UK-specific disadvantaged populations. For example, the most robust trial of the four RCTs by Bettinger and colleagues revolved around the American taxation system, and families were enrolled when completing their annual tax return. However, the concept of an intervention involving financial advisors working with families of low-income students to demonstrate what financial support is available for them could be developed and evaluated in a UK setting (see design option 1). Similarly, the intervention of counselling low-income students about the support available to them evaluated by Castleman *et al* could also be developed and evaluated in a UK setting (see design option 3). Consequently, the evidence of promise of these interventions provides a compelling rationale for adaptation and development of the interventions in UK settings and contexts.

Current evidence for the effectiveness of differing interventions to increase enrolment by high achieving students from groups that traditionally do not apply to a research-intensive university within a UK context is weak. The current review has identified a number of possible interventions that appear to have promise, including financial counselling for students and their families where two trials of different types of support appear to be effective. Therefore, it is proposed that a trial of financial advice packages should be evaluated within the UK context using a robust design (see below design option 1).

7.3 Design option 1: Trial of financial counselling to increase enrolment into research intensive universities

The trial undertaken by Bettinger *et al* (2009) found that, in the US context, giving students and their families support to access student grants, loans and scholarships leads to increased enrolment into higher education institutions. Given the dissimilarity between the

US and the UK systems of financial aid it would seem sensible to evaluate whether or not a package of advice and counselling offered to disadvantaged students and their families would be effective in a UK context. A fully developed intervention is not yet ready to be evaluated. Consequently, we propose a two-staged evaluation. In stage one an intervention would be developed using input from accountancy experts, higher education tutors, existing and graduated students. Using an iterative framework, the intervention would be developed and tested for feasibility on a sample of students; when fully developed its effectiveness would be tested using a pragmatic randomised controlled trial design.

Trial design

The trial would be a two-armed pragmatic randomised controlled trial. Students and their parents/guardians would be randomised to financial counselling including one to one support with a financial expert or to receive a leaflet describing the financial support that is available to prospective students.

Sample size

To see a 10% difference, that is increasing the enrolment rate to a research intensive university from 20% to 30%, would require a sample size of approximately 300 per group (i.e., 600 in total) to have 80% power at 5% level of significance.

8. Results: Systematic review of UK-based interventions

8.1 Results

A total of 6 UK-based interventions were included in this review. These were evaluated in 9 papers.

8.2 Annotated bibliography

More in-depth descriptions of the interventions discussed are available in Appendix J.

Sutton Trust Summer Schools (STSS)

Byrom, T. (2009). "I don't want to go to a crummy little university": Social class, higher education choice and the paradox of widening participation. *Improving Schools*, 12(3), 209-224.

AND

Hoare, T., & Mann, R. (2012). *The impact of the Sutton Trust's Summer Schools: A report to the Sutton Trust*. London: Sutton Trust.

Hoare and Mann (2012) evaluated the STSS using a quasi-experimental design with two kinds of 'inner' controls and two kinds of 'outer' controls. Although the design used for the formation of the control groups would have been susceptible to selection bias, the use of control groups in this design enabled evidence of the promise of the intervention to be demonstrated.

There is a compelling rationale for the significance of a randomized controlled trial (RCT) effectiveness evaluation of STSS. This is based on the practical importance of the intervention and evidence of promise of effectiveness from the previous empirical research. An individually randomized controlled trial design is proposed using a lottery of all applicants who meet the minimum criteria for eligibility. At application all prospective applicants would be informed that application would include consent to be allocated to some aspect(s) of the summer school programme on the basis of a lottery. After screening for eligibility, those eligible would be randomly allocated to one of two (or more) alternative sessions at the summer school, using stratification by institution. All those in the intervention and control groups would be followed up to university application, acceptance and admission.

Sutton Trust Academic Routes (STAR)

Wiggins, A., Jones, K., Ainsworth, P., & Kirk, A. (2012). *Sutton Trust Academic Routes - Lessons for university access*. Report to Sutton Trust. London: Sutton Trust.

This intervention was evaluated by Wiggins *et al* (2012) using a RCT design. Due to very high levels of attrition this evaluation is considered to be a quasi-experimental design (QED). Although the attrition experienced would have meant that the results would have been susceptible to selection bias, the use of a randomised control group in this design enabled evidence of the feasibility of evaluating this intervention using a RCT design to be demonstrated. There is a compelling rationale for the significance of a randomized controlled trial (RCT) effectiveness evaluation of *STAR*. This is based on the practical importance of the intervention and evidence of promise of effectiveness from the previous empirical research. A clustered randomized controlled trial design is proposed using a lottery of schools at which the intervention is targeted. At recruitment all prospective schools would be informed that participation would include consent to be allocated (or not) to the programme or a less intensive intervention on the basis of a lottery. Schools would be randomly allocated to receive the more intensive or less intensive intervention for eligible pupils using stratification by geographical area. All those in the intervention and control groups would be followed up to university application, acceptance and admission.

The issues with high attrition experienced in the Wiggins *et al* (2012) pilot trial could possibly be addressed by, for example, having a recruitment event for all eligible schools/students, using incentives for recruitment and retention, ensuring written consent of schools and pupils before random allocation. [See below design option 2.]

Aimhigher

Doyle, M., & Griffin, M. (2012). Raised aspirations and attainment? A review of the impact of Aimhigher (2004-2011) on widening participation in higher education in England. *London Review of Education*, 10(1), 75-88.

AND

McCaig, C., & Bowers-Brown, T. (2007). *Aimhigher: achieving social justice?* Paper presented at the British Educational Research Association Annual Conference, Institute of Education, University of London, September 5-8 2007.

Two reviews evaluated the impact of *Aimhigher* (Doyle and Griffin, 2012; McCaig and Bowers-Brown, 2007). The *Aimhigher* programme was a widening participation initiative which was implemented between 2004 and 2011 and which comprised a multi-faceted programme with an emphasis on local partnerships. It included a mix of the following elements: summer school experience on university campuses, master classes, campus visits, guest lectures and mentoring. Results of the reviews were mixed, with Doyle and Griffin (2012) finding positive effects for mentoring, but McCaig and Bowers-Brown (2007) finding no measurable impact.

Opportunity Bursary Scheme

Hatt, S., Hannan, A., Baxter, A., & Harrison, N. (2005). Opportunity knocks? The impact of bursary schemes on students from low-income backgrounds. *Studies in Higher Education*, 30(4), 378-388.

Hatt *et al* (2005) evaluated financial assistance via a bursary scheme for students from low income backgrounds and found bursary students from low-income backgrounds were more likely to continue than those without an award.

Brunel Urban Scholars Programme

Casey, R., Smith, C.P., & Koshy, V. (2011). Opportunities and challenges of working with gifted and talented students in an urban context: A university-based intervention program. *Gifted Child Today*, 34(1), 35-43.

AND

Pinheiro-Torres, C., & Portman-Smith, C. (2008). *Preliminary findings of a four year intervention programme for higher ability students*. Paper presented at the British Educational Research Association Annual Conference, Heriot Watt University, Edinburgh, September 3-6 2008.

Casey *et al* (2011) and Pinheiro-Torres and Davies (2008) evaluated a 4-year university-based multi-faceted intervention. Casey *et al* (2011) found that 90% of the students who participated and completed the programme either met or exceeded the school targets compared with 22% of the rest of the gifted and talented group who met or exceeded their school targets (note: as stated by authors no formal comparison groups were set up) (Casey *et al*, 2011). Pinheiro-Torres and Davies (2008) used a design experiment methodology and found no major change using quantitative outcomes but enhanced confidence using qualitative data. However, there was no comparison group in this evaluation.

Scottish Wider Access Programme Pre-University Summer School

Walker, L. (2000). Predicting or guessing: The progress of Scottish Wider Access Programme (SWAP) students at the University of Glasgow. *International Journal of Lifelong Education*, 19(4), 342-356.

Walker (2000) evaluated the *Scottish Wider Access Pre-University Summer School* by comparing outcomes for those who attended with students on the SWAP who did not attend the summer school and found positive effects on academic performance. However, the two groups of students are not considered to be equivalent, with those attending the summer school on average more likely to be the 'weaker' students (Walker, 2000, p.347), and therefore this design had the potential to suffer from selection bias.

8.3: Design option 2: Trial of *STAR* intervention to increase enrolment into research intensive universities

Pragmatically, it would seem sensible to evaluate the *STAR* programme as this has already been delivered in the UK and does not yet have randomised evidence to support its wider use. However, the feasibility of cluster random allocation of schools to this programme or to a control condition has been demonstrated by Wiggins *et al* (2012).

A large RCT is required. The evidence from the US suggests that financial assistance is effective. Consequently, it is proposed to build on this plus the fact that *STAR* uses a £1500 scholarship as part of its intervention that some kind of financial scholarship would form the 'control' group. It is proposed, therefore, that all participants in all the groups receive general written information about the process of applying to a research intensive institution plus a £1500 'scholarship', conditional on them achieving sufficiently high A level grades. In addition, to avoid the attrition observed in the Wiggins *et al* study of *STAR* it is proposed that an incentive is offered to students that is payable on condition that they provide data at the end of the study.

As well as the scholarship 'control' intervention it is proposed to add the *STAR* programme to evaluate this to see if there is any additional benefit over and above that achieved by the financial scholarship.

Trial Design

A two-armed cluster randomised study is proposed. Schools would be asked to recruit students into the study and then would be randomised into two groups: (group 1) information with a financial incentive conditional on good grades; (group 2) information with financial incentive plus the *STAR* intervention.

Outcomes

The primary outcome would be enrolment into a research intensive university. Secondary outcomes would be A level scores and enrolment into any higher educational institution. Further follow-up would allow tertiary outcomes to be collected in terms of drop-out rates from university and class of degree.

Sample size

We make the following assumptions: there are 20 eligible students per school and the intra-cluster correlation coefficient is approximately 0.10 and we want to see a 10% increase in enrolment from 20% to 30%. In an individually randomised trial this would require approximately 600 students; however, the design effect of clustering is 3.9, which implies a total of 1740 students or about 88 schools. However, if we wished to detect a larger difference of doubling enrolment from 20% to 40% we would need 640 students in 32 schools.

8.4 Design option 3: Trial of the most promising interventions embedded within delivery of the *Sutton Trust Summer Schools*

A pragmatic individual RCT embedded within the delivery of the *STSS* is proposed. Students accepting a place on a summer school would consent to individual random allocation (within university) to one of the following promising interventions or a combination of interventions: counselling; mentoring; parental involvement; financial advice. For example, in the study by Bettinger *et al* (2009) the intervention involved financial advice with parental involvement, and so this combination of intervention components could be tested within this trial in the UK context.

The design of the trial would enable all students to attend the existing core components of the summer schools with up to one day devoted to the additional (experimental) intervention(s).

Students would be followed up to enrolment in HE, and subsequently to assess retention rates and academic success. Rates of enrolment to university and to research intensive university, rates of drop-out from university and academic performance in each of the experimental conditions would be compared in a robust design which would allow testing of relative effectiveness of the individual components.

The design of the trial would have the advantage of reducing the potential for resentful demoralisation as all students would receive the core programme plus one of the promising interventions.

9. Results: Review of narrative reviews

9.1 Results

Narrative reviews were identified from the first and second searches as specified in Chapter 4. 24 studies are included in an annotated bibliography. The majority of reviews looked at evidence for a particular kind of intervention. The reviews varied in quality and scope and this is reflected in the bibliography. The interventions ranged from targeted programmes (such as US TRIO programmes) to policy changes such as grants and modes of study. The reviews focused on higher education access, persistence and success for underrepresented students such as ethnic minority, first-generation and/or low-income students.

9.2 Annotated bibliography

Arbona, C. (2005). Promoting the Career Development and Academic Achievement of At-Risk Youth: College Access Programs. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work*. (pp. 525-550). Hoboken, NJ US: John Wiley & Sons Inc.

This detailed and informative review reports on research studies that use a nationally representative longitudinal panel survey (the NELS) to identify factors that affect college attendance for at-risk students. The review then describes multiple college access programmes. It concludes with a review of evaluations of such programmes, finding that although cost and lack of information are important barriers, addressing these may not be sufficient to effect change. Adult support and mentorship, academic enrichment and career counselling and college advising are identified as successful strategies for improving attendance and persistence in four-year colleges.

Baker, T. L., & Velez, W. (1996). Access to and Opportunity in Postsecondary Education in the United States: A Review (pp. 82-101).

The majority of this review is concerned with describing the changing characteristics of US college students, including ethnicity, from the 1960s to 1990s. In relation to financial aid, the review found that grants were more effective than loans for low-income and ethnic minority students in encouraging attendance. There was mixed evidence on the effect of financial aid on persistence.

Brock, T. (2010). Young Adults and Higher Education: Barriers and Breakthroughs to Success. *Future of Children*, 20(1), 109-132.

The review begins with a historical account of increased university access since the 1960s and illustrates that persistence and success have not increased at the same rate. The review finds that remedial education is often ineffective (leading to increased dropout); financial support is effective when the application process is simplified or supported and student support programmes are effective when well-funded and consistently implemented.

Broton, K. (2009). Increasing Postsecondary Education Access and Success: Raising Achievement through Outreach Programs. Brief (pp. 2): Wilder Research. , Wilder Foundation. 451 Lexington Parkway North, Saint Paul, MN 55104.

This comprehensive review considers the evidence for the effectiveness of interventions aimed at increasing postsecondary enrolment and success of underrepresented groups. It gives priority to randomised trials and other robust forms of evidence, and favours independent evaluation. The inclusion criteria are not applied in a completely systematic way. The review finds that academic preparation, social support, early intervention, parental involvement, admissions support, long-term support, systemic reform and financial support are key features of effective programmes. It also highlights particular programmes with the best evidence for effectiveness, evaluates evidence and gives detailed reports of multiple programmes.

Contreras, F. (2011). Strengthening the Bridge to Higher Education for Academically Promising Underrepresented Students. *Journal of Advanced Academics*, 22(3), 500-526.

The review begins by identifying the barriers to higher education for underrepresented students. It then describes the different types of programme (largely distinguished by programme setting) designed to address these barriers and facilitate transition to college. It concludes with a series of practical recommendations for programme providers, including offering long-term, personalised support.

Cowan Pitre, C., & Pitre, P. (2009). Increasing Underrepresented High School Students' College Transitions and Achievements: TRIO Educational Opportunity Programs. *NASSP Bulletin*, 93(2), 96-110.

The review gives an overview of the history and activities of long-running TRIO programmes (Upward Bound, Talent Search and Upward Bound Math-Science). It then reports effectiveness research for these programmes, particularly Upward Bound. Studies included are longitudinal comparative studies. The review finds that while Upward Bound is effective in increasing college entry, evidence of its effectiveness in increasing high school attainment and other high school factors is mixed. The review concludes with recommendations for policy-makers and school leaders.

Cunningham, A., Redmond, C., & Merisotis, J. (2003). Investing Early: Intervention Programs in Selected U.S. States. Millennium Research Series (pp. 72): Canada Millennium Scholarship Foundation, 1000 Sherbrooke Street West, Suite 800, Montreal, Canada H3A 3R2.

The review reports on state-funded 'early intervention' programmes in the US, focussing on the 12 states where programmes have been running for longest (on the assumption that these will have refined their approach most effectively). The review does not evaluate the quality of evidence for each programme. Positive outcomes are reported for all programmes; these range from quantitative measures of increased college enrolment or proxies for this (such as increased persistence in high school) to qualitative reports that staff and students 'want more' of the programme. The review is a useful summary of programmes and a good indicator of the varying approaches to evaluation.

de Acosta, M. (1996). Characteristics of Successful Recruitment and Retention Programs for Latino Students. Research Report #15 (pp. 30).

This review focusses on programmes that assist Latino students, but less than half of the included programmes are exclusively for Latinos. Due to the age of the review there is little evaluative literature; the body of the review describes 15 large programmes and reports evaluation outcomes where available. The review also identifies effective practice by assessing how closely it is matched to barriers to participation identified in the literature. The review finds that personalised programmes (accounting for the culture of participants and institutions) and ongoing programme improvement are important factors for success.

Dynarski, S., & Scott-Clayton, J. (2013). Financial Aid Policy: Lessons from Research. *Future of Children*, 23(1), 67-91.

This comprehensive review first gives a history of financial aid (both grants and loans) since the 1960s, focussing on the largest programmes but considering others too. The review then considers evidence for their effectiveness in increasing college enrolment, retention and completion, particularly for underrepresented groups who would not otherwise attend. It finds substantially more research on grants than on loans. The review concludes that grant aid is effective in its aims, but that complexity in the eligibility and application process reduces effectiveness. Grants offered as incentives for maintaining attainment tend to be effective in doing so. The picture on loans is complex and research is still emerging. This review is useful for understanding financial aid in the US context.

Harrison, N., & Hatt, S. (2012). Expensive and Failing? The Role of Student Bursaries in Widening Participation and Fair Access in England. *Studies in Higher Education*, 37(6), 695-712.

This study reviews the evidence for the effectiveness of bursaries (grants) in UK universities. It begins with an overview of the government policy changes leading to the increased offer of bursaries to underrepresented, low-income students. The review finds little evidence for the effectiveness of bursaries in widening participation, although this is partly because the evidence is confounded by contemporaneous changes to fees arrangements. It finds no evidence that bursaries have affected application patterns and little research on whether bursaries affect academic outcomes in the UK.

Heller, D. E. (1996). Tuition, Financial Aid, and Access to Public Higher Education: A Review of the Literature (pp. 58).

The review first considers the link between tuition [fees] and HE participation (as fees increase, participation of low income students decreases). The review then considers the effects of financial aid, finding that aid does not counteract increased fees in a straightforward way. The evidence for the success of financial aid is mixed, although grants seem to be more effective than loans. The review also gives details of college costs and financial aid options.

Jaggars, S. S. (2011). Online Learning: Does It Help Low-Income and Underprepared Students? CCRC Working Paper No. 26. Assessment of Evidence Series (pp. 60): Community College Research Center. , Teachers College, Columbia University, 525 West 120th Street Box 174, New York, NY 10027.

The review found no studies explicitly addressed the extent to which online learning options increase college enrolment rates in comparison to face-to-face learning options (p.4) so the conclusions drawn in relation to this are speculative. Generally, online courses had a negative effect on progression, particularly for underprepared students.

Kim, K., & Smerdon, B. (2012). Dual enrollment: A bridge between high school and college. In B. Smerdon & K. M. Borman (Eds.), *Pressing forward: Increasing and expanding rigor and relevance in America's high schools*. (pp. 135-149). Charlotte, NC US: IAP Information Age Publishing.

This chapter reviews the literature on dual enrolment, a curricular option whereby high school students take college level classes alongside their high school classes (either in a school or college setting). The chapter gives detailed information about the nature of dual enrolment programmes, arguing that their effectiveness in widening participation depends a great deal on how they are implemented in each state. The authors found limited research, particularly with long-term follow-up and recommend that although there are some positive findings, results are not yet conclusive.

Kinzie, J., Gonyea, R., Shoup, R., & Kuh, G. D. (2008). Promoting Persistence and Success of Underrepresented Students: Lessons for Teaching and Learning. *New Directions for Teaching and Learning*(115), 21-38.

The focus of this review is support for underrepresented students once they arrive at college, in particular those who are not well prepared academically. The largest population in this group is Latinos, so the lessons may not be directly generalisable to the UK context. The review presents evidence that engagement is crucial to student retention and describes ways that engagement can be increased through teaching and learning practice. They find that it is especially important to target this intervention at students with lower entrance scores, who are at increased risk of drop-out.

Lerner, J. B., & Brand, B. (2006). The College Ladder: Linking Secondary and Postsecondary Education for Success for All Students (pp. 176): American Youth Policy Forum. 1836 Jefferson Place NW, Washington, DC 20036.

The review considers the evidence for the effectiveness of Secondary-Post-Secondary Learning Options (SPLOs) in increasing academic performance, closing the achievement gap, and increasing entry to, and retention in, postsecondary education, particularly for first-generation, low-income, ethnic minority students and students with disabilities. SPLOs include Dual Enrolment (including Advanced Placement), Tech Prep, middle/early college high schools and college access programmes. They found that evaluations often did not include longitudinal follow-up and rarely included a control group (15% of studies); hence conclusions were limited. The review found that on average, college-going rates for SPLO participants, especially middle- and low-achieving students, were higher than for nonparticipants (p.ix).

Martinez, M., & Klopot, S. (2005). The Link between High School Reform and College Access and Success for Low-Income and Minority Youth (pp. 60): American Youth Policy Forum. 1836 Jefferson Place NW, Washington, DC 20036.

This review reports on whole-school reforms designed to increase college attendance, persistence and graduation rates for low-income, minority and first-generation students. It finds that a rigorous academic curriculum for all students, personalised learning, academic and social support, and alignment of curriculum between educational levels (including high school to college) are the most important elements for effective interventions. The study reviews evidence on large programmes and makes recommendations for policy-makers and school leaders.

Nora, A., Barlow, L., & Crisp, G. (2006). Examining the tangible and psychosocial benefits of financial aid with student access, engagement, and degree attainment. *American Behavioral Scientist*, 49(12), 1636-1651. doi: 10.1177/0002764206289143

This study reviews the literature on financial aid in relation to access, college choice and persistence in higher education (generally positive). The authors theorise that financial aid is effective not simply through lowering costs, but through reduced (financial) stress for students and less time spent in paid work leading to better academic outcomes. The paper also uses data on financial aid claims to investigate this and propose further research questions, as well as giving examples of financial aid schemes.

Pathways to College Network. (2004). A Shared Agenda: A Leadership Challenge to Improve College Access and Success (pp. 52): Pathways to College Network. , 1320 19th Street NW Suite 400, Washington, DC 20036.

This review synthesises research on college access and success for low-income, first generation, minority and disabled students, for a policy-maker and practitioner audience. The review includes all studies that meet the US National Research Council's principles of inquiry (p.44) regardless of their methodology. The review presents findings in the form of six recommendations for policy-makers, ranging from the social/cultural (high aspirations for all students; make high-level preparation available accordingly) to the practical (involve leaders across all levels of education; frequent evaluation of programmes).

Perna, L. W. (1999). Early intervention programs: A New Approach to Increasing College Access. *Advances in Education Research*, 4(Winter 1999), 14.

This review was conducted in 1999 when the 'early intervention' programmes discussed had been running for only a few years. The students targeted by the interventions had not yet reached university attendance age so the evaluation studies included use proxy outcomes for university attendance. This limits the relevance of the study. The review gives an overview of the first 'early intervention' programmes and gives useful suggestions for later research. It finds that programmes that include support services increase students' self-reported intentions to attend college. This review is most interesting as a historical perspective on the research context in the early days of 'early intervention' programmes.

Schultz, J. L., & Mueller, D. (2006). Effectiveness of programs to improve postsecondary education enrollment and success of underrepresented youth.

The review draws on programme evaluations and other literature to identify intervention features most likely to contribute to improving college access and persistence for underrepresented students. Identified factors are: academic preparation, social support, early intervention, parental engagement, admissions support, long-term support, systemic

reform (for example, integrating strategies and positive attitudes into schools), and financial support. The review also used programme evaluations to assess which individual programmes had the best evidence for effectiveness. These were: Indiana's Twenty-first Century Scholars programme, Upward Bound, Gateway to Higher Education, The Quantum Opportunities Program, Sponsor-A-Scholar (SAS), and Talent Search. Limitations of programmes and limitations of evidence are also discussed.

St John, E. P. (2004). The impact of financial aid guarantees on enrollment and persistence: evidence from research on Indiana's Twenty-first Century Scholars and Washington State Achievers programs. In D. E. Heller & P. Marin (Eds.), *State Merit Scholarship Programs and Racial Inequality*: Harvard Education Publishing Group, 8 Story Street, 1st Floor, Cambridge, MA 02138.

This study reviews evidence for the effectiveness of two early intervention programmes (including analysis of publicly available data). The study found that the programmes were effective in widening access for low-income students, attributing this to the early promise of financial aid.

The Pell Institute. (2009). National Studies Find TRIO Programs Effective at Increasing College Enrollment and Graduation (pp. 8): Pell Institute for the Study of Opportunity in Higher Education. 1025 Vermont Avenue NW Suite 1020, Washington, DC 20005.

This brief review reports on four national studies conducted by the US Department of Education on three TRIO programmes (Student Support Services, Talent Search and Upward Bound). It finds that the programmes were all successful in increasing the likelihood of postsecondary/higher education enrolment. Some programmes had also been shown to increase attainment or take-up of financial aid.

The Western Interstate Commission for Higher Education. (2006). Accelerated Learning Options: Moving the Needle on Access and Success. A Study of State and Institutional Policies and Practices (pp. 184): Western Interstate Commission for Higher Education. P.O. Box 9752, Boulder, CO 80301-9752.

The review is found in Appendix A of the report. In discussing the effect of accelerated learning options (where high school students take classes that give credit towards a college degree) they note that evidence on the topic is mixed and incomplete, especially in relation to persistence and success. The review finds some evidence that AP courses may help with transition to college, but that this will only be effective if such courses are accessible to all students (in terms of practical and cultural barriers). The evidence is generally mixed and there is no account of whether studies account for self-selection; given the nature of the intervention it is unlikely that this would be possible.

Thomas, L. (2011). Do Pre-Entry Interventions Such as "Aimhigher" Impact on Student Retention and Success? A Review of the Literature (Vol. 65, pp. 230-250): Wiley-Blackwell. 350 Main Street, Malden, MA 02148.

The review is explicitly un-systematic, using: "meta-ethnographic approach to construct interpretations and a realist synthesis approach to test out the potential relationship between pre-entry interventions and improved student retention and success" (p.237). The main aim was to investigate the impact of WP interventions on retention and success; there

was little literature on this and effectiveness on enrolment was investigated to enhance understanding of retention and success. The review found that support for decision making, appropriate expectations and preparation were important to retention and success in higher education.

10. Conclusions and recommendations

10.1 Headline conclusions

We found no UK-based studies evaluating access strategies and approaches using robust designs to establish effectiveness. However, the following strategies and approaches have been tested out in the US using robust designs and found to be promising: financial incentives; financial assistance; close personal mentoring; academic mentoring; 'black box' programmes containing a variety of components including financial incentives and scholarships and close personal mentoring, but also academic and social enrichment, counselling and parental involvement interventions. More UK-based research is needed to test out interventions previously tested in the US. However, the US-based interventions found to be effective or with evidence of promise were developed in a HE context which is different from the UK context. The interventions themselves and the populations of disadvantaged students are also different. Therefore, UK-context specific interventions need to be developed and tested within the UK HE context and with UK-specific populations of disadvantaged students.

10.2 Recommendations

A number of US-based intervention evaluations of high quality were encountered in the systematic reviews undertaken for this report. Many of these studies are of limited generalisability to the UK context because both the school and university settings and the nature of the student populations are different, for example, the specific mix of minority ethnic students in the US is very different from the specific mix of minority ethnic students in the UK context. We recommend that strategies and approaches found to be effective in the US, in particular financial and mentoring strategies, should be developed and adapted for the UK context and then tested out using robust designs. Where a match already exists between an effective US-based intervention and a UK-based intervention this intervention should be a priority for carefully testing using a robust design. We recommend the following evaluations as a priority: an evaluation of financial counselling to increase enrolment into research intensive universities using a randomised controlled trial (RCT) design (design option 1); and an evaluation of *STAR* using RCT design (design option 2). Finally, we recommend an embedded cluster RCT evaluation of the most promising interventions – for example, financial advice and school-based academic mentoring – within the delivery of the *Sutton Trust Summer Schools* (design option 3).

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Contributions:

C Torgerson (CT): Design; led on all stages of review (except searching); report writing; design options

L Gascoine (LG): Led on searching; screening; data extraction of systematic reviews and UK-based interventions; contributed to report and approved final version

C Heaps (CH): Led on EndNote library management and all tables; screening; data extraction of UK-based interventions; research administration; contributed to report and approved final version

V Menzies (VM): Screening; data extraction of RCTs and RDDs; contributed to report and approved final version

K Younger (KY): Searching and screening (QEDs and update); data extraction and quality appraisal (QEDs and update); contributed to report and approved final version

Absence of conflict of interest:

C Torgerson was author on two of the included systematic reviews. These reviews were quality appraised by another reviewer who was not an author on these reviews.

12. APPENDICES

Appendix A Inclusion criteria

Appendix B Search strings for all databases

Appendix C Results of searching at 1st, 2nd and 3rd stages in all 3 reviews

Appendix D Number of studies after 3rd screening in each of the 3 reviews

Appendix E Included studies – Systematic reviews

Appendix F Included studies – RCTs and RDDs

Appendix G Included studies – programmes and interventions

Appendix H Data extraction forms for systematic reviews

Appendix I Data extraction forms for experimental and regression discontinuity literature

Appendix J Data extraction forms for quasi-experimental literature

Appendix K Data extraction forms for UK-based interventions

Appendix L Glossary

Appendix A: Inclusion criteria

Topic of study: Higher Education (HE) access: study must be about strategies and approaches to increase participation and retention of students in HE

Design of study: review, overview, systematic review, meta-analysis, experiment* or quasi-experiment with regression discontinuity design** OR a description of a UK intervention

Year of study: 1992 to present

Language of study: any

Country of study: any

* experiment: randomised controlled trial/RCT/'true' experiment

** quasi-experiment: regression discontinuity design/RDD

Appendix B – Search strings for all databases

First search

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 (Education Resources Information Centre) [ProQuest]	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. 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) 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 3- 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)

Second search

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 - 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 (Education Resources Information Centre) [ProQuest]	11 December 2013	1 December 2012 – current	6	4	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	11 December 2013	2012 – 2013	29	27	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	11 December 2013	2012 – 2013	20	10	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	11 December 2013	2012 – 2103	215	200	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	11 December 2013	2012 – 2013	166	102	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) 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- 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)
ERIC (Education Resources Information Centre) [ProQuest]	11 December 2013	1 January 1992 – current	298	283	Search 4 – Narrative Reviews ab(literature review OR narrative review OR evidence review OR synthesis OR overview) 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	1992 – 2013	55	45	Search 4 – Narrative Reviews ab(literature review OR narrative review OR evidence review OR synthesis OR overview) 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	1992 – 2013	217	173	<p>Search 4 – Narrative Reviews</p> <p>Topic=(literature review OR narrative review OR evidence review OR synthesis OR overview) 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)</p> <p>Timespan=1992-01-01 - 2012-09-21. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH.</p> <p>Lemmatization=On</p>

Appendix C: Results of searching at 1st, 2nd and 3rd stages in all 3 reviews

First search

Database searched	Number of studies (Number of papers) after de-duplication	Number of studies (number of papers) after 1st screening	Number of studies not available	Number of studies after 2nd screening	Number of studies after 3 rd screening
ERIC (ProQuest) Search 1	371 (372)	49 (50)	3	15	6
ERIC (ProQuest) Search 2	184	25	2	10	4
PsycInfo Search 1	186	11		4	0
PsycInfo Search 2	89	5		2	0
Web of Science Search 1	634 (635)	19 (20)	1	5	1
Web of Science Search 2	446	18		4	3
BEI	375	34		4	2
Citations		1		1	1
Expert review					4
Total	2286 (2287)	162 (164)	6	45	21

1st Screening - independent double screening in pairs (CT and LS, CT and CH, CT and VM)

2nd Screening - independent double screening in pairs (CT and LS, CT and CH, CT and VM)

3rd Screening - independent double screening in pairs (CT and LS, CT and CH, CT and VM)

Second search

Database searched	Number of studies after de-duplication	Number of studies after 1st screening	Number of studies not available	Number of studies after 2nd screening	Number of studies after 3rd screening
ERIC (ProQuest) Search 1 (re-screen of first search for narrative reviews)	263	31	2	14	9
PsycInfo Search 1 (re-screen of first search for narrative reviews)	176	8	1	1	1
Web of Science Search 1 (re-screen of first search for narrative reviews)	510	12		6	1
ERIC (ProQuest) Update 1	7	0		0	0
ERIC (ProQuest) Update 2	4	0		0	0
PsycInfo Update 1	27	0		0	0
PsycInfo Update 2	10	2		0	0
Web of Science Update 1	200	8		4	2
Web of Science Update 2	102	6		1	0
BEI Update (3)	102	10		4	0
ERIC (ProQuest) Search 4	283	41	4	17	11

PsycInfo Search 4	45	7		2	2
Web of Science Search 4	173	7		1	0
Quasi-experimental studies excluded after second screening in first searches	-	16		3	1
Citations	-	-	-	2	1
Total	1902	148	7	55	28

Appendix D: Number of studies after 3rd stage screening in each of the 5 reviews

First search

	Number of studies after 3rd screening
Systematic reviews	4
RCTs and RDDs	8
UK-based interventions	9
Total	21

Second search

	Number of studies after 3rd screening
Systematic reviews	0
RCTs and RDDs	0
UK-based interventions	0
Quasi-experiments	4
Narrative reviews	24
Total	28

Appendix E: Included studies: systematic reviews

Bibliographic details

Harvill, E.L., Maynard, R.A., Nguyen, H.T.H., Robertson-Kraft, C., & Tognatta, N. (2012). *Effects of college access programs on college readiness and enrollment: A meta-analysis*. Evanston, IL: Society for Research on Educational Effectiveness.

See, B.H., Gorard, S., & Torgerson, C. (2012). Promoting post-16 participation of ethnic minority students from disadvantaged backgrounds: a systematic review of the most promising interventions. *Research in Post-Compulsory Education, 17*(4), 409-422.

Torgerson, C., See, B.H., Low, G., Wright, K., & Gorard, S. (2008). *What are the factors that drive high post-16 participation of many minority ethnic groups, and what strategies are effective in encouraging participation? A systematic map, and a focused review of the international intervention studies*. Report. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

What Works Clearinghouse. (2006). *Talent Search. What Works Clearinghouse Intervention Report*. Washington DC: What Works Clearinghouse, Institute of Education Sciences.

Appendix F: Included studies: RCTs and RDDs

Bibliographic details

Bergin, D.A., Cooks, H.C., & Bergin, C.C. (2007). Effects of a college access program for youth underrepresented in higher education: A randomised experiment. *Research in Higher Education*, 48(6), 727-750.

Bettinger, E.P., Long, B.T., Oreopoulos, P., & Sanbonmatsu, L. (2009). The role of simplification and information in college decisions: Results from the H&R Block FAFSA experiment (*Working Paper No. 15361*). Retrieved from National Bureau of Economic Research website: <http://www.nber.org/papers/w15361>.

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Goodman, J. (2008). Who merits financial aid?: Massachusetts' Adams Scholarship. *Journal of Public Economics*, 92, 2121-2131.

Myers, D., Olsen, R., Seftor, N., Young, J., & Tuttle, C. (2004). *The impacts of regular Upward Bound: Results from the third follow-up data collection*. Washington, DC: Mathematica Policy Research, Inc.

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Solis, A. (2011). *Credit constraints for higher education*. Evanston, IL: Society for Research on Educational Effectiveness.

Appendix F: Included studies: Quasi-experiments

Bibliographic details

Brewer, E. W., & Landers, J. M. (2005). A Longitudinal Study of the Talent Search Program. *Journal of Career Development, 31*(3), 195-208.

Myers, C. B., Brown, D. E., & Pavel, D. M. (2010). Increasing access to higher education among low-income students: The Washington State Achievers Program. *Journal of Education for Students Placed at Risk, 15*(4), 299-321. doi: 10.1080/10824669.2010.532446

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Pharris-Ciurej, N., Herting, J. R., & Hirschman, C. (2012). The impact of the promise of scholarships and altering school structure on college plans, preparation, and enrollment. *Social Science Research, 41*(4), 920-935. doi: 10.1016/j.ssresearch.2012.03.007

Appendix G: Included studies: UK-based interventions

Bibliographic details

Byrom, T. (2009). "I don't want to go to a crummy little university": Social class, higher education choice and the paradox of widening participation. *Improving Schools*, 12(3), 209-224.

Casey, R., Smith, C.P., & Koshy, V. (2011). Opportunities and challenges of working with gifted and talented students in an urban context: A university-based intervention program. *Gifted Child Today*, 34(1), 35-43.

Doyle, M., & Griffin, M. (2012). Raised aspirations and attainment? A review of the impact of Aimhigher (2004-2011) on widening participation in higher education in England. *London Review of Education*, 10(1), 75-88.

Hatt, S., Hannan, A., Baxter, A., & Harrison, N. (2005). Opportunity knocks? The impact of bursary schemes on students from low-income backgrounds. *Studies in Higher Education*, 30(4), 378-388.

Hoare, T., & Mann, R. (2012). *The impact of the Sutton Trust's Summer Schools: A report to the Sutton Trust*. London: Sutton Trust.

McCaig, C., & Bowers-Brown, T. (2007). *Aimhigher: achieving social justice?* Paper presented at the British Educational Research Association Annual Conference, Institute of Education, University of London, September 5-8 2007.

Pinheiro-Torres, C., & Portman-Smith, C. (2008). *Preliminary findings of a four year intervention programme for higher ability students*. Paper presented at the British Educational Research Association Annual Conference, Heriot Watt University, Edinburgh, September 3-6 2008.

Walker, L. (2000). Predicting or guessing: The progress of Scottish Wider Access Programme (SWAP) students at the University of Glasgow. *International Journal of Lifelong Education*, 19(4), 342-356.

Wiggins, A., Jones, K., Ainsworth, P., & Kirk, A. (2012). *Sutton Trust Academic Routes - Lessons for university access*. Report to Sutton Trust. London: Sutton Trust.

Appendix G: Included studies: Narrative Reviews

Bibliographic details

- Arbona, C. (2005). Promoting the Career Development and Academic Achievement of At-Risk Youth: College Access Programs. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work*. (pp. 525-550). Hoboken, NJ US: John Wiley & Sons Inc.
- Baker, T. L., & Velez, W. (1996). Access to and Opportunity in Postsecondary Education in the United States: A Review (pp. 82-101).
- Brock, T. (2010). Young Adults and Higher Education: Barriers and Breakthroughs to Success. *Future of Children, 20*(1), 109-132.
- Broton, K. (2009). Increasing Postsecondary Education Access and Success: Raising Achievement through Outreach Programs. Brief (pp. 2): Wilder Research. , Wilder Foundation. 451 Lexington Parkway North, Saint Paul, MN 55104.
- Contreras, F. (2011). Strengthening the Bridge to Higher Education for Academically Promising Underrepresented Students. *Journal of Advanced Academics, 22*(3), 500-526.
- Cowan Pitre, C., & Pitre, P. (2009). Increasing Underrepresented High School Students' College Transitions and Achievements: TRIO Educational Opportunity Programs. *NASSP Bulletin, 93*(2), 96-110.
- Cunningham, A., Redmond, C., & Merisotis, J. (2003). Investing Early: Intervention Programs in Selected U.S. States. Millennium Research Series (pp. 72): Canada Millennium Scholarship Foundation, 1000 Sherbrooke Street West, Suite 800, Montreal, Canada H3A 3R2.
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- Dynarski, S., & Scott-Clayton, J. (2013). Financial Aid Policy: Lessons from Research. *Future of Children, 23*(1), 67-91.
- Harrison, N., & Hatt, S. (2012). Expensive and Failing? The Role of Student Bursaries in Widening Participation and Fair Access in England. *Studies in Higher Education, 37*(6), 695-712.
- Heller, D. E. (1996). Tuition, Financial Aid, and Access to Public Higher Education: A Review of the Literature (pp. 58).
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Appendix H: Data extraction forms for systematic reviews

Bibliographic details	What Works Clearinghouse. (2006). <i>Talent Search. What Works Clearinghouse Intervention Report</i>. Washington DC: What Works Clearinghouse, Institute of Education Sciences.	
Country	US	
Access in HE intervention(s)	'Talent Search': A combination of services designed to improve academic achievement and increase access to financial aid: test-taking and study skills assistance, academic advising, tutoring, career development, college campus visits, financial aid application assistance.	
Aims of intervention	To promote college enrolment and completion among low-income students by preventing drop-out.	
Number of studies incl.	2	
Design(s) of studies	Texas: propensity score matching of participants and non-participants (QED) Florida: propensity score matching of participants and non-participants (QED)	
Setting(s) and participants	High schools; 9 th grade students	
Outcome measure(s)	Completion of high school and gaining access to college.	
Results, as reported by authors	Completing school: potentially positive effects (average +17 percentile points, range +14 to +19 points using wwc average improvement index) Texas study: 'Talent Search' participants completed school at a significantly higher rate than comparison group students: 86% compared with 77%. Florida study: 'Talent Search' participants completed school at a significantly higher rate than comparison group students: 84% compared with 70%.	
Conclusions, as reported by authors	'Potentially positive effects of 'Talent Search' on completing school'.	
Quality appraisal		Yes/Not Stated/Unclear
Title	Identified the report as a systematic review	Y
Introduction	Described the rationale for the review in the context of what is already known.	Y
Methods: Eligibility	Specified study characteristics such as PICOS (participants, interventions, comparisons, outcomes, and study design) and stated characteristics used as criteria for eligibility, giving rationale (such as language, years considered).	Y
Methods: Search and info sources	Presented full electronic search strategy for at least one database, including any limits used, in a way that it could be duplicated. Described all information sources in the search and dates searched.	Y (technical appendices)
Methods: Study selection	Stated the process for selecting studies, who was involved in each step and how decisions were made.	Y
Methods: Risk of bias	Authors address the risk of bias, including bias within studies and bias across studies.	Y (within) NS (across)
Results: Study selection	Gives numbers of studies screened, assessed for eligibility, and included for review, with reasons for exclusion at each stage (ideally a flow diagram).	Y (technical appendices)
Results: Study characteristics	For each study, characteristics of extracted data are provided (including PICOS, study size, results of individual studies).	Y
Discussion	Summarised key findings including the strength of evidence for each main outcome and discusses the limitations of the review.	Y

Bibliographic details	Harvill, E.L., Maynard, R.A., Nguyen, H.T.H., Robertson-Kraft, C., & Tognatta, N. (2012). <i>Effects of college access programs on college readiness and enrollment: A meta-analysis</i>. Evanston, IL: Society for Research on Educational Effectiveness.	
Country	US	
Access in HE intervention(s)	College access programs that identified college readiness and/or college enrolment as a primary goal of the program. Total of 12 college access programs, including whole school reform initiatives, college access supports. Majority provided academic enrichment program and counselling, fewer involved personal enrichment and social integration, mentoring, parental involvement and scholarships.	
Aims of intervention	To increase college readiness and enrolment	
Number of studies included	14	
Design(s) of studies	RCT: 6 QED: 8	
Setting(s) and participants	Students in grades 6 to 12 with at least 75% low-SES students	
Outcome measure(s)	high school graduation; college enrolment	
Results, as reported by authors	On average college access programs increase high school graduation by 8%, 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 a 12% increase and the average effect sizes from the 3 RCTs is 4%.	
Conclusions, as reported by authors	Authors hesitant to draw conclusions.	
Quality appraisal		
		Yes/Not Stated/Unclear
Title	Identified the report as a systematic review	Y
Introduction	Described the rationale for the review in the context of what is already known.	Y
Methods: Eligibility	Specified study characteristics such as PICOS (participants, interventions, comparisons, outcomes, and study design) and stated characteristics used as criteria for eligibility, giving rationale (such as language, years considered)	Y
Methods: Search and info sources	Presented full electronic search strategy for at least one database, including any limits used, in a way that it could be duplicated. Described all information sources in the search and dates searched.	Y
Methods: Study selection	Stated the process for selecting studies, who was involved in each step and how decisions were made.	Y
Methods: Risk of bias	Authors address the risk of bias, including bias within studies and bias across studies.	Y (within - brief) NS (across)
Results: Study selection	Gives numbers of studies screened, assessed for eligibility, and included for review, with reasons for exclusion at each stage (ideally a flow diagram)	Y
Results: Study characteristics	For each study, characteristics of extracted data are provided (including PICOS, study size, results of individual studies)	Y (brief)
Discussion	Summarised key findings including the strength of evidence for each main outcome and discusses the limitations of the review.	Y

Bibliographic details	<p>Torgerson, C., See, B.H., Low, G., Wright, K., & Gorard, S. (2008). <i>What are the factors that drive high post-16 participation of many minority ethnic groups, and what strategies are effective in encouraging participation? A systematic map, and a focused review of the international intervention studies</i>. Report. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.</p> <p>AND</p> <p>See, B.H., Gorard, S., & Torgerson, C. (2012). Promoting post-16 participation of ethnic minority students from disadvantaged backgrounds: a systematic review of the most promising interventions. <i>Research in Post-Compulsory Education</i>, 17(4), 409-422.</p>
Country	UK (these papers), included studies (US)
Access in HE intervention(s)	'...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)
Number of studies included	10 (Torgerson <i>et al</i> , 2008) 14 (See <i>et al</i> , 2012)
Design(s) of studies	RCTs and QEDs
Setting(s) and participants	Minority students
Outcome measure(s)	Increased participation of ethnic minority students from disadvantaged backgrounds
Results, as reported by authors	<p>Torgerson <i>et al</i>, 2008</p> <p>Post 16 in school settings: 'Monetary incentives/sanctions interventions: consistent high quality evidence of positive effects' p. 17 (Spencer <i>et al</i>) 'Monetary incentives/sanctions interventions: partial evidence of positive effects There was one medium quality quasi-experimental study evaluating a paid work-based learning intervention to improve education and employment outcomes, and one large medium quality quasi-experimental study evaluating a school attendance intervention to improve school attendance rates, both with mixed results.' (Goldberger and Jones <i>et al</i> p. 18)</p> <p>Torgerson <i>et al</i>, 2008</p> <p>Post 16 in HE settings 'Faculty/student mentoring interventions: consistent high quality evidence of positive effects' (p. 19-20 Nagda <i>et al</i> and Campbell and Campbell)</p> <p>See <i>et al</i>, 2012, p. 413:</p> <p>'Evidence from the review reveals six interventions that have positive effects on improving prospective post-compulsory outcomes for disadvantaged young people from ethnic minority backgrounds. Four of these were interventions in higher education settings and the rest were interventions carried out among children in secondary (high) schools.'</p> <p>'Positive effects of the use of monetary incentives to improve post-16 participation and retention among high school students were found in three studies of at least medium quality.' – Spencer (2005), Jones <i>et al</i> (2002), Goldberger (2000)</p> <p>Spencer – 'At the end of one year, students in receipt of stipends showed a 10% higher retention rate than those in the 'delayed stipend' group who did not receive monetary incentives.'</p> <p>Jones – 'The project was successful in improving attendance rates, but no significant effects were found for completion rates (57.5% for the experimental group and 55.4% for the control group). The intervention was also less successful with Hispanic students, who were less likely to meet the 80% rule than other</p>

	<p>ethnic subgroups.’ Goldberger – ‘The effect of Pro-Tech on academic performance appeared to be mixed. In the first year, participants’ grades and grade point averages (GPAs) were positively associated with the programme, but in the second year programme participation seemed to be negatively associated with grades and GPA.’ See et al, 2012 ‘Some of the evidence from this review also suggests that mentoring, particularly mentoring provided by faculty members, may have positive effects on educational outcomes of ethnic minority students in both secondary schools and universities. However, the overall evidence is far from convincing, and the most positive results tend to come from the smallest studies.’ (p.414)</p>	
Conclusions, as reported by authors	<p>Torgerson et al, 2008 ‘As in many fields of education research, we encountered plausible interventions either not funded or not tested at the level required for likely success and the generation of rigorous evidence of impact.’ (p.23) See et al, 2012 ‘In conclusion, the only intervention that is anywhere near ready to be rolled out and implemented is the offer of financial incentives...All else is in need of considerable further development if any progress is to be made... Therefore, for the other interventions reported in this review which hold some promise, the next step would be to design high-quality cost-effective trials that would be monitored and robustly evaluated in a UK context.’ (p.420)</p>	
Quality appraisal		Yes/Not Stated/Unclear
Title	Identified the report as a systematic review	Y
Introduction	Described the rationale for the review in the context of what is already known.	Y
Methods: Eligibility	Specified study characteristics such as PICOS (participants, interventions, comparisons, outcomes, and study design) and stated characteristics used as criteria for eligibility, giving rationale (such as language, years considered)	Y
Methods: Search and info sources	Presented full electronic search strategy for at least one database, including any limits used, in a way that it could be duplicated. Described all information sources in the search and dates searched.	Y
Methods: Study selection	Stated the process for selecting studies, who was involved in each step and how decisions were made.	Y
Methods: Risk of bias	Authors address the risk of bias, including bias within studies and bias across studies.	Y (within) NS (across)
Results: Study selection	Gives numbers of studies screened, assessed for eligibility, and included for review, with reasons for exclusion at each stage (ideally a flow diagram)	Y
Results: Study characteristics	For each study, characteristics of extracted data are provided (including PICOS, study size, results of individual studies)	Y
Discussion	Summarised key findings including the strength of evidence for each main outcome and discusses the limitations of the review.	Y

Appendix I: Data extraction forms for experimental and regression discontinuity designs:

RCTs

Bibliographic details	Bergin, D.A., Cooks, H.C., & Bergin, C.C. (2007). Effects of a college access program for youth underrepresented in higher education: A randomised experiment. <i>Research in Higher Education, 48(6), 727-750.</i>
Intervention(s)	<i>EXCEL</i> - scholarship incentive and support programme for aspiring youth
Outcome(s)	University enrolment
Research question	'Would <i>EXCEL</i> participants enrol in the sponsoring university at a higher rate than control students? Would <i>EXCEL</i> participants enrol in higher education at a higher rate than the control group? Would <i>EXCEL</i> participants have higher GPAs, higher self-esteem in high school, and greater desire to attend college than control students?' (p. 735)
Study characteristics	
Country in which study carried out	US
Year in which study carried out	NS
Methodological characteristics	
Design	Individual RCT; stratified by achievement level, gender and ethnicity to <i>EXCEL</i> or control group; groups tested for baseline equivalence on 8 th grade grades, parent education and income, desire for educational achievement, self-esteem and learning strategies.
method of assignment to condition	NS
blinded assessment of outcome	NS
attrition	3 <i>EXCEL</i> students moved out of the area. Control data collected for 34-37/40 at follow up. 10 <i>EXCEL</i> & 6 control students did not complete follow-up questionnaire.
implementation fidelity	NS
Participant characteristics	83 (nominated by school counsellors from groups underrepresented in higher education; selection criteria included eighth grade status, approx. 'B' grade average, eighth grade performance on standardised test & 200 word essay on 'Why I want to go to college' (p. 736)
Intervention: number and type of participants	I: 43 (32 African American, 7 Latino, 4 Asian American; 29 female)
Control: number and type of participants	C: 40 (31 African American, 6 Latino, 3 Asian American; 25 female)
Setting	High school intervention ; 13 high schools involved in medium size city
Intervention characteristics	<i>EXCEL</i> – a scholarship incentive and support program for aspiring youth most of whom are African American and Latino sponsored by a doctorate granting university.

	<p>'EXCEL enlists parental participation and commitment, assists students through their years in high school and college, and awards them scholarships to the sponsoring university that cover tuition, fees, and books. In order to be eligible for the scholarship, students must complete a college preparatory curriculum, maintain a B average in high school, participate in program activities, and achieve a score of 18 on the ACT' (p.735-6)</p> <p>Programme includes summer institutes, weekend seminars, tutoring, mentoring, activities on university campus, writing instruction and guidance through the college application process.</p>
Control/comparison characteristics	<p>Control students at same school as EXCEL students. 2 control students were in other programmes that also offered loan-free financial aid, 9 control students were also in other programmes. Control students paid \$10 for completing outcome questionnaire and interview.</p>
Outcome measures	<p>Student enrolment in post-secondary education in fall following high school High school grades Hare self-esteem scale Item regarding amount of education desired</p>
Results as reported by authors	<p>One purpose of the program was to attract minority students to enrol at the sponsoring university. For this purpose, the programme had a statistically significant effect.' (p.741)</p> <p>No statistically significant difference in postsecondary education enrolment between the control and treatment groups.</p> <p>Neither self-esteem nor high school cumulative GPA showed a treatment effect.</p> <p>The EXCEL group had higher educational aspirations than the control group.</p>
Conclusions as reported by authors	<p>'The EXCEL program succeeded at the key goal: recruiting qualified minority students to enrol in the sponsoring university, where minority students are underrepresented compared to the region's demographics.'</p> <p>'EXCEL participants did not enrol in post-secondary education at a higher rate than the control group. This suggests that programs for relatively high achieving students from underrepresented groups may not alter college attendance rates, although they may alter which college the students attend.' (p.744-6)</p>

Bibliographic details	Bettinger, E.P., Long, B.T., Oreopoulos, P., & Sanbonmatsu, L. (2009). The role of simplification and information in college decisions: Results from the H&R Block FAFSA experiment (Working Paper No. 15361). National Bureau of Economic Research.
Intervention(s)	Assistance with completing application for financial aid and information about post-secondary options (intervention 1) Information estimating financial aid eligibility (intervention 2)
Outcome(s)	Likelihood of FAFSA application/college enrolment/financial aid receipt
Research question	What are the effects of two experimental treatments designed to test the importance of simplifying the process of receiving financial aid and providing clear information about personal aid eligibility on improving access to college? (p.iii)
Study characteristics	
Country in which study carried out	US
Year in which study carried out	2008
Methodological characteristics	
Design	Individual RCT; unequal allocation to 2 interventions & control group (intervention 1: 10634, intervention 2:1654, Control: 11916)
method of assignment to condition	Random assignment done by computer software based on last 2 digits of taxpayer's social security number (allocation algorithm concealed from implementers).
blinded assessment of outcome	NS
attrition	Some participants who verbally consented did not complete consent form and some consent forms did not reach central processing. These participants were excluded. Attrition seemed unrelated to treatment status.
implementation fidelity	Monitored by internal software checks which tracked completion of questions & prompted implementer on what to ask. Also field visits by H&R Block. No reports of serious deviation from scripts.
Participant characteristics	24204 assigned to group, data for 16740. Selection criteria included clients having an 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. Sample divided into 3 groups: dependent participants, independent adults with no college experience and independent adults with college experience.
Intervention: number and type of participants	Intervention 1 FAFSA assistance: 10634 assigned to group (data for 7864) Dependent sample: N=390 (56% female; 56% white, 38% black, 2% Hispanic; mean age 17.7; mean AGI \$23594).

	<p>Independent with no college experience: N=4350 (57% female; 70% white, 24% black, 3% Hispanic; mean age 26.0; mean AGI \$16053).</p> <p>Independent with prior college experience: N=3124 (63% female; 64% white, 31% black, 2% Hispanic; mean age 26.2; mean AGI \$18056).</p> <p>Intervention 2 (Information only treatment): 1654 assigned to group (data for 1319)</p> <p>Dependent sample: N=80 (57% female; 65% white, 30% black, 3% Hispanic; mean age 17.8; mean AGI \$22 509).</p> <p>Independent with no college experience: N=732 (55% female; 72% white, 22% black, 2% Hispanic; mean age 25.7; mean AGI \$15647)</p> <p>Independent with prior college experience: N=507 (60% female; 63% white, 31% black, 2% Hispanic; mean age 26.0; mean AGI \$17737).</p>
Control: number and type of participants	<p>Control: 11916 assigned to group (data for 7557)</p> <p>Dependent sample: N=396 (56% female; 55% white, 38% black, 2% Hispanic; mean age 17.7; mean AGI \$23214).</p> <p>Independent with no college experience: N=4155 (57% female; 71% white, 23% black, 3% Hispanic; mean age 26.0, mean AGI \$16,315). Independent with prior college experience: N=3006 (64% female; 64% white, 30% black, 2% Hispanic; mean age 26.1; mean AGI \$17944).</p>
Setting	156 H&R Block tax preparation offices in Ohio and Charlotte, North Carolina.
Intervention characteristics	<p>Intervention 1 – FAFSA simplification and assistance treatment group: Help with completing FAFSA (Free application for Federal Student Aid). Software used tax return information to pre-populate the FAFSA. H&R Block tax professional gathered answers to remaining questions through an interview protocol. Software computed the amount of financial aid the client was eligible to receive and client was provided with a written explanation of these numbers. Participants also informed of tuition prices at nearby colleges. H&R Block offered to submit the FAFSA electronically free of charge if all information was collected during the visit, or participants are sent completed paper FAFSA by mail to submit themselves. FAFSA completed for almost 7 out of 10 participants in this group.</p> <p>Intervention 2 - Information-only treatment group: Individualised aid eligibility estimates were calculated using information provided from the tax return. Individuals were given a written description of their aid eligibility and a list of tuitions at nearby college. The tax professionals encouraged the individuals in this group to complete the FAFSA on their own.</p>
Control/comparison characteristics	Participants provided with a brochure containing basic information about the importance of going to college and general information on costs and financial

	aid. Information included was readily accessible online and elsewhere. This brochure was also given to the treatment groups.
Outcome measures	Likelihood of submitting a FAFSA. College enrolment (Intention to treat) using data from National Student Clearinghouse. Financial aid receipt using data from DOE.
Results as reported by authors	<p>Likelihood of submitting a FAFSA. For dependent students: 40.2% of control group filed a FAFSA and 55.9% of FAFSA assistance group submitted FAFSA. For independent sample with no prior college experience: 13.8% of control group filed a FAFSA but 39.5% of FAFSA assistance group filed a FAFSA. For independent sample with prior college experience: 35.3% of control group filed a FAFSA and 55.7% of FAFSA assistance group filed a FAFSA. No effect of information-only intervention on submitting a FAFSA for any of sample.</p> <p>College enrolment. For dependent participants enrolment rates increased from 26.8% among the control group to 34.5% in the FAFSA assistance group. For the independent sample with no prior college enrolment the control group mean enrolment is 2.9% and the FAFSA assistance group is 3.5% which is almost significant ($p=0.14$). For the independent sample who had previous college experience the mean enrolment rate was much higher than that for other independents, but no significant differences between the treatment and control groups. (23.7% of control group and 24.3% of simplification and assistance group). Effect for information only treatment group is insignificant for all groups.</p> <p>Financial Aid Receipt: For dependent participants: 29.8% of control group received a Pell Grant. The FAFSA assistance treatment increased this rate by 9.8% to 39.6%. For independent participants with no prior college experience the estimated treatment effect is 2 percentage points. For independent participants who previously attended college the treatment effect was about 3 percentage points.</p>
Conclusions as reported by authors	<p>'The results of the H&R Block FAFSA experiment are unambiguously positive in terms of the effects of simplifying the financial aid application process combined with providing individualised aid eligibility information. The estimates suggest that the FAFSA simplification and assistance treatment had strong effects in terms of increasing college financial aid applications, improving the timeliness of aid application submission, increasing the likelihood of college attendance, and increased the receipt of need-based grant aid. This is true for students who were just graduating from high school and for most independent adults without prior college experience.'</p> <p>P 21</p>

Bibliographic details	Castleman, B.L., Arnold, K., & Lynk Wartman, K. (2012). Stemming the tide of summer melt: An experimental study of the effects of post-high school summer intervention on low-income students' college enrollment. <i>Journal of Research on Educational Effectiveness</i> , 5(1), 1-17.
Intervention(s)	'Active' Counselling
Outcome(s)	College enrolment
Research question	Do graduates who are offered active summer counselling the summer after graduation enrol in college at higher rates than those who do not? (p.4)
Study characteristics	
Country in which study carried out	US
Year in which study carried out	2008
Methodological characteristics	
Design	Individual RCT, stratified by school, half to intervention and half to control; groups tested for baseline equivalence on baseline characteristics: gender; ethnicity; SES; baseline level; IEP and whether they planned to go to college (Table 1)
method of assignment to condition	NS
blinded assessment of outcome	NS
attrition	NS
implementation fidelity	NS
Participant characteristics	162 students from 7 high schools; 43% male (intervention; 45% male (control); 29% black (intervention and control); 49% Hispanic (intervention) 40 Hispanic (control); 21% white (intervention and control); 68% FSL (intervention) 62% FSL (control); Best ACT level 14.6 (intervention) 14.5 (control)
Intervention: number and type of participants	NS
Control: number and type of participants	NS
Setting	Urban high schools; 'Big Picture' schools which emphasise personal growth and real world learning; low drop-out rate in BP schools.
Intervention characteristics	'Active' college counselling aimed at helping students address gaps in financial aid packages, information barriers, and social/emotional barriers to enrolment by trained counsellors. 'School-based counsellors worked with members of the treatment group throughout the summer to secure additional financial aid, complete necessary paperwork, and alleviate concerns about going to college' (p.6) Counsellors were broadly trained. 'Older alumni met with students to provide perspective on the college experience' (p.6) Counselling was available to all students but only the treatment group received pro-active outreach from the college/transition counsellors during the summer months. Students were contacted by phone, email, instant messaging, Facebook, personal contact through schools. Length of intervention: 10 weeks.

	84% of intervention group students met once, many met with counsellors multiple times. (p.7)
Control/comparison characteristics	Counselling was available to participants in the control group. 21% of control group students met at least once with counsellors. (p.7)
Outcome measures	Enrolment rates at college Enrolment full- or part-time Enrolment at college: type of course
Results as reported by authors	'Members of the treatment group were 14 percentage points more likely to enrol in college during the fall semester'. (p. 10 and Table 2) 47% of treatment group enrolled full-time compared with 32% of the control group. (p. 10 and Table 2) 41% of the treatment group attended four-year colleges and universities, compared with 26% of the control group. (p. 10 and Table 2)
Conclusions as reported by authors	Conclusions: '..for low-income students at BP high schools, active college counselling during the summer after high school graduation leads to substantially higher rates of college graduation. Equally important, college counselling during the summer months leads to better quality enrolment: Assisted students enrol full time and attend 4-year institutions at higher rates.' (p.12)

Bibliographic details	Myers, D., Olsen, R., Seftor, N., Young, J., & Tuttle, C. (2004). <i>The impacts of regular Upward Bound: Results from the third follow-up data collection</i>. Washington, DC: Mathematica Policy Research, Inc.
Intervention(s)	<i>Upward Bound</i> – comprehensive and intensive preparation programme for attending college for students from low-income backgrounds
Outcome(s)	College enrolment, postsecondary credits earned, high school credits earned
Research question	What effect does <i>Upward Bound</i> have on students' postsecondary experiences? Who benefits most from <i>Upward Bound</i> ? What is the association between staying in <i>Upward Bound</i> and student outcomes?
Study characteristics	
Country in which study carried out	US
Year in which study carried out	2000
Methodological characteristics	
Design	RCT with random selection of projects taking part and random selection of students at each project to intervention or control (which was also a waiting list group). Each project could request stratification (e.g., by sex, racial or ethnic group) to ensure balance of participants within the project.
method of assignment to condition	NS
blinded assessment of outcome	NS
attrition	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.
implementation fidelity	NS
Participant characteristics	2292 (To be eligible for participation students had to be either low-income or first generation)
Intervention: number and type of participants	I: 1265 (79% were low-income and first-generation, 4% were low-income only, 16% were first-generation only; 22% Hispanic, 22% White, 49% African American; 29% Male).
Control: number and type of participants	C: 1027 (79% were low-income and first generation, 4% were low-income only, 17% were First-generation only; 22% Hispanic, 20% White, 52% African American; 28% Male)
Setting	High school supplementary programme both after school and during summer.
Intervention characteristics	<i>Upward Bound</i> is designed to help economically disadvantaged student prepare for, enter and succeed in college. Students typically enter the programme while in ninth or tenth grade and can participate in the programme until the summer following twelfth grade). Usual participation is for around 21 months. Projects provide students with a variety of services, including instruction, tutoring and counselling. The project has regular scheduled meetings throughout the school year as well as an intensive instructional program that meets daily for

	about six weeks during the summer. Most projects are hosted by four-year colleges.
Control/comparison characteristics	<p>Students allocated to the control group serve on a waiting list for Upward Bound until the next enrolment period. If a position becomes free a student from the waitlist group is randomly selected to be offered it.</p> <p>2.2% of control group were allowed to attend the Upward Bound project by project directors. Around 1% of control group students reported having attended Upward Bound (although may not have been at projects in the trial).</p>
Outcome measures	<p>Preparation for college</p> <p>College enrolment</p> <p>The highest level of postsecondary education attended</p> <p>Initial progress in college</p>
Results as reported by authors	<p>Effects on postsecondary outcomes. Almost ¾ of students in both the treatment and control group attended postsecondary institutions. The program may have increased the percent of students attending four-year colleges by about 6 percentage points but the evidence is not conclusive.</p> <p>For students who had lower educational expectations when they applied to the program, it more than doubled the percent attending four-year colleges from 18 percent to 38 percent. It also raised the number of credits these students earned in 4 year colleges from 11 to 22. For students with higher educational expectations it had no effect on enrolment or credits earned.</p> <p>Effects on High School Outcomes. The program increased the number of math credits earned at high school by 0.2 credits but had no effect on credits earned in other subjects.</p> <p>For students with lower educational expectations it increased the number of credits earned in the five core subjects by 2 credits.</p>
Conclusions as reported by authors	Findings in the report suggest that for the average student, <i>Upward Bound</i> increased the number of high school math credits earned by participants, did not affect other measures of high school academic preparation, may have increased enrolment at four-year institutions, did not affect enrolment at postsecondary institutions more generally. The most notable effect of <i>Upward Bound</i> was to increase the likelihood of attending four-year colleges and universities relative to other postsecondary institutions for students with lower educational expectations.

RDDs

Bibliographic details	Curs, B.R., & Harper, C.E. (2012). Financial aid and first-year collegiate GPA: A regression discontinuity approach. <i>Review of Higher Education</i> , 34(4), 627-649.
Intervention(s)	Merit-based financial aid
Outcome(s)	Academic performance (first year GPA)
Research question	Does institutional merit aid have a causal effect on collegiate success as measured by a student's first-year grade point average?
Study characteristics	
Country in which study carried out	US
Year in which study carried out	1999-2000 and 2003-2004
Methodological characteristics	
Design	RDD
Assignment variable	High school grade point average
Assignment variable appropriate	Y; GPA is continuous and assignment was done before intervention. Cut point was based on GPA (4 bands). Amount of aid received varied with GPA increasing as GPA increased: 3.6-3.69 - \$2000, 2.7-3.79 - \$3000, 3.8-3.99 - \$4000, 4.0+ - \$5000.
True discontinuity	'Fuzzy' discontinuity, p.636
No manipulation of cut-off	NS
Composition of treatment and comparison groups does not differ in ways that would indicate selection bias	NS
blinded assessment of outcome	NS
Attrition	NS
Implementation fidelity	NS
Participant characteristics	Participants were 'out of state' freshman whose first enrolment occurred during fall term of the academic years 1999-2000 through 2003-2004. The average student received \$1221 in institutional aid with \$851 from the Dean's Scholarship. Low-income students were more likely (32%), and students of colour were less likely (22%) to be awarded a Dean's Scholarship when compared to the overall sample average (27%). 55% of sample female, 23% students of colour and average age at application 17.8. Average high school GPA 3.3 and average SAT score 1125. (p.634)
Total	2138
Intervention: number and type of participants	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
Control: number and type of participants	Less than 3.6 GPA (\$0): n=1524
Setting	University of Oregon
Intervention characteristics	'University of Oregon Dean's Scholarship was awarded to out-of-state students primarily on the applicant's high school GPA. Specifically, students with GPAs in the ranges 3.6-3.69, 3.7-3.79, 3.8-3.99 and 4.0+ received \$2000, \$3000, \$4000, and \$5000 in

	merit aid, respectively.' (p.631)
Control/comparison characteristics	Students with lower than 3.6 GPA did not receive any financial aid from the Dean's Scholarship.
Outcome measures	First Year University of Oregon Grade Point Average.
Results as reported by authors	\$1000 increase in financial aid increased college GPA by between 0.6 and 0.8 GPA points.
Conclusions as reported by authors	'..the findings support the idea that increased financial aid leads to increased academic performance as measured through first-year collegiate GPA' (p.639). 'Our results indicate that the institutional financial aid program at the University of Oregon is successful, not only at encouraging students to attend UO, but also at increasing their success as measured by first-year collegiate GPA. Further, we estimate that financial aid has positive effects on academic success for underrepresented groups' (p.642).

Bibliographic details	Goodman, J. (2008). Who merits financial aid?: Massachusetts' Adams Scholarship. <i>Journal of Public Economics</i>, 92, 2121-2131.
Intervention(s)	Massachusetts' Adams Scholarship – merit based financial aid.
Outcome(s)	Student reported post-secondary college enrolment intentions.
Research question	What effect does the scholarship program have on college enrolment?
Study characteristics	
Country in which study carried out	US (Massachusetts)
Year in which study carried out	2003-5
Methodological characteristics	
Design	RDD
Assignment variable	Massachusetts Comprehensive Assessment System
Assignment variable appropriate	Y (but complex due to different cut points in different districts. Based on scores on Massachusetts Comprehensive Assessment System (MCAS) with a personal and a district cut point).
True discontinuity	Y (only students above the threshold received intervention.)
No manipulation of cut-off	Y (exams for assignment variable taken before knowing about the scholarship.)
Composition of treatment and comparison groups does not differ in ways that would indicate selection bias	NS
blinded assessment of outcome	NS
Attrition	6% of students were excluded if they were missing MCAS scores, school district identifiers or post-graduation plans.
Implementation fidelity	NS
Participant characteristics	
Total	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).
Intervention: number and type of participants	NS
Control: number and type of participants	NS
Setting	Scholarship automatically awarded in fall of senior year for tuition at college or university in Massachusetts.
Intervention characteristics	Adams Scholarship program waives tuition for students at any of 15 two-year community colleges, 7 four-year state colleges, or 4 University of Massachusetts campuses. To receive students must be in the top 25% of their district as well as perform above a threshold in the MCAS. The tuition scholarship covered between 16% and 25% of direct cost of attendance at institution. To get the scholarship eligible students have to submit at FAFSA

	and enrol in college immediately following high school graduation. (p.2124)
Control/comparison characteristics	Did not receive access to the scholarship.
Outcome measures	Post-graduate intentions as reported by high school's guidance department.
Results as reported by authors	<p>With a linear fitting model, the RDD results suggest that the scholarship induced 7.6% of winners to enrol in four-year public colleges and 5.6% of winners to leave four-year private colleges. The RDD approach suggests that the scholarship did raise the proportion of students intending to attend college by 2-3 percentage points.</p> <p>Fitting a non-linear model the RDD found that 7.8% of winners switched between the four-year private and public college categories.</p>
Conclusions as reported by authors	<p>Approximately 800 of the students attending the University of Massachusetts on scholarships, largely from the 60-79th percentiles of academic skill, would have attended four-year private colleges had the scholarship not existed.</p> <p>Scholarship's primary effect was to move students from in-state private colleges to in-state public colleges. (p.2130)</p>

Bibliographic details	Nui, S.X., & Tienda, M. (2010). The impact of the Texas top 10 percent law on college enrollment: A regression discontinuity approach. <i>Journal of Policy Analysis and Management</i>, 29(1), 84-110.
Intervention(s)	Top 10% law
Outcome(s)	Enrolment at HE
Research question	To assess whether a new law in Texas guaranteeing a university place for students in the top 10% of their class increases enrolment from minorities.
Study characteristics	
Country in which study carried out	US, Texas
Year in which study carried out	2002
Methodological characteristics	
Design	RDD
Assignment variable	Class rank within individual Texan high schools. Cut-point at 10%.
Assignment variable appropriate	Y
True discontinuity	Y
No manipulation of cut-off	There does not appear to have been any 'gaming' of the assignment variable, as this was known in advance.
Composition of treatment and comparison groups does not differ in ways that would indicate selection bias	There is no 'clumping' of achievement around the cut-point.
blinded assessment of outcome	NS
Attrition	30%
Implementation fidelity	N/A
Participant characteristics	
Total	5,836 were sampled; 4939 were included in the analysis
Intervention: number and type of participants	725: 45% white, 11% black, 28% Hispanic, 15% Asian, 38% had parental education of college or higher, 82% owned home, 11% rented.
Control: number and type of participants	4214: 37% white, 19% black, 38% Hispanic, 5% Asian, 21% had parental education of college or higher, 70% owned home, 15% rented.
Setting	Texan high schools
Intervention characteristics	A guarantee of a place in a public Texan University for top 10% ranked pupils.
Control/comparison characteristics	No guarantee
Outcome measures	Enrolment at public university
Results as reported by authors	Top 10% law does not appear to affect the likelihood of enrolment at public flagships when analysis is conducted across all seniors. Established evidence of discontinuity at 10% class rank cut point for 3 subgroups: Hispanic students, those from predominantly minority high schools and those from high schools with average shares of economically disadvantaged students.
Conclusions as reported by authors	The law has increased university enrolment from Hispanic students and students who graduate from predominately ethnic minority schools.

Bibliographic details	Solis, A. (2011). <i>Credit constraints for higher education</i>. Evanston, IL: Society for Research on Educational Effectiveness.
Intervention(s)	Financial intervention: college tuition loans
Outcome(s)	College enrolment, progress and dropout rates
Research question	What are the causal effects of tuition loan access on college enrolment, college progress and dropout rates?
Study characteristics	
Country in which study carried out	Chile
Year in which study carried out	2006-9
Methodological characteristics	
Design	RDD
Assignment variable	Sharp RD design based on a natural experiment with analysis done for range of 4 points around the cut point.
Assignment variable appropriate	Y (assignment to intervention was done based on scoring at least 475 on the college admissions test-PSU)
True discontinuity	Y
No manipulation of cut-off	Y (tested whether PSU scores are not subject to manipulation around the cut off by looking at frequency distribution of scores)
Composition of treatment and comparison groups does not differ in ways that would indicate selection bias	Y (for all years high school GPA is higher for intervention group but only significant at 10% level for 2 point neighbourhood around the cut off. Students in treatment and control groups are not different in observables even when comparing 3 or 4 points around the cut point. Beyond 4 points the groups are different.) (p.15)
blinded assessment of outcome	NS
Attrition	NS
Implementation fidelity	NS
Participant characteristics	Students had to apply for benefits and belong to the lowest four income quintiles.
Total	For full sample 666,535. For sample around cut point 3,438.
Intervention: number and type of participants	NS
Control: number and type of participants	NS
Setting	Loan program for students applying to University.
Intervention characteristics	Two loan programs give tuition loans to eligible students: the Traditional Loan Program and the State Guaranteed Loan Program. To be eligible for these loans students needed to: apply for benefits; be classified in one of the poorest four income quintiles; and score more than 475 in the PSU test. The Traditional University Loan Program is managed by the universities, which decide the amount to loan to the student and are later in charge of the collection process. Repayment starts 2 years after graduation and instalments correspond to 5% of borrower's income. The loan costs around 2% per year with a maximum of 15 years of payments and afterwards the debt is written off. (p.8)

	The State Guaranteed Loan program allows private banks to give loans to eligible students that are guaranteed by the state and by higher education institutions. The interest rate is about 6% per year. Students start repayments 18 months after graduation in monthly instalments for 20 years. (p.9)
Control/comparison characteristics	NS
Outcome measures	College enrolment data from Ministry of Education
Results as reported by authors	<p>Students with loan access increase their enrolment probability by 21 percentage points which is equivalent to a 133% increase in the enrolment rate of the group without access to loans. Students from the poorest income quintile benefit more with a 150% increase in the probability of enrolment.</p> <p>Students with access to tuition loans also improved their progress in college. Eligible students increased their probability of enrolling for a second year by 33 percentage points, while the enrolment probability for a third year increased by 29 percentage points. Students with access to loans were 26 percentage points less likely to drop out after their first year and 25 percentage points less likely after the second year. (p.3)</p>
Conclusions as reported by authors	<p>Students eligible for tuition loans increased their enrolment rate by 21 percentage points from the enrolment rate of students without access to loans. These effects were stronger for the poorest quintile. When loan access was granted for students above the cut point, the college enrolment gap by family income disappeared.</p>

Appendix J: Data extraction forms for quasi-experimental literature

Bibliographic details	Brewer, E. W., & Landers, J. M. (2005). A Longitudinal Study of the Talent Search Program. Journal of Career Development, 31(3), 195-208.
Intervention(s)	Talent Search (career exploration and aptitude assessment, test-taking and study skills development, counselling, academic advising, financial aid workshops, cultural enrichment activities and job shadowing). University of Tennessee, Knoxville (UTK), 1980 – 1989.
Outcome(s)	Postsecondary education enrolment rates
Research question	1. What were the characteristics of Talent Search participants at UTK between 1980 – 1989? 2. How did participation in TS affect students' postsecondary education enrolment rates?
Study characteristics	
Country in which study carried out	United States
Year in which study carried out	Intervention between 1980 and 1989 – follow up data collected 1990
Methodological characteristics	
Design	Post hoc comparison between intervention and control
method of assignment to condition	Systematic sample (around 10%) of TS applicants who were eligible and chose to take up a place; compared with equal number of systematically sampled TS applicants who were eligible but chose not to take up a place.
blinded assessment of outcome	n/a
attrition	24% attrition from intervention; 55% attrition from control
implementation fidelity	Not within the scope of the study.
Participant characteristics	TS applicants assessed as eligible for TS, i.e. low-income, first-generation). Grades 7-12 at time of (eligibility for) participation.
Intervention: number and type of participants	758 participating TS applicants
Control: number and type of participants	450 TS applicants choosing not to participate
Setting	Intervention is delivered by UTK on campus or in high schools
Intervention characteristics	Students attended a range of activities, including but not limited to career exploration and aptitude assessment, test-taking and study skills development, counselling, academic advising, financial aid workshops, cultural enrichment activities and job shadowing (p.200).
Control/comparison characteristics	Students applied and were eligible for, but chose not to attend the above activities.
Outcome measures	Self-reported college enrolment status in 1990 (1 – 10 years from programme participation, depending on year of participation).
Results as reported by authors	93.8% of the TS participants had enrolled in

	<p>postsecondary education, in comparison with 42.2% of control group members who had enrolled in postsecondary education. Results from the χ^2 test indicated that the difference between these two frequencies was significant ($\chi^2 = 401.73$, $p < 0.001$). 76.4% of TS participants enrolled in 4-year colleges, compared to 14.2% of control group members who enrolled in 4-year colleges. Results of the χ^2 test revealed significant difference in these frequencies ($\chi^2 = 558.62$, $p < 0.001$). (p.203)</p> <p>A total of 189 TS participants received fewer than six interventions. Of those 189 participants, 174 (92.1%) were enrolled in postsecondary education. Participants who received 6 or more interventions totalled 554, of whom 523 (94.4%) were enrolled in postsecondary education.</p>
<p>Conclusions as reported by authors</p>	<p>First-generation college students from economically disadvantaged backgrounds face numerous obstacles to their enrolment in higher education. Results from this study strongly indicate that those obstacles can be overcome. Although the results from this study are not generalisable to all other TS programmes, they clearly assert the potential of educational opportunity programmes to have a significant impact on the lives of low-income, first generation college students. (p.205)</p>

Bibliographic details	Myers, C. B., Brown, D. E., & Pavel, D. M. (2010). Increasing access to higher education among low-income students: The Washington State Achievers Program. Journal of Education for Students Placed at Risk, 15(4), 299-321. doi: 10.1080/10824669.2010.532446
Intervention(s)	The Washington State Achievers programme (WSA): school-wide reform, financial scholarship and college preparation activities.
Outcome(s)	College enrolment (including 2-year vs 4 year and quality of college)
Research question	(a) To what extent did WSA participants and non-participants differ in types of college enrolment (none, 2-year or 4 year)? (b) To what extent did WSA participants and non-participants differ in the quality (inclusive, moderately selective or highly selective) of the undergraduate institution in which they are currently enrolled? (c) To what extent did selection, background, college preparation and funding, and school differences explain variations in these higher education enrolment patterns? (p.300)
Study characteristics	
Country in which study carried out	United States
Year in which study carried out	2006
Methodological characteristics	
Design	Quasi-experimental comparison between students who were offered participation in the WSA programme and received funding for college (funded achievers), students who were offered participation and received college preparation activities but not funding (non-funded achievers) and students in WSA schools who applied for but were not offered participation in the programme; using generalized multinomial logistic regression modelling. (p.308)
method of assignment to condition	Admission to the programme (see above)
blinded assessment of outcome	Yes – web survey with no researcher interference
Attrition	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
implementation fidelity	Administrative records were used to identify WSA funded achievers and non-funded achievers, so receipt of some treatment can be assumed. Monitoring of intervention delivery was not within the scope of the study. Regression variables included some survey items on whether students had received elements of the intervention (such as college 'foundational skills').
Participant characteristics	Participants were located in 16 WSA high schools (generally schools with a low-income population) in the state. Participants in the study were those who applied to

	become WSA achievers; indicating that they attend one of the 16 WSA high schools, are in the lowest 35% of Washington state income levels based on family size, and have the academic potential and intention to go to college in-state (p.304). Participants applied for the programme as juniors (age 16-17).
Intervention: number and type of participants	345 participants; an unspecified mix of funded and non-funded.
Control: number and type of participants	234 unsuccessful applicants. NB these participants were all in schools that had undertaken the WSA school-level reform programme.
Setting	The WSA programme was delivered within the 16 high schools. Some elements were delivered on campus.
Intervention characteristics	The WSA programme has three elements: (1) High school reform focussed on personalised learning environments and aspiration for all. (2) WSA achievers: mentoring and other college preparation. (3) WSA scholarship: financial grant
Control/comparison characteristics	Controls attended WSA schools so received the school reform element of the intervention, but did not receive the other elements.
Outcome measures	Attendance at college in the year following the intervention. Respondents reported a named college and researchers assessed college type and college quality (using Carnegie classification) (p.307)
Results as reported by authors	<i>Type of college</i> "Funded achievers were about 12 times more likely than non-funded achievers to attend a four-year college than not to attend at all. Funded achievers were also about 22 and 3 times more likely than non-recipients to attend a four-year college when compared to not attending or to attending a two-year college, respectively. The last significant difference was between non-funded achievers and non-recipients where non-recipients were 68% less likely to attend four-year colleges when compared to two-year colleges." (p.313) <i>Quality of college</i> "Non-recipients were less likely than non-funded achievers to attend a highly selective institution than a moderately selective institution, and funded achievers were more likely to attend a highly selective institution than an inclusive or moderately selective institution compared to non-recipients. The best fitting model continued to find no statistical differences between funded achievers and non-funded achievers in the quality of institutions they were attending." (p.316)
Conclusions as reported by authors	"The WSA Program is effective in promoting positive college-going enrolment outcomes for at-risk students." (p.317)

Bibliographic details	Olsen, R., Seftor, N., Silva, T., Myers, D., DesRoches, D., & Young, J. (2007). Upward Bound Math-Science: Program Description and Interim Impact Estimates (pp. 104): US Department of Education. , P.O. Box 1398, Jessup, MD 20794-1398.
Intervention(s)	Academic support, college familiarisation and career support with a maths/science focus (Upward Bound Math-Science)
Outcome(s)	Academic performance in high school, college attendance, quality of college attended (four year vs two year vs vocational college; selective vs non-selective), college completion, studying a maths/science field.
Research question	<ol style="list-style-type: none"> 1. What are the effects of UBMS participation on student performance in high school overall and in math and science courses in particular? 2. What are the effects of UBMS participation on college attendance, attendance at different types of colleges and universities, years of college, and college completion? 3. What are the effects of UBMS participation on the likelihood of completing a degree in math or science? (p.24)
Study characteristics	
Country in which study carried out	United States
Year in which study carried out	1998
Methodological characteristics	
Design	Retrospective comparison of Upward Bound Math-Science (UBMS) participants with non-participants, including a sub-group analysis of those who also participated in 'regular' Upward Bound, using propensity score matching and regression analysis.
method of assignment to condition	The study analysed the data collected as part of Myers, D., Olsen, R., Seftor, N., Young, J., & Tuttle, C. (2004) (see above), matching students who had chosen to participate in the UBMS programme with those who had not.
blinded assessment of outcome	n/a
attrition	One of the 62 qualifying projects failed to provide participant information. The survey collected 1425 responses from 1759 UBMS participants (19.0% attrition) and 2146 responses from 2830 controls (24.2% attrition). 1365 students attended identifiable postsecondary institutions and 1109 complete transcript records were obtained (18.8% attrition mostly attributable to random administrative issues.)
implementation fidelity	The study includes a survey of 81 UBMS projects, to which 74 projects responded. Some of these projects operated outside of the time period included in the quantitative study. The survey gives a broad range of detail about the participants and services of UBMS. Responses from individual programmes are not linked with programmes in the quantitative analysis.

Participant characteristics	To be eligible for Upward Bound (including UBMS) participants have to be from low income households (defined as income below 150% of the poverty line) or potentially the first generation in their immediate family to attend college. At least two-thirds of attendees must meet both of these criteria. Participants must have completed 8 th grade (age 13-14).
Intervention: number and type of participants	1759 UBMS participants Also participated in Upward Bound: 18%, Female: 59%, African American: 37%, White: 25%, Hispanic: 18%, Other race: 20%, Native English speaker: 80%
Control: number and type of participants	2830 controls Also participated in Upward Bound: 18%, Female: 59%, African American: 37%, White: 30%, Hispanic: 16%, Other race: 17%, Native English speaker: 86%
Setting	Around 90% of UBMS projects are hosted by four-year universities and colleges; most of the remainder are hosted by two-year colleges. Students attend a residential summer programme at the institution lasting six weeks on average. (p.14) Students may attend other activities at the institution during the year (although these are infrequent as most UBMS students will access these activities through regular Upward Bound).
Intervention characteristics	UBMS projects provide instruction that includes hands-on experience in laboratories, computer facilities, and at field sites. Opportunities are also provided to learn from mathematicians and scientists employed at the host institution or engaged in research or applied science in other institutions in the community. A six-week summer program providing intensive instruction in laboratory science and mathematics through precalculus is also offered. Some students who participate in UBMS summer programs are referred from regular Upward Bound programs and then return to those programs during the academic year. (p.ix)
Control/comparison characteristics	Control students were selected using propensity score matching on a range of criteria (see p.29 for details). Matching was conducted separately for those who had participated in Upward Bound to ensure a 100% match on this criterion. Control participants were not prevented from taking up other interventions, although the authors argue (p.24) that any alternatives are likely to be less intensive than UBMS.
Outcome measures	Maths and science courses taken in high school; Postsecondary attendance, persistence and completion; Postsecondary field of study
Results as reported by authors	There were no significant differences in the rate of maths course taking in high school, although significantly more UBMS participants took biology and chemistry classes ($p < 0.01$). (p.33)

	<p>UBMS participants were significantly more likely to attend postsecondary education (95% vs 90%, $p < 0.01$) and significantly more likely to attend a four-year college or university (82% vs 71%, $p < 0.01$). They were also more likely to attend more selective institutions (33% vs 23%) although this effect was not statistically significant. (p.34)</p> <p>Participants attending four-year college had completed significantly more years of college at the time of interview (2.9 years vs 2.4 years, $P < 0.05$) although the interviews were too early to determine ultimate completion rates for all participants. Of those who had completed a bachelor's degree, the rate for UBMS participants was non-significantly higher (35% vs 33%).</p> <p>UBMS participants were significantly (at $p < 0.01$ level) more likely to be studying maths or science in all institutions and specifically in four-year institutions.</p>
<p>Conclusions as reported by authors</p>	<p>"While the findings in this report are promising, a note of caution is appropriate. We speculate that the selection bias is likely to be largest for outcome variables most closely tied one's interest in pursuing math and science careers, but it is not possible to measure the selection bias. While we took several steps to reduce selection bias, the estimated effects of UBMS may overstate the true effects of the program." (p.39)</p>

Bibliographic details	Pharris-Ciurej, N., Herting, J. R., & Hirschman, C. (2012). The impact of the promise of scholarships and altering school structure on college plans, preparation, and enrollment. Social Science Research, 41(4), 920-935. doi: 10.1016/j.ssresearch.2012.03.007
Intervention(s)	The Washington State Achiever programme (WSA). Scholarship and mentoring at individual level and school reform model at school level.
Outcome(s)	(1) planning to attend 4-year college, (2) taking a college entrance exam (i.e. SAT, ACT), (3) enrolment in any college (2 or 4 year), and (4) enrolment at a 4 year college (p.923)
Research question	What is the effect of the presence of the WSA programme on the likelihood of students attending college? (p.923) (Considering the school as the unit of evaluation of the programme effect)
Study characteristics	
Country in which study carried out	United States
Year in which study carried out	2000 – 2006
Methodological characteristics	
Design	Clustered retrospective quasi-experimental comparison between students in three high schools that receive WSA and students in two high schools where WSA was not available. Outcomes for one cohort in each school are compared with outcomes for four cohorts in each school following the programme's introduction.
method of assignment to condition	Study participants either attended a WSA school or not. Schools in the study had taken part in the University of Washington Beyond High School project, an unrelated survey-based project; of the five schools taking part in WBHS project three were WSA schools and two were not.
blinded assessment of outcome	n/a
attrition	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)
implementation fidelity	This is not within the scope of the paper.
Participant characteristics	Students were eligible for the WSA scholarship and mentoring if family income was in the lowest one-third of the state income distribution. Students were selected for the programme using a competitive process. All students in WSA schools received the school reform element of the intervention. Participants were US high school seniors (age 17-18) at baseline.
Intervention: number and type of participants	2876 completed baseline survey (3 low income schools)
Control: number and type of participants	2742 completed baseline survey (2 middle income schools)

Setting	Washington state high schools
Intervention characteristics	WSA scholars receive a scholarship designed to cover all college expenses and local mentoring to assist with college application process. (p.922) WSA schools aim to create smaller more personalized learning communities that emphasized higher standards and expectations of all students. (p.922)
Control/comparison characteristics	Non-WSA schools that were taking part in the WBHS survey. These schools were more 'middle class' (study provides demographic data) than the intervention schools.
Outcome measures	Whether survey respondents were: (1) planning to attend 4-year college, (2) taking a college entrance exam (i.e. SAT, ACT), (3) enrolment in any college (2 or 4 year), and (4) enrolment at a 4 year college.
Results as reported by authors	Regression analysis: The most successful WSA high school (#1), which was only slightly, but significantly, below the non-WSA schools in 2000, caught up with and then surpassed the non-WSA schools. Students from high school #1 have much higher rates of college planning, preparation, and attendance than their peers in the non-WSA schools. These differences in 2005 are all significant. (p.928) The multivariate model testing program effectiveness shows: "that the WSA program was effective in WSA schools #1 and #3, but not in #2. The WSA effect was statistically significant in 2004 and 2005 for both 4-year college plans and having taken the SAT/ACT. In 2002 and 2003, the program had an effect only for SAT/ACT test taking and only for high school #1." (p.931)
Conclusions as reported by authors	After 4 years of the WSA program, there is strong evidence of a program effect in two of the three WSA high schools. One low income high school (#1), which was just barely behind the middle class non-WSA high schools at the outset, now has college going rates that exceed those of the non-program high schools. (p.932) In additional models not reported in detail, "the positive impact of a WSA school on postsecondary educational outcomes was entirely mediated by [an individual-level dummy variable for WSA scholars as a] covariate. So, there is no immediate evidence of a spillover effect on students who did not receive scholarships in WSA schools, but this cultural change may require a longer time horizon to take hold." (p.933)

Appendix K: Data extraction forms for UK-based interventions

Bibliographic details	<p>Byrom, T. (2009). "I don't want to go to a crummy little university": Social class, higher education choice and the paradox of widening participation. <i>Improving Schools</i>, 12(3), 209-224.</p> <p>AND</p> <p>Hoare, T., & Mann, R. (2012). <i>The impact of the Sutton Trust's Summer Schools: A report to the Sutton Trust</i>. London: Sutton Trust.</p>
Title of intervention or programme	Sutton Trust Summer School
Intervention type	1 week Summer School at end of Year 12
Intervention or programme characteristics	<p>Byrom, 2009: 5 summer schools at Oxford, Cambridge, Nottingham, Bristol and St Andrews.</p> <p>Hoare and Mann, 2012: Summer Schools (which have run since 1997) at 4 universities: St Andrews, Bristol, Cambridge and Nottingham. Oxford was also a part of the scheme for 10 years.</p> <p><i>'The Sutton Trust Summer Schools offer an opportunity for over 1700 young people each year to try university life. The one week taster courses consist not only of lectures, seminars and tutorials, but also a varied programme of social activities, to give participants an accurate idea of life as an undergraduate at a research-led university.'</i> (Sutton Trust website)</p> <p>Students with five or more GCSE's at A and A* grades can apply if they meet some or all of the other indicators of a non-traditional HE background:</p> <p>Attendance at a 'low performing school'</p> <p>Being in receipt of Educational Maintenance Allowance</p> <p>Having no parental experience of higher education. (p.3)</p>
Intended outcomes	<p>Byrom, 2009: 'Increasing the participation of students from 'non-privileged' backgrounds in elite HE.' (p 212)</p> <p>Hoare and Mann, 2012: Increase the probability of applying to one of the participating universities and leading universities more generally.</p> <p>Widening access from non-privileged and under-represented homes.</p>
Design of evaluation and actual outcomes	<p>Byrom, 2009: 16 students were tracked over 18 months following their participation in the Sutton Trust Summer School (no comparison group). The students' experiences of the process of applying to university and their first term of university life explored using qualitative data e.g. focus group interviews, individual interviews, journals, and email communications.</p> <p>The author looked at the role that The Sutton Trust may have had in the students' decision to enter HE. In particular, barriers to participation were explored.</p> <p><i>'The influence of The Sutton Trust in their (students) decision-making is therefore questionable as by the time of their participation, the decision to go to university had already largely been made.'</i> (p.220)</p> <p>Hoare and Mann, 2012: Hoare and Mann (2012) evaluated the STSS using a quasi-experimental design with two kinds of</p>

	<p>'inner' controls and two kinds of 'outer' controls. Although the design used for the formation of the control groups would have been susceptible to selection bias, the use of control groups in this design enabled evidence of the promise of the intervention to be demonstrated.</p> <p>'The summer school programme reaches its target group: over 90% of attendees met the programme's academic criterion and at least one of the socio-economic criteria. Just under half of all attendees met all four of the socio-economic and academic criteria.</p> <p>Summer school attendees were more likely to engage with the university application process overall: 93% ended up applying to - and 84% registering at - university, compared to 88% and 68% respectively of unsuccessful applicants to the programme.</p> <p>Summer school attendees were also considerably more likely to apply to - and end up at - leading universities than students in one of five control groups. Over three quarters (76%) of summer school attendees matched in the UCAS database went on to a leading university 1, compared to 55% or less of students in the control groups who did not apply to the scheme but who had similar academic and socio-economic profiles.</p> <p>Summer schools particularly increase the likelihood of students attending a summer school university, and especially their host university: of those who applied, 23% went to a summer school university, compared with 13% of unsuccessful applicants to the scheme and 7% in the control group.</p> <p>Summer schools make the biggest difference to the poorest students. Attending a summer school substantially narrows the gap in application and registration rates for those meeting all the Sutton Trust eligibility criteria, in receipt of Education Maintenance Allowance, from low participation neighbourhoods and with non-graduate parents. In some cases, the summer schools reduce completely the gap between the success of the more affluent students and those from non-privileged homes.' (p.2)</p>
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Bibliographic details	<p>Casey, R., Smith, C.P., & Koshy, V. (2011). Opportunities and challenges of working with gifted and talented students in an urban context: A university-based intervention program. <i>Gifted Child Today</i>, 34(1), 35-43.</p> <p>AND</p> <p>Pinheiro-Torres, C., & Portman-Smith, C. (2008). <i>Preliminary findings of a four year intervention programme for higher ability students</i>. Paper presented at the British Educational Research Association Annual Conference, Heriot Watt University, Edinburgh, September 3-6 2008.</p>
Title of intervention or programme	A University-based intervention program (Brunel University, UK)
Intervention type	4 year multi-faceted program at Brunel University
Intervention or programme characteristics	<p>Casey et al, 2011: 4 year programme, year 8 (age 12) of secondary school. 9-10 Saturdays per year. Taught mostly by University staff.</p> <p>'The three broad strands of the program included the following:</p> <p><i>Teaching of specific skills.</i> Sessions addressed basic subject knowledge and skill, critical thinking skills, problem-solving skill, presentation skills, study skills, and time management.</p> <p><i>Adult interactions and support.</i> Sessions included parent days, involvement of undergraduate mentors, career education, and outside speakers.</p> <p><i>Academically challenging activities.</i> Sessions focused on project work and peer group tasks.' (p.38)</p>
Intended outcomes	<p>Casey et al, 2011: 'The specific and interrelated aims of the program were to:</p> <p>raise academic achievement, raise aspirations and create higher expectations for the future, encourage orientation into higher education, and support students to engage with their learning.' (p.37)</p> <p>Pinheiro-Torres and Davies, 2008: 'Design and evaluate a multi-faceted 4 year intervention programme to raise students' academic achievement and aspirations. Consider issues relating to participation of these students in University education.</p> <p>Explore students' perception of self and their world.</p> <p>Offer a model for wider use, which could be replicated by practitioners in different settings and impact on policy and practice.' (p.3)</p>
Design of evaluation and actual outcomes	<p>Casey et al, 2011: Qualitative and quantitative data collected on 80 students from 8 schools in 2 urban areas of London. No formal comparison groups set up. 'Based on results of the national tests at the age of 11 and 14, it was found 90% of the students who participated and completed the intervention program, for at least 2 years, had either met or exceeded the targets set by the school, whilst only 22% of the rest of the gifted and talented group met or exceeded their target.' (p. 42)</p> <p>Pinheiro-Torres and Davies, 2008: Design experiment using quantitative and qualitative data:</p> <p>'After two years of this four year intervention programme, quantitative data collected does not show any major change.'</p> <p>'The qualitative data ... indicate positive change is taking</p>

	<p>place. The biggest change in the scholars is in enhanced confidence both on and off the programme. ' (p.23)</p> <p>'Scholars feel privileged to be studying at university, using university facilities and experiencing university-style sessions before most young people..... the scholars interact with students of similar ability, and feel able to display effort and their talents and abilities.' (p. 24)</p>
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Bibliographic details	<p>Doyle, M., & Griffin, M. (2012). Raised aspirations and attainment? A review of the impact of Aimhigher (2004-2011) on widening participation in higher education in England. <i>London Review of Education</i>, 10(1), 75-88.</p> <p>AND</p> <p>McCaig, C., & Bowers-Brown, T. (2007). <i>Aimhigher: achieving social justice?</i> Paper presented at the British Educational Research Association Annual Conference, Institute of Education, University of London, September 5-8 2007.</p>
Title of intervention or programme	<i>Aimhigher</i> (2004-11)
Intervention Type	<p>Doyle and Griffin, 2012: 'Typical interventions include: summer school experience on university campuses, master classes, campus visits, guest lectures and mentoring.' (p.76)</p> <p>Emphasis on local partnerships</p>
Intervention or programme characteristics	<p>Doyle & Griffin, 2012: '...localised interventions aimed at potential first generation entrants to higher education.' (p.76)</p> <p>Summer school experiences, master classes, campus visits, guest lectures, mentoring (p. 76)</p> <p>Regional partnerships: situating national policy within local priorities. (p. 77)</p> <p>McCaig and Bowers-Brown, 2007: '<i>Aimhigher</i> interventions do cover both academic and vocational projects, for example by identifying talented young people regardless of their socio-economic status, working to develop vocational pathways into HE and developing foundation degrees relevant to employment.' (p.2)</p>
Intended outcomes	<p>Doyle & Griffin, 2012: 'The purpose of the interventions has largely been a combination of attainment and aspiration-raising with target pupils, and owing to policy and funding cycles that require demonstrable results, has mainly focused on pupils in school years 10-12 (ages 14-16).' (p. 76)</p> <p>National policy translation into local practice based on local needs</p> <p>McCaig and Bowers-Brown, 2007: p. 2 'to help achieve the government target of 50% of 18-30 year olds having experienced higher education by 2010 (DfES, 2003)' (p.8)</p> <p>'Ultimately <i>Aimhigher</i> and other HE outreach activity will be judged on its success in narrowing the social class gap in achievement at all levels and, in particular, narrowing the social class gap in HE participation.'</p>
Design of evaluation and actual outcomes	<p>Doyle & Griffin, 2012: Review of 40 papers evaluating <i>Aimhigher</i>.</p> <p>'One-on-one mentoring was demonstrated to have substantial impact. This allowed for an individualised service through which students could assist those needing more guidance.' (p. 80)</p> <p>'In a national evaluation McCaig et al. (2006) found that 35% of HEI's attributed increased applications to their institutions to the impact of <i>Aimhigher</i> activities. The number was lower (23%) for students on vocational routes but this still demonstrates a perceived impact.' (p. 80) raising academic achievement within schools and aspiration raising (p. 81)</p> <p>McCaig and Bowers-Brown, 2007: Methodological review of</p>

	<p><i>Aimhigher</i> evaluations. ‘..the pre-92 universities engage only to the extent of widening participation by offering a limited number of places to the academically gifted while post-92s, though engaging in valuable development work on vocational pathways into HE and innovative curricula, merely provide more educated workers for the labour market. Given this set of circumstances it is perhaps unsurprising that <i>Aimhigher</i> fails to live up to its social justice potential’ (p.14)</p>
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Bibliographic details	Hatt, S., Hannan, A., Baxter, A., & Harrison, N. (2005). Opportunity knocks? The impact of bursary schemes on students from low-income backgrounds. <i>Studies in Higher Education</i>, 30(4), 378-388.
Title of intervention or programme	<i>The Opportunity Bursary Scheme</i> (first introduced 2001).
Intervention Type	Financial assistance via a bursary scheme for students from low income backgrounds.
Intervention or programme characteristics	<p>‘Limited financial support for students from low-income backgrounds: funds are administered by higher education institutions, resulting in differences in practice with respect to advertising and applying for the bursaries. Some institutions also supplemented their OBs with their own awards, so that more students could benefit from financial assistance.’ (p. 374)</p> <p>£2000 (£ 1000 in 1st year and £500 in Yr 2 and in Yr 3)</p> <p>In one example the OBs were advertised extensively in the local area (including contact with local schools)</p>
Intended outcomes	<p>Encourage HE applications from low income groups and educationally disadvantaged groups</p> <p>Help students complete their course</p> <p>Retain students from low income groups</p> <p>Give students ‘additional’ financial confidence</p>
Design of evaluation and actual outcomes	<p>Case studies of two institutions bursary schemes (using qualitative and quantitative data comparing bursary students with matched students not in receipt of a bursary. ‘The results are noteworthy: bursary students from low-income backgrounds are more likely to continue than those without an award. The difference between the continuation rates of bursary and non-bursary students is significant at each institution.’ (p. 832). Interview data ‘suggests that bursary students are well motivated and determined to succeed, but it is unclear whether this is due to the additional financial support or to the process of conscious choice through which they have entered higher education.’ (p.373)</p> <p>Evidence described as limited but still points to students even if only receiving a small amount of help being more likely to continue.</p>

Bibliographic details	Walker, L. (2000). Predicting or guessing: The progress of Scottish Wider Access Programme (SWAP) students at the University of Glasgow. <i>International Journal of Lifelong Education</i>, 19(4), 342-356.
Title of intervention or programme	Analysis of the performance of <i>Scottish Wider Access Programme (SWAP)</i> students, University Glasgow 1988-93, half attended the Pre-University Summer School.
Intervention type	Summer school which provides preparation and access for non-traditional students most of whom have backgrounds of socio-economic disadvantage.
Intervention or programme characteristics	<p>'Progress to Higher Education is promoted through offering guaranteed places to those who complete the access course.' (p. 345)</p> <p>Aims of the summer school are: to give students confidence in themselves and in their abilities to cope at university; and to allow those who have not reached the standards designated by admissions officers to have their applications reconsidered on the basis of their summer school reports</p> <p>'The Pre-University Summer School runs for nine weeks over the summer before the students enter university in October. Students study three subjects plus a study skills unit. Subjects are taught by university lecturers at first year university standards. The students also attend a week long plenary session which serves as a general introduction to undergraduate life.' (p. 346)</p> <p>'... the summer school was part of the pre-higher education aimed at those with entry qualifications but lacking certain personal skills or knowledge essential for survival in higher education.' (p.346).</p> <p>The Pre-University Summer School is seen as providing a link between degree courses and access programmes.</p>
Intended outcomes	'...to give students confidence in themselves and in their abilities to cope at university, and to allow those who have not reached the standards designated by admissions officers to have their applications reconsidered on the basis of their summer school reports.' (p.346)
Design of evaluation and actual outcomes	<p>Comparison of students who entered SWAP having attended the Pre-University Summer School with those students who entered SWAP without having attended the Pre-University Summer School.</p> <p>'... preparation given to the SWAP students through pre-university summer school had a positive effect on academic performance. Although the students were equally likely to leave they were considerably more likely to pass examinations.' (p. 356) 'The results appeared to offer some tentative conclusions as to possible predictors of likely levels of success to be achieved by the SWAP students in the survey who had not yet graduated. '(p.351)</p>

Bibliographic details	Wiggins, A., Jones, K., Ainsworth, P., & Kirk, A. (2012). <i>Sutton Trust Academic Routes - Lessons for university access</i>. Report to Sutton Trust. London: Sutton Trust.
Title of intervention or programme	<i>Sutton Trust Academic Routes (STAR)</i>
Intervention Type	Support programme and bursary, with summer residential
Intervention or programme characteristics	Guaranteed pathway to a place at a sponsoring university, for those completing the STAR programme; comprehensive support programme, including visits to university campus (subject master classes and immersion sessions), support for the university application process; summer residential with a focus on progression/transition support including finance, study skills, progression research and personal statements; mentoring; assessed interview; guaranteed compact offer (2 grades lower than standard offer for course) subject to successful completion of course elements including interview; bursary of £1500 (for students who meet or exceed the standard offer for their course)
Intended outcomes	'Increase students chances of gaining a place at a leading university' (p.3)
Design of evaluation and actual outcomes	Pilot RCT; high attrition (> 70%) led to collapse of the RCT

Appendix L: Glossary

Confidence interval: A confidence interval is a measure of uncertainty. Statistical estimate of intervention effects are bounded by sampling uncertainty. Consequently the point estimate of an effect is unlikely to be the 'true' effect. A confidence interval represents this sampling uncertainty. A 95% confidence interval represents the boundary within which the true estimate would lie 95 times out of a 100 if the experiment were repeated many times: the larger the study, the smaller the confidence intervals.

Effect size: An effect size converts a difference in means into a proportion of a standard deviation; this allows a comparison across studies that may use very different outcome measures.

Intra-cluster correlation coefficient: This is a measure of how similar in outcomes a group of participants are who share similar characteristics. For example, children in a class are likely to have more similar outcomes than other randomly chosen children. This is because they have the same teacher and have similar educational experiences so their outcomes are more similar to each other than would be expected by chance.

Meta-analysis: A meta-analysis is a statistical method of combining similar studies to produce a 'pooled' effect size or intervention estimate. This allows a number of small studies to be combined to give greater precision (i.e., smaller confidence intervals) of the estimated intervention effects.