The relationship between socio-economic disadvantage and the attainment gap in the English education system: Protocol for a systematic review

Principal investigator(s): Prof. C. Raffo, Dr. C. Cascella, Dr. O. Demkowicz, Dr. C. Emery, Dr. D. Harris, Dr. A. Hennessey, Dr. M. Pampaka with Prof. R. Lupton

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Background and review rationale

The strong relationship between socioeconomic disadvantage and low educational attainment is one of the most widely documented features of educational life, revealed in studies not only in England over time but across many industrialised countries (David, 2010; Gesthuizen et al., 2005, Bowden and Doughney, 2010; Demie and Lewis, 2010a &b).

For example, in England the gap in outcomes between those students from the least well-off and socially excluded backgrounds and their more affluent and more included classmates is already evident by the time they begin school, and worsens over the next 11 years of education. The gap upon which this review is focused is, in part, due to existing social and educational inequalities and their continued effects as pupils move through the school system. There is evidence that these ongoing gaps are hard for schools alone to reverse; but also that schools can and do narrow socioeconomic gaps for attainment. However, the *extent* to which schools can and do impact the gap remains debated. And although there is clarity about the nature of the link between socioeconomic disadvantage and attainment there is less clarity about how various explanatory mediating and moderating variables that modify or change that relationship interconnect in ways that can provide causal explanations about the gap.

Theoretical rationale for the review

In undertaking this study, we recognise the need to be explicit about key terms such as 'socioeconomic disadvantage' and the educational 'attainment gap'. In the context of this study, we take socioeconomic disadvantage to mean impediments to education arising from social or economic circumstances that prevent students from deriving appropriate benefit from education in schools. The socioeconomic attainment gap refers to the differences in educational attainment between more and less socioeconomically affluent young people throughout their life course. For the purposes of this study, we are classifying these attainment outcomes according to educational level: early years (for example, early years development goals), primary education (for example, KS2 outcomes in maths and English), secondary education (for example, GCSE attainments), and post-16 (16–18 educational outcomes). The distinction between more and less socioeconomically affluent young people is frequently operationalised in the U.K. as those who are eligible for free school meals (FSM) and those who are not (non-FSM). Such eligibility is a measure that correlates with low parental income and has been commonly adopted as a proxy indicator of potential socioeconomic disadvantage, particularly in educational research (Gorard, 2012). While this simple binary measure is not without its limitations, it does provide a reliable indicator of socioeconomic disadvantage (Taylor, 2018) and is widely associated with a significant attainment gap (EEF, 2017).

There is a continuing challenge for educational empirical research to provide causal explanations based on appropriate social theory and empirical evidence that might suggest how and why a variety of factors interconnect to influence the link between socioeconomic disadvantage and educational attainment (for example, Raffo et al., 2007). Most importantly, such research is also about generating causal explanations that deal with both the commonalities (captured by aggregate macro socioeconomic indicators) and the differences—observed and measured through the mix/interactions of individual and contextual factors including family, school, culture, and so forth—of socioeconomically disadvantaged young people that result in different attainment outcomes.

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Background evidence

Statistical (quantitative) evidence on factors that influence (or relate to) the link between socioeconomic disadvantage and educational attainment

Although the link between socioeconomic disadvantage and educational attainment is well established (EEF, 2017), the nature of this simple between-group (FSM/non-FSM) difference has always been complex with direct implications on the effectiveness of interventions intended to bridge this gap. (Appendix 1 documents our scoping review of reviews that provides an introductory list of factors that influence the attainment gap.)

A recent meta-analysis (Ashraf et al., 2021) looking at the impact of 88 EEF trials focusing on FSM pupils reported an overall positive impact (pooled effect size 0.06: 0.03, 0.08) of interventions on literacy outcomes but no overall impact for mathematics on this disadvantaged student group. Their 'analysis of the attainment gap indicated that literacy outcomes for FSM pupils were improved by interventions marginally more than for non-FSM pupils' (p. 1) with consistent estimates across different methodological approaches according to the risk of bias assessment.

The complexity and challenges in understanding the source and dynamics of these relationships is reflected in numerous studies that focus on different, and at times interconnected, explanatory variables. These usually reflect aspects of the individual, societal/cultural, education system, and educational practice factors as reported in a recent synthesis of this evidence for the U.K. (Crenna-Jennings, 2018). When also including international literature, Cooper and Stewart's (2021) systematic review provided evidence of the impact of household income on children's developmental outcomes (cognitive development, social-behavioural development, and health): they drew on 54 RCT, quasi-experimental, or longitudinal studies from EU and OECD countries. They also found evidence of a positive causal effect of income on what they called 'intermediate outcomes' for children's development, which include maternal mental health, parenting, and the home environment. The other two relevant recent reviews (meta-analyses) on narrowing attainment gaps (Gorey, 2009; Jeynes, 2015) come from the U.S. and focus on the white versus black/latino groups achievement gap in the U.S. The results of Jeyne's (2015) meta-analysis of factors most related to reducing the achievement gap points to similar factors (for example, classroom structure, cultural factors, curriculum, family, expectations, and so forth) as those reported for the U.K. (Crenna-Jennings, 2018). The difference in the conceptualisation of the gap, though, (that is, as a function of race/ethnicity in U.S.) indicates the intersectionality within which attainment gaps are to be conceptualised in general but also within particular contexts (for example, Strand, 2014).

In the plethora of literature and related syntheses of the evidence, various terms have been used to denote the relevant 'factors': 'key drivers', 'determinants', 'associates', 'covariates', 'intermediate outcomes' (Cooper and Steward, 2021), 'primary' and 'secondary' effects (for example, Bukodi et al., 2021; Early et al., 2020), 'moderators', 'mediators', 'causal effects', and so on. The variety and sometimes inconsistency in terminology does not help to provide a basis for a systematic review. We thus opt for a more 'quality-substantive' classification of these variables in regard to their function in the different studies. From this perspective, we encounter variables that establish processes such as 'how' (for example, the quality of teaching) or 'why' (for example, young people's aspirations) any variable, or combination of variables together, predict differential educational attainment outcomes

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for socioeconomically disadvantaged pupils compared to their more advantaged peers. In addition, there are approaches that focus on 'when/where' (time and context, for example, primary versus secondary schooling or London versus Manchester) or 'for whom' (in terms of gender, ethnicity, or (dis)ability, for example) a variable is more strongly associated with attainment differences between groups. All these variables together paint a complex picture of the connections and interactions between young people's characteristics, the places in which they live, and the schooling quality in those places. Given the complexity of the field, the first work package (WP1) will systematically review—and potentially meta-analyse—the evidence about the attainment gap in ways that explore the interconnected and varying impacts of the different factors in this gap at the different educational levels and contexts.

Explanations for the attainment gap

Given the quantitative evidence documented above, a number of questions need to be asked about the explanations that attempt to provide a sequencing of events that pertain to such connections and outcomes. For example, how do various factors interconnect in the lives of young people, and what is the importance of any link or process in the chain or web of influences? Although quantitative studies document the underlying characteristics and connections, many often only provide a limited set of reasons. In response to this challenge the research team undertook a scoping review of relevant reviews (both quantitative and qualitative evidence syntheses, see Appendix 1 for the list) that explored the link between socioeconomic disadvantage and educational attainment. The following list provides our summary of some of the explanatory factors documented in those reviews.

Individual characteristic:
- Sex/gender;
- ethnicity;
- disability, special educational needs (SEN), or English as an additional language (EAL); and
- temporary immigrant or guest workers status.

Out of school explanations for attainment gap:
- perinatal factors—smoking, birth weight, breastfeeding;
- physical home environment—cold, damp, or cramped and overcrowded living, lack of computer or internet resources, lack of toys, lack of nutritious food, housing affordability, and homelessness or mobility;
- social home environment—parental psychological and physical functioning and behaviours (for example, inter-parental conflict), victimisation or abuse, attitudes and aspirations in the home, childrearing strategies (concerted cultivation, extra-curricular, authoritative parenting), lack of role model visibility, family structure, parental (mother) qualifications, adverse childhood experiences, lack of supported home learning (for example, homework), carer responsibilities, looked after children;
- physical wellbeing—health conditions such as asthma, eyesight, effects of FSM/SES on interacting biological systems underlying child development;
- mental wellbeing—general sense of alienation, social difference and stereotype threat, locus of control, sense of belonging, anxiety;

- peer groups—socialising impacts of norms, values, and behaviours in or out of school, issues of social and cultural capital within and beyond schooling, bullying (including cyber);
- mobility—school changes, friendship groups, learning orientations;
- neighbourhood and community effects—social: norms and community social capital/collective efficacy, economic: levels of work opportunities, physical: green space, levels of pollution, and cognitive/physical impairment, infrastructure and amenities; and
- persistent disadvantage versus intermittent disadvantage.

Schooling variables, processes, and systems for the attainment gap:
- school practices—poorer teaching quality, unconscious bias/expectations, attainment grouping, restricted curriculum, uniforms/resources/extra-curricular costs, leadership, organisation model, size and climate, perceived discrimination, oppositional culture; and
- school systems—differentiating impact of the assessment system (for example, highly academic), associated progression routes through various school phases, into further education and higher education and employment, the allocation of teachers to schools in disadvantaged areas, school funding formulas, levels of school exclusion, quality and accessibility of early years provision, impact of accountability systems, and so forth.

Critical explanations for the attainment gap:
- educational access, opportunities and outcomes related to choice, standards and the market that favour the middle classes;
- critical race theory and ethnic disadvantage, FSM and educational underachievement;
- geographic, political, or educational forms of exclusion—not just about FSM/SES but also about inequalities pertaining to each domain that excludes; and
- deficit explanations and interventions developed to solve the problem more likely to reinforce stereotypes.

Resilience and 'bucking' the attainment gap:
- social ecological/transacted resilience—social, cultural, and economic affordances and constraints; and
- moderating risk variables—caring adult relationships, and so forth.

Age-specific factors:
- preschool and primary years—the interconnected living/lived milieu of the child in and out of school: issues of general wellbeing and progression;
- the widening of the gap from primary to secondary schooling;
- prior Key Stage (KS) attainment; and
- quality and accessibility of early years provision.

Even though the above list is helpful as a starting point to explore potential influencing factors, it does not necessarily establish causes or interconnections between them. Qualitative studies and theoretically focused research in many respects attempt to make up this explanatory shortfall. Many use sociological explanations that utilise social stratification and reproduction theory to articulate how

and why middle- and working-class young people differ in what they do and how they achieve in schools (Bourdieu and Passeron, 1979; Reay et al., 2011). There are also ethnographic accounts that point to the specific micro-manifestations of poverty in the social relations that make up pupils' lives and which are theorised as being central to their socialisation and particular forms of behaviour, including their school behaviour (Brown, 2014). Social psychologists often utilise ecological theory (Bronfenbrenner, 1979) to explore the nested connections between the individual and the various levels and aspects of societal life, showing how the different mechanisms between various levels of societal activity impact individuals and their education. Moreover, for many psychologists the focus is on issues associated with the individual including notions of self-efficacy (Bandura, 1982), self-determination (Ryan and Deci, 2000) and self-regulation (Schunk and Zimmerman, 2007) that together influence educational engagement and attainment. Given the diversity of explanations and approaches, a second work package (WP2) will synthesise conceptually these understandings.

The challenge of establishing causal explanations—synthesising quantitative and qualitative evidence

At the heart of this research proposal is the development of a generalising set of causal explanations about the attainment gap that can aid policymakers and practitioners to think about the nature of any interventions being developed and implemented in the field. This means recognising which variables are quantitatively important for detailing the attainment gap link and, secondly, which set of explanations are most developed, coherent, and theoretically and empirically appropriate for interpreting and suggesting explanations for how such variables work in practice. The combination of such research is at the heart of developing causal explanations. Such explanations are ones which:

> '(a) are founded on, and draw from the most robust theory (e.g. that theory embraces intentionality, agency, interaction as well as structure i.e., micro and macro factors) (b) explain all the elements of the phenomenon, i.e. that fits the explanandum and data more fully than rival theories, (c) is tested in contexts and with data other than those that gave rise to the theory and causal explanation' (Morrison, 2021).

Given such a challenge, there is growing evidence of the need to synthesise qualitative and quantitative evidence to enable such causal explanations to be developed—what has been termed 'mixed research synthesis' (Sandelowski et al., 2006). Such an approach provides ways of developing complementary evidence about the central importance of explanatory variables and also how they then might causally interconnect to provide appropriate explanations.

A segregated mixed research synthesis (Sandelowski et al., 2006) as a third work package (WP3) is suggested for this study as we recognise that qualitative and quantitative studies in this field of research are often different entities and, therefore, need to be treated separately. This suggests that studies that focus on the attainment gap quantitatively need to be screened, selected, and then synthesised separately from studies that are qualitative in nature. It is only once separately synthesised accounts have been generated that the separate synthesis products can themselves be then synthesised. Such an approach also recognises that qualitative and quantitative findings around the attainment gap are often complementary and require a predominately configured rather than an assimilated mixed research synthesis.

The issue of complementarity rests on the view that qualitative and quantitative research on the attainment gap often do not address the same specific questions, with each focusing on a different sort of curiosity. Because they address different aspects or dimensions of the attainment gap phenomenon, qualitative and quantitative research findings can only generally complement each other. Complementarity here rests on the conception of findings as related to each other—in that they are in the same attainment gap domain but not as addressing the same aspects in that domain (Hara, 1995; Plano Clarke, 2019). An example of complementarity is when a set of qualitative neighbourhood effects studies might focus on young people's socialisation processes around educational engagement and aspiration, whereas a quantitative study might explore the variation in attainment between neighbourhoods via the variables that might pertain to such places. Such studies might then be seen as complementary in terms of explanations and observations. Quantitative findings indicate 'that-knowledge', for example, that living in particular parts of the country with particular demographic variables will result in particular aggregate levels of educational attainment while qualitative findings indicate 'why-knowledge', for example, the historic, ongoing, or changing socialisation processes in such places that might explain these observations through, perhaps, interconnecting issues of agency and structure and culture of such places.

Qualitative and quantitative findings are viewed as addressing different aspects of the attainment gap in a complementary relationship. For example, qualitative findings about neighbourhood effects might be positioned as delineating the conditions for the occurrence or the nature of variables associated with events depicted in quantitative findings. Hence findings conceived in such a way are seen as complementary and cannot be reduced or directly assimilated into each other. Instead, they can only be reconfigured into a coherent whole by undertaking a critical interpretive synthesis—one that configures the complementary syntheses into a line of argument. This would contain a network of constructs and explanations connecting the syntheses in such a way as to provide a causal understanding of the attainment gap.

Objectives

The review's objectives are guided by the key research question: 'What are the factors that influence the attainment outcomes of socioeconomically disadvantaged pupils compared to their more socioeconomically advantaged peers?'

The following sub-questions are also defined:

1. What are the mediators and moderators of the link between socioeconomic disadvantage and educational attainment (WP 1)?
2. How do these mediators/moderators together or separately explain the socioeconomic attainment gap (WP 2)?
3. Which explanations are the most rigorous in terms of providing an evidence base for generating causal explanations that hold across subgroups of socioeconomically disadvantaged young people (WP 3)?

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Methodology

This section provides the logic to the overall review including general details for each of the work packages and how they interrelate and what the nature of the study design is, the outcome of interest, and other criteria.

Logic of the overall review

The evidence synthesis and conceptual review will involve a combination of methods initiated with a common search and initial screening task (Task 0), which will inform two parallel and interacting approaches: a systematic review of quantitative evidence (as in conventional reviews) (WP1) and a conceptual review of previous reviews and quantitative, qualitative, and mixed methods evidence (WP2). Based on a mixed research synthesis approach, the final component of the study (WP3) will combine the findings from WP1 and WP2 to produce causal explanations of the attainment gap.

Given the complexity of the topic, the methods for performing this review and synthesis for WP1 will draw on guidelines for advanced and high quality meta-analytic methods (for example, Higgins et al., 2019; Pigott and Polanin, 2020), particularly in regard to the use of explanatory factors (mediation, moderation, association/correlation) (Holland et al., 2017; Kraemer et al., 2008) and exemplar reviews that focus on topics associated with the utilisation of moderation and mediation definitions and approaches (for example, Reyno and McGrath, 2006; Lundhal et al., 2006; Quin, 2017).

After retrieving relevant empirical and/or theoretical research studies that explore the relationship between educational attainment and disadvantage, we will then, through WP2, systematically identify and narratively synthesise the conceptualisations of various explanatory variables and theorisations associated with those variables that explicitly seek to explain the attainment gap. These conceptualisations and theorisations will be based on robust research methods and document when, why, how, and in what ways socioeconomically disadvantaged young people are enabled or constrained in relation to success in formal education across the age range. This type of review is known as a 'conceptual synthesis' (Nutley et al., 2002) of research evidence. A conceptual synthesis differs from both traditional narrative reviews of research and from systematic reviews in that it is concerned not only to synthesise the substantive findings from research but also to identify the conceptual or explanatory bases out of which they have emerged.

The comprehensive search in Task 0 will provide the evidence base for the quantitative systematic review in WP1 and the basis for locating the key items for the conceptual synthesis in WP2. 'Key' in this sense refers to pieces of research literature that are particularly illuminating of assumptions, mediators/moderators, or which review the research within a conceptualisation, or which have been particularly influential in determining the direction taken by research.

WP3 (aiming for causal explanations) will include an initial mixed research data synthesis that will develop complementary syntheses (see pages 26–27 for more detailed explanations) that connect quantitative and qualitative evidence and explanation from WP1 and WP2. In order to move to developing causal explanations, WP3 will then introduce a structured critical interpretive and configured synthesis (CICS) of the complementary syntheses. In essence this means developing a further synthesis by articulating a network of constructs and the relationships that connect and configure the separate complementary syntheses. In many respects this can be understood

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as configuration of syntheses that arranges the complementary syntheses into a line of argument (see Noblit and Hare, 1988)—one that contains both theory that posits an explanation of relationships among complementary syntheses and a narrative that posits a temporal ordering of such relationships. Together, such a CICS will provide the evidence base for documenting a generalised causal understanding of the attainment gap.

A diagrammatic representation of causal explanations based on the theoretical framework will also be provided indicating where possible the interconnection of factors and their relative predictive strengths.

In considering the above, the work will be implemented within four interconnected work packages outlined below and connected via common tasks.

WP0: Initial scoping—review of reviews

Task 0: Search and screen for relevance—coding key information

WP1: Systematic review   WP2: Conceptual synthesis

Quantifications   Explanations

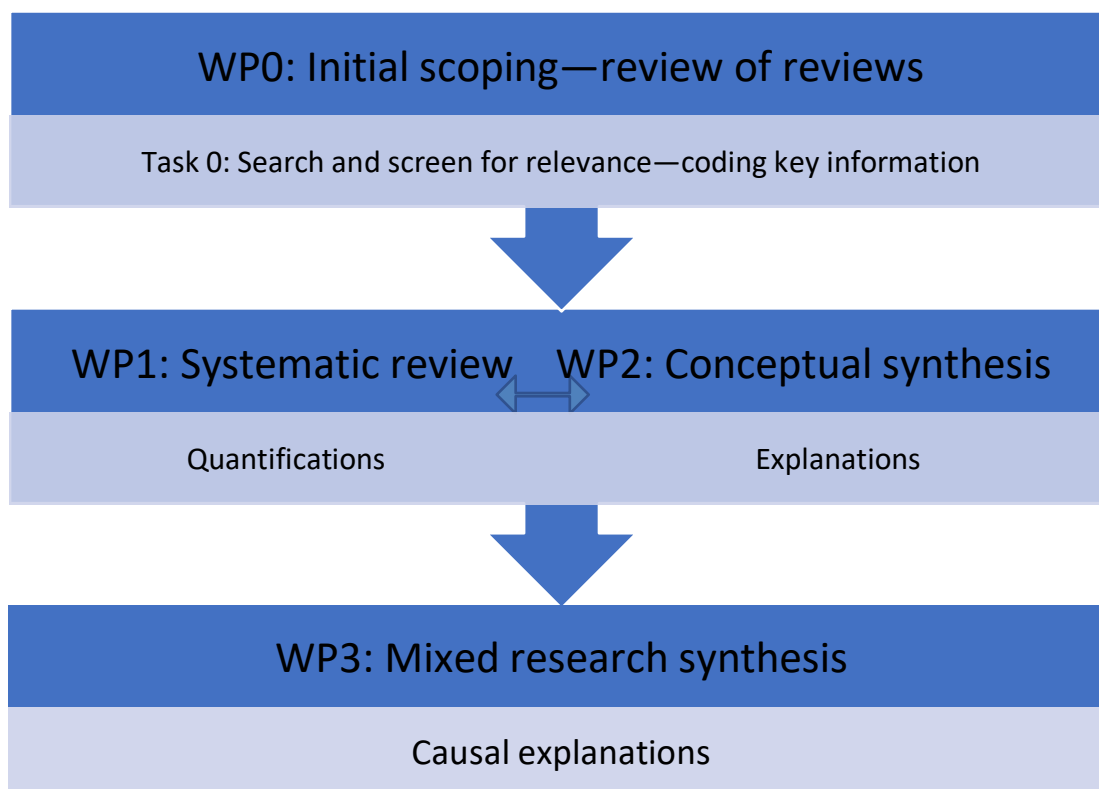**WP3: Mixed research synthesis**

Causal explanations

Figure 1: Flowchart of work packages

WP0 involved the scoping exercise with a review of reviews which informed the criteria and details provided in this protocol. Next we present the inclusion and exclusion criteria, separating out, where necessary, those that are different for WP1 and WP2.

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Overall inclusion and exclusion criteria

Population sample

Studies are of interest for the review if they focus on 3- to 18-year-old students, children, or young adults located in England and the other nations of the U.K. University-focused studies with first year undergraduate students (who are likely to be within the prespecified age of interest) are excluded. International comparative studies with results from the U.K. or any of the U.K. nations, for example PISA, TIMMSS, and so forth, will also be included.

Outcomes

The outcome of interest is attainment as defined within the following inclusion and exclusion criteria:

- Include studies that are focused on educational attainment outcomes of 3- to 18-year-olds, in particular national tests such as KS SATs and GCSEs and educational outcomes for 16- to 18-year-olds.
- Include studies that report results from measuring attainment via tests (including standardised tests, international assessments, and school examinations) in any curriculum subject.
- Include studies that report results from cognitive ability tests as these are used in schools for measuring progress and also for setting children. Such tests are also used in national surveys (for example, those in the millennium cohort study, as reported in Moulton et al., 2020). These would allow capturing the full life-course of pupils as national tests are only sat at certain time points. We expect this to include tests that are administered verbally by teachers or marked by teachers (for example, The Research-Based Elementary Math Assessment).
- Exclude studies focusing on non-cognitive outcomes, aspirations, and other socio-emotional 'learning outcomes' such as attitudes and dispositions, and studies focusing on 'destinations' (for example, either into higher education or employment) beyond the specified age range.
- Exclude studies that use observational protocols and holistic teacher judgements as well as quantitative aggregation of marks from multiple test items (for example, the Early Years Foundation Stage; DfE, 2020). There is evidence to suggest particular difficulties in guaranteeing the validity and reliability of these measures (Harlen, 2004).

For the purposes of this study we also need to define socioeconomic disadvantage as a key variable of interest related to the outcome. Therefore, studies are only eligible if they report on socioeconomic disadvantage using *any* SES measure. Anticipated variables include, but are not limited to, the following individual or small-area based measures or indices used in the context of other systematic reviews and/or for the definition of disadvantage for Pupil Premium allocation (Craske, 2018; Taylor, 2018; Qualter et al., 2021; Foster et al., 2021; Wu et al., 2015; Boliver, Gorard and Siddiqui, 2022):

- FSM/non FSM distinction—including FSM recorded in last three years, last six years or 'ever';
- parental employment status—for example, Highest NS-SEC of parent/carer;
- parental educational level—for example, highest qualification of parent/carer;
- children in care (looked after children);
- children with parents in the military (service children);

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- living space (for example, Foye, 2017);
- income (family) or family affluence scale;
- Index of Multiple Deprivation (IMD);
- Index Deprivation Affecting Children Index (IDACI); and
- POLAR2—youth participation rate, YPR, and adult higher education rate, AHE.

As noted, the list is not exhaustive but will inform the list of keywords for searching (as described later). We should also note that those indices not directly associated with SES—for example, children in care and children with parents in the military—will not be included in the keywords (but will be considered when included by proxy in overall Pupil Premium analysis).

Phenomena of interest

WP1 will focus on synthesising studies that quantify the relationship between attainment gap and other factors, whether this is causal or simply associative, as a starting point. During the analysis of these findings—and the coding schemes detailed later—we will be able to classify the type of these relationships: associates, (causal) risk factors, moderators, and mediators (Murray et al., 2009; Kraemer et al., 2001).

We consider all these relationships to be informative for the overall synthesis and the causal explanations (WP3). For the purposes of this study, therefore, we perceive mediating and moderating variables as those which explain the process through which socioeconomic disadvantage and educational attainment are related (mediator variables) and those that affect the strength and direction of that relationship (moderator variables).

In regard to how we envisage encountering these terms in the literature, it is worth noting:

- the terms 'moderator' and 'mediator' are not used consistently in (quantitative) studies and sometimes one has to infer from the context or the reported model;
- under some analytical frameworks (such as regression or GLM) mediation is established or quantified by comparing multiple models—for example, with and without the mediator;
- moderation is usually quantified with complex interaction terms (in regression models); and
- many studies will have missing moderators or mediator variables that might be pertinent to an exhaustive explanation of the attainment gap.

On the basis of the above, we consider as relevant for our systematic review any study that somehow quantifies the association of interest (see Figure 2 for a simple schematic); this also implies that studies without any moderators or mediators (that is, missing) will be considered to understand the intensity of the link for the population as a whole.

Figure 2: Simple mediation model

Including studies without moderators or mediators is also in agreement with standard criteria for establishing mediation (Baron and Kenny, 1986) where mediation is tested through three regressions with associated criteria as noted in Table 1.

Table 1: Statistical criteria for mediation (Baron and Kenny, 1986)

Equation	Criterion
1: SES predicting attainment outcome	SES significantly influence the outcome
2: SES predicting the mediator variable(s)	SES significantly influence the mediator
3: SES and mediator variable(s) predicting the attainment outcome	Mediator significantly influence the outcome
Complete mediation: SES no longer predicts the outcome in Equation 3. Partial mediation: The influence of SES is reduced in Equation 3 (compared to Equation 1).	

We should also consider as an additional criterion that SES precedes the mediators (Kraemer et al., 2008) as well as the modifications suggested by Kraemer et al. (2001), known as the MacArthur modifications, for assessing moderating effects and other ways variables interact (or not) to affect an outcome. The list below is an example considering risk factors (SES and A for 'other factors') for an outcome (attainment). We will further consider the proposed definitions of how risk factors can work together to affect the outcome as noted in Table 3, Kraemer et al., 2001:

- A is proxy risk factor for SES for attainment outcome;
- SES and A are overlapping risk factors (no temporal precedence, correlated, for example, A might be parental income);
- SES and A are independent risk factors (no temporal precedence, no high correlation);
- A is a mediator of SES (as in Baron's table above); or
- SES is a moderator of A (via interactions).

In sum, for WP1 we will be restricted to reviewing studies which quantify the association and impact of SES and other explanatory variables (purposely not defined as moderators or mediators at this stage) on attainment outcomes.

For WP2 we will consider qualitative studies and theoretical work which may or may not necessarily relate to quantified evidence and yet provide explanations for the gap. The general criteria for including such studies is that they should explicitly conceptualise and explain the attainment gap.

Study design

As a whole, this review does not exclude any study on the basis of its methods, so long as these are appropriate to the study aims, and the study design and reporting is robust (as indicated by Research Excellence Framework criteria for rigour).[1] As with risk factor research (Murray, Farrington and Eisner, 2009), this review involves events or social phenomena such as family circumstances, parental behaviour, peer pressure, and group membership, or even place of residence and environmental factors that cannot be randomly assigned. This therefore suggests that observational studies and other qualitative or mixed method studies will be considered as long as they meet the inclusion criteria documented earlier and later.

However, there are further considerations in this regard depending on the purposes of each WP, which will inform the types of studies to be included within each. These are detailed below.

WP1

Studies that help answer RQ1 should quantify the attainment gap through an analysis of factors that are related to it and its change (upward or downward) over time. The following inclusion and exclusion criteria will be used for the selection process:

- inclusion—studies which examine the direct relationship between educational attainment and SES variables, either cross-sectionally or over time; and
- exclusion—studies that do not examine the direct relationship between attainment and SES variables and treat either attainment or SES variables only as moderators or control variables within models of other outcomes.

We therefore consider as relevant for inclusion in WP1 any study with a quantitative element either in the form of subgroup comparisons of attainment involving SES groups or at least one statistical model with attainment or attainment difference, gap, or progress as an outcome. This is expected to include primarily evaluations (experiments, RCTs, and so forth) and survey studies (cohort, cross-sectional).

EEF evaluation reports will be considered separately for reviewing and coding purposes for this review. As an example from EEF evaluations, potential mediating factors may be identified with the comparison of FSM coefficient between the ITT models (included as a default) and further models which may include additional variables (this of course depends on whether such models are published with the reports). As shown with the example in Box 1, taken from Pampaka et al. (2021), the ITT model (Equation 1) and in particular the coefficient for FSMever will be compared to the various models reported with the specification noted with Equation 5, and while coding the extra variables denoted with vector X, the changes in the coefficient of FSMever will also be recorded to quantify potential mediating (or moderating) relationships between attainment (progress) and disadvantage.

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[1] The extent to which the purpose of the work is clearly articulated, an appropriate methodology for the research area has been adopted, and compelling evidence presented to show the purpose has been achieved.

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ITT model	
Additional models	

Box 1: ITT and additional models specified for the purposes of an EEF evaluation

WP2

The conceptual synthesis will include explanatory studies (reviews and quantitative, qualitative, or mixed methods studies) generated through Task 0 and then screened as relevant to WP2. Such studies may also fulfil criteria for WP1.

The core general criteria for including studies for review in WP2 is that they explicitly theorise and explain the attainment gap. Screening of such studies to enable manageability (after the initial common screening, see details later) will be based on whether they are standalone studies or syntheses of evidence.

The criteria for including a synthesis of evidence will focus on the extent to which a review is transparent in its research design and analysis. Studies will need to document:

- research questions and the purpose of the evidence synthesis;
- key search terms and search term strings for how studies were generated and the results of those searches;
- a rationale for the screening and selection of studies;
- how studies were coded, analysed, synthesised, and categorised; and
- a synthesis in terms of categorisations and any explanatory conceptual synthesis paradigm selection or development.

The criteria for including standalone (qualitative, quantitative, mixed, or theoretical) studies are that they document:

- research questions;
- a clearly argued and robust methodology or set of methods that emanate from the research questions;
- explanations directly focused on socioeconomic disadvantage and educational attainment; and
- explanatory arguments made in relation to the evidence generated.

Other criteria

Publication year: we will restrict the search to studies published during or after 2000 as these studies are most likely to connect to policy conditions that are pertinent to today.

End date of search: searches (Task 0) will be completed by end of February 2022.

Language: include studies published in English; exclude studies published in languages other than English. This is necessary due to resource constraints.

Reporting: include studies reported as journal paper, book chapters, official reports or working paper format. Include peer reviewed journal articles and doctoral theses. Exclude conference papers or extended abstracts (as they usually do not have enough information to judge quality or to extract useful data).

In the remainder of the methodology we detail the common searching and screening Task 0 and then provide the details that guide each work package separately (see Figure 1 for the flow chart).

Task 0: searching and screening

Search strategies for identification of studies

Search databases

- We will search the following databases: SCOPUS, Web of Science, British Education Index (BEI), Education Resources Information Center (ERIC), ProQuest/Applied Social Sciences Index and Abstracts (ASSIA), JSTOR, PsychINFO, Education Abstracts; Google Scholar; ProQuest Dissertations and Theses.
- We will also search the reference lists of previous systematic reviews in this area (defined as reviews that themselves searched at least two databases) as retrieved in our preliminary WP0 work. These will include for example, Ashraf et al. (2021) and Jeynes (2015); see Appendix 1 for full starting list.
- The EEF database/evaluations archive.
- Official reports from the U.K. and international comparative studies involving the U.K. (for example, PISA, TIMMS).

Search terms—keywords
The database search incorporates terms (keywords) designed to capture the three main concepts which are focal to this review and illustrated below.

<div align="center">

"Attainment (Gap)" AND Disadvantage AND Context

</div>

We have previously explored whether using the resulting key phrase ('attainment gap') rather than the individual keywords is necessary (see Appendix 2, Figure 2A) and we have performed various searches to explore this keywords configuration for an earlier draft of the protocol (see Table 2A in Appendix 2). We had also explored whether including 'gap' words was necessary at all, that is, we

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checked whether the relevant studies of interest were retrieved with keyword specifications and combinations that did not include these words (Table 2B in Appendix 2).

Piloting and feedback from the team led to the following considerations and amendments to keywords, which were tested with various search comparisons documented in Table 2C (Appendix 2).

- 'Inequality' placed under the 'attainment' group was perhaps responsible for an excess of irrelevant medical studies. The implications of moving this to the 'disadvantage' group were explored (#S6) along with removing the keyword altogether (#S5).
- Consider 'early year' and 'vocational' qualifications on 'exam/tests' group and 'apprentice*', boy and girl under context (S7).
- Additional keywords were added as a second context group to enable capturing all U.K./England-focused studies without having to deal with the unmanageable results when this national context was left open to whole document search.

The resulting keywords from each group will be combined as overviewed in Table 2.

Table 2: Overview of keyword search approach

Search term group	Search string (keywords/phrases)—to be used within titles and abstracts
Group 1A: Focus concept "Attainment"	attainment OR achievement OR performance OR success OR qualification* OR "cognitive ability" OR "cognitive test*" OR progress* OR "cognitive score*" OR "cognitive ability test*" OR "value added" OR trajectory OR trajectories
Group 1B: Exam/Tests[2]	SAT* OR "Standard Attainment test*" OR "national exam*" OR "standard* test*" OR "standard* assessment*" OR "national curriculum test*" OR "national curriculum assessment*" OR "General Certificate of Secondary Education" OR GCSE OR IGCSE OR "A level*" OR "International Baccalaureate" OR "Advanced Subsidiary" OR "early year* foundation assessment" OR EYFS OR "Early Years Foundation Stage Profile*" OR "Early year* learning goals" OR GNVQ OR "General National Vocational Qualification" OR BTEC* OR "KS1 test*" OR "Key stage 1 test*" OR "KS2 test*" OR "Key stage 2 test*" OR "key stage 2 science sampling" OR "statutory assessment*" OR "KS3 test*" OR "Key stage 3 test*" OR "level 2 qual*" OR "level 3 qual*"
Group 2: (Dis)advantage	"free school meal*" OR fsm OR income* OR socioeconomic* OR "socio economic" OR "socioeconomic" OR "socio economic status" OR ses OR "social class" OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "pupil premium" OR "EYPP" OR "free early education entitlement" OR "FEEE" OR "parent* qualification" OR "parent* occupation" OR "parent* employment

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[2]   https://www.goodschoolsguide.co.uk/international/curricula-and-exams/uk-overview

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	status" OR "NS-SEC" OR "family affluence scale" OR idaci OR imd OR polar2 OR TUNDRA OR ACORN OR "social background" OR inequal* OR inequit* OR disadvantage* OR "less affluent" OR impecunious
Context 1	education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR youth OR "young people" OR college OR nursery OR "early year setting*" OR pupil* OR student* OR apprentice* OR boy OR girl
Context 2	UK OR England OR Scotland OR Wales or "Northern Ireland" OR "National Pupil Database" OR "Pupil Level Annual School Census" AND NOT "New South Wales"

Keyword specification: (Group 1A OR Group 1B) AND Group 2 AND Context 1 AND Context 2 >1999 Example (resulted in 6,477 references in Scopus at 21 February 2022):

TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification* OR "cognitive ability" OR "cognitive test*" OR progress* OR "cognitive score*" OR "cognitive ability test*" OR "value added" OR trajectory OR trajectories OR SAT* OR "Standard Attainment test*" OR "national exam*" OR "standard* test*" OR "standard* assessment*" OR "national curriculum test*" OR "national curriculum assessment*" OR "General Certificate of Secondary Education" OR GCSE OR IGCSE OR "A level*" OR "International Baccalaureate" OR "Advanced Subsidiary" OR "early year* foundation assessment" OR EYFS OR "Early Years Foundation Stage Profile*" OR "Early year* learning goals" OR GNVQ OR "General National Vocational Qualification" OR BTEC* OR "KS1 test*" OR "Key stage 1 test*" OR "KS2 test*" OR "Key stage 2 test*" OR "key stage 2 science sampling" OR "statutory assessment*" OR "KS3 test*" OR "Key stage 3 test*" OR "level 2 qual*" OR "level 3 qual*") AND ("free school meal*" OR fsm OR income* OR socioeconomic* OR "socio economic" OR "socioeconomic" OR "socio economic status" OR ses OR "social class" OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "pupil premium" OR "EYPP" OR "free early education entitlement" OR "FEEE" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "family affluence scale" OR idaci OR imd OR polar2 OR TUNDRA OR ACORN OR "social background" OR inequal* OR inequit* OR disadvantage* OR "less affluent" OR impecunious) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR youth OR "young people" OR college OR nursery OR "early year setting*" OR pupil* OR student* OR apprentice* OR boy OR girl) AND (UK OR England OR Scotland OR Wales or "Northern Ireland" OR "National Pupil Database" OR "Pupil Level Annual School Census")) AND PUBYEAR > 1999

As part of the pilot investigations we also tested whether the various keyword specifications were successful in retrieving papers (and reports) expected to be included in the review (see list in Table 3A of Appendix 3). It was observed that certain databases are more efficient capturing official reports than others (for example, Scopus does not cover such documents but a further investigation with BEI identified most of the reports). It is expected that the combination of various databases and the revision of keywords as noted above will cover the relevant references. We were also mindful of the various potential moderators, mediators, associates, or factors already documented as a result of WP0

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(see Table 3B, Appendix 3) and concluded that our search is open enough to capture all these concepts and there is no need to specifically search using such keywords.

The resulting references will be managed via Endnote and imported to Covidence to assist with systematic reviewing.[3] Covidence will then be used for de-duplication, screening, document management, data extraction, and data analysis (when possible).

Selection of studies

Results of the searches will be subject to an initial screening based on title and abstract regarding their suitability and the availability of required details.

Screening for inclusion in the review will occur in two stages. First, the inclusion criteria will be applied to titles and abstracts. Screening will be based on a yes/no/maybe basis to enable fast review when further information is needed for an inclusion decision. The criteria for this first screening (see Appendix 3) were piloted on a sample of studies from an initial search (#S4 in Table 2B, Appendix 2).

Small scale reliability analyses were performed on (i) a pre-pilot stage, which informed the first draft of the protocol between the first and second authors of the protocol—and so far agreement is very high (more than 85%) and (ii) the current pilot, with similar agreement with various combinations of comparisons amongst four research team members. Once the main search and screening commences, a group meeting with those involved in the screening process will take place to ensure the inclusion and exclusion criteria are clear. A selection of studies will be screened by all involved and any discrepancies will be discussed and clarified to ensure mutual understandings with the protocol and across the team.

Partial double screening will be used for the actual screening. This will consist of double screening 20% of records and then switching to single screening if 95% agreement has been achieved; if not, then screening will continue in allocations of 100 records until at least 95% agreement is attained for that allocation. The reviewers will regularly discuss screening to ensure consistency in the way that studies are being included and excluded.

In the second screening stage, the shortlist of those references marked for inclusion (with either 'yes' or 'maybe') at the first stage will be screened again on the basis of the full-text article, if necessary. (The same partial double screening procedure detailed above will be employed at this stage as well.) Additional coding for this stage will involve a study type description (that is, quantitative, qualitative, mixed, review, or theoretical) and a preliminary classification of articles for inclusion in WP1 and/or WP2. Those references that pass the inclusion criteria on the basis of full-text screening will be included in the review. The results of this process will be documented in a PRISMA flow chart (Moher et al., 2009).

Our preliminary position to the approach for dealing with multiple papers reporting on the same study takes into account the aims and objectives of the review and the fact that in our synthesis it is not

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[3] The EEF may provide additional funding for a subscription to the EPPI-reviewer systematic review platform.

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necessarily the study that is the focus of the review (that is, for WP1 it is the model that presents a relevant relationship) and points to the following:

(a) If different papers draw on the same study but present different models that can inform the review, then they can be used as separate entries (this is more relevant to WP1).
(b) If different papers draw on the same study but present various aspects and results (for example, some more relevant to WP2 conceptualisations, and some with models to inform WP1) then they will be used as separate entries to inform both WP1 and WP2.
(c) In the unlikely event that none of the above applies then the most recent reference will be chosen to represent the study (and the other references will be documented as multiple entries).

WP1: systematic review

Data extraction and management

For all studies passing the screening stage for eligibility to WP1, a detailed coding will be performed based on a scheme informed by various existing tools, amended as necessary to fit the purpose of the investigation as follows:

- the EEF extraction tool EEF Toolkit effect size data extraction v 1.0 October 2019 [Standard]—to facilitate the particular task of coding results from EEF evaluations;
- the revised Cochrane Risk-of Bias Tool for randomised trials (RoB 2) (Sterne et al., 2019; Higgins et al., 2016), cluster-randomised trials[4] and cross-over trials[5]—for quality appraisal;[6]
- the Risk of Bias in Non-Randomised Studies—of Interventions tool (ROBINS-I) and the Risk of Bias—due to Missing Evidence tool (ROB-ME) for quality appraisal;[7]
- the Newcastle-Ottawa scale (NOS)—for quality appraisal of non-intervention studies (see later section);
- the JBI critical appraisal tools for various research designs; [8] and
- the Cambridge Quality Checklists for assessing risk factors (Murray et al., 2009).

Our coding for WP1 will be recorded on a data extraction tool (influenced by the above but specialised for the purposes of this review), the main areas of coverage are listed below (Table 4A, Appendix 4 presents a preliminary extended list):

- publication information—cross referenced with Task 0 and WP2;
- study design and methods;
- study design-details—depending on the design, for example, for interventions, surveys, or observational studies;
- location of data collection and study location;

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[4] https://sites.google.com/site/riskofbiastool/welcome/rob-2-0-tool/rob-2-for-cluster-randomized-trials
[5] https://sites.google.com/site/riskofbiastool/welcome/rob-2-0-tool/rob-2-for-crossover-trial
[6] These criteria will be used to describe the studies included post-hoc rather than as inclusion criteria.
[7] https://sites.google.com/site/riskofbiastool/welcome
[8] https://jbi.global/critical-appraisal-tools

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- educational setting;
- study sample;
- intervention details; and
- evaluation details—including information for outcomes.

An important aspect of data extraction for this review is how to extract and document the relevant factors—covariates, moderators, and mediators. In finalising a mechanism for that we need to test with some real studies, however some starting points are provided here.

We need to consider (1) the definitions of 'moderators', 'mediators', and so forth from a general analytical perspective (as described earlier) and then (2) within the methodological literature for systematic review but also (3) within the context of this particular review and its focus. Based on these considerations and other examples (for example, Pincus et al., 2011 who defined the methodological criteria for assessing moderators in systematic reviews of RCTs in a 'consensus' study) we anticipate that as a baseline our extraction tool will need to record: (a) the full model specified in the paper and (b) the coefficients of each explanatory variable and their standard errors. Based on this information we will eventually be able to either summarise results (and calculate effect sizes when appropriate) and/or model the collective results in a form of meta-analysis (that is, meta-regression). An example of the types of models to be coded as part of this (motivated by the results presented in Quin, 2017) is presented with Table 3.

Table 3: Statistical analysis coding for WP1

Bivariate analysis and/or traditional tests	Models
Correlations (zero-order, Pearson coefficient, Spearman)	Multiple regression
ANOVA	Hierarchical/multilevel regression
MANOVA	(Latent) growth curve modelling
t-tests	General Linear Modelling
	Cross-lagged models
	Structural Equation Modelling

Appraising studies for the systematic review

Quality assessment of the included evaluation studies will follow the guidelines provided by the Cochrane RoB2 as noted earlier. Non-experimental studies (cohort, cross-sectional, and observational) will be examined according to the guidelines in the JBI tools and Newcastle-Ottawa scale (NOS, Wells et al., 2014), which is typically used for assessing the quality of non-randomised studies in meta-analyses. The NOS contains the following three subscales: selection of the study population (four items), comparability of exposed and non-exposed sub-cohorts (one item), and outcome assessment (three items). We will further consider quality criteria for correlates based on

the Cambridge Quality Checklist (CQC, Murray et al., 2009), which includes an evaluation of the sampling method, response rates, sample sizes, and the quality of correlate measure and the outcome (Table 3A, Appendix 3). For assessing SES as risk factor of the outcome (that is, whether it precedes the outcome) we will consider the type of data reported on the three-point scoring of CQC guidelines: 1 = cross-sectional, 2 = retrospective, and 3 = prospective (longitudinal). For assessing whether SES or other factors are causal risk factors, we consider the CQC as in Table 3B (Appendix 3). Finally, the assessment of moderators and mediators will be based on the criteria detailed in Table 1 (and pages 11–12).

Effect size calculation

Given the focus of the review, it is anticipated that the quantitative synthesis of evidence (meta-analysis) will call for a meta-regression, which is considered as an extension to the traditional meta-analysis approach: this is because studies are expected to be grouped into subgroups, both in respect to study type as well as based on the various moderators and mediators they include or the report in question.

As a starting point, effect sizes will be reported and then standardised depending on the type of study, attainment outcome, and statistical evidence presented (for example, as in Table 3). Some examples are:

- Standardised Mean Differences (SMDs) for continuous attainment outcomes—between-group SMDs when means are reported for two independent groups (for example, FSM/nonFSM); within-group SMDs when one group is examined (for example, in repeated measures designs); Cohen's d will be relevant for the former case; and
- risk ratios and odds ratios will be used for binary attainment outcomes.

SMDs and Cohen's d effect sizes will be corrected for small sample bias, to be converted into Hedge's g effect sizes and will be used in meta-analyses using multiple-metaregression to account for multiple covariates, moderators, mediators, and study characteristics (for example, Unverzagt et al., 2014; Li et al., 2020; Jamshidi et al., 2020).9 Example outputs and reporting of findings from such analysis are presented in Appendix 6.

If such analysis is deemed appropriate (that is, there are at least ten studies considered for meta-analysis)[10] we plan to perform this within the statistical package Stata (noting alternative options exist with R).[11]

Unit of analysis issues

Even though the outcomes of interest are at the pupil level there are anticipated clustering issues (within classrooms, schools, and regions). Such clustering is important as it should be reflected in the modelling of the phenomena under review. This, in essence, will be recorded as a variable into the coding—the data extraction tool (that is, the type of model: simple linear, multilevel, also number and

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[9] https://handbook-5-1.cochrane.org/chapter_9/9_6_4_meta_regression.htm
[10] See https://handbook-5-1.cochrane.org/chapter_9/9_6_4_meta_regression.htm
[11] https://journals.sagepub.com/doi/pdf/10.1177/1536867X0800800403

description of levels) and will have implications for the analytical approach of synthesising such studies—potentially to consider how a meta-regression will analyse either multilevel models separately or in combination with singe-level model findings. We plan to use meta-analytic models within a multi-level approach (for example, Van Den Noortgate, et al., 2003, Harrer et al., 2021) as in addition to the above clustering effects, findings—records, effect sizes—are clustered within studies. It is also anticipated that random-effect models will be more appropriate compared to fixed-effects given the expected variability of outcomes across studies.

Dealing with missing data

As missing data is inevitable in systematic reviews and meta-analyses, we will deal with these issues following the three-step process of Polanin et al. (2019): infer, initiate, and impute. First, wherever possible, missing values will be calculated from the paper making an informed inference from what the authors stated. This can be achieved in instances where effect sizes are not reported but group scores, sizes, and standard deviation statistics are. If that is not possible, the authors will be contacted by email and asked to supply the missing data if it is deemed of potential importance to the review findings (initiate step). When both steps fail then we will proceed with dealing with missing data using multiple imputation techniques (for example, Pampaka et al., 2016).

Data synthesis

Different synthesis methods will be used to address the research questions within each of the WPs and the integration of quantitative with qualitative findings is the main focus of WP3.

Findings from the systematic review (WP1) will be presented initially in summary tables, grouped by organising variables, which will be decided upon completion of screening and coding. It is anticipated that these tables will be structured to include the following: study reference, study type, sample size for SES groups, age group, attainment domain, moderators and mediators, and effect sizes. The results of any meta-analysis will be reported as shown with the example in Appendix 6.

Investigation of heterogeneity

Exploration of heterogeneity is an integral and focal element of our review. Therefore, our data extraction tools (preliminary versions presented in Appendix 4) will ensure that all potentially relevant study characteristics are captured during coding and also reported during the initial synthesis.

One objective related to WP1 is to quantify the differential effects of any groups of pupils and how these affect the (existing or evolving) disadvantage attainment gap. In line with that, our data extraction tool will record information on educational stage, age, gender, ethnicity, and other potentially relevant factors: these variables will be used as a means of performing subgroup analyses where possible and will also be considered as variables in the multivariate, multilevel meta-regression analyses.

Sensitivity analysis

It is anticipated that potential sources of bias such as study design, type of treatment, publication source, missing data, sample size, or attrition will be considered as part of the heterogeneity

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investigation noted above. Sensitivity analyses will further involve the comparison of findings when including and excluding studies which are evaluated as low (< 50%) on the quality assurance criteria.

It is also expected that such investigations within the results of WP1 may have implications for the explanations put forward in WP3, which will be documented accordingly as explained in a later section.

WP2: conceptual synthesis

Data extraction and management

For WP2, data will be extracted, managed, and coded using the following protocol (see draft extraction tool in Appendix 4, Table 4B, which will also include study design and participants characteristics):

- full reference—cross-referenced with Task 0 and WP1;
- publication type—book, journal article, book chapter, review;
- country the study or work originates from;
- study design;
- participant characteristics—age, year group, and so forth;
- what the study says—key overall findings;
- type of research evidence—narrative, thematic analysis, theoretical;
- scale of research;
- main outcomes;
- what it says about the relationship between socioeconomic disadvantage and educational attainment;
- the main loci and factors of the study—for example, individual, peer, family, school, neighbourhood, wider social and economic context;
- what other loci/factors are mentioned;
- what causal mechanisms are put forward in claims made in the study?;
- are these tested and, if so, with what result?; and
- does any theoretical perspective underpin the design or interpretation of findings? If so, what? Is it explicit or implicit?

The grouping of studies into conceptualisation will depend on the nature of the studies reviewed but such conceptualisations are likely to be categorised into a mapping framework that will include particular loci of analysis such individual, peer, family, school, neighbourhood, and the wider social and economic context. Furthermore, conceptualisations will be categorised in ways that reflect the extent to which they adopt more functionally orientated perspectives such as exploring ameliorative approaches to current social, cultural, policy and practice orientations to education or socially critical perspectives eg documenting inequalities of power associated with educational practices and systems and the lived lives of young people and their families and communities. An illustrative example of such mapping framework is provided below (Raffo et al., 2007 for the Joseph Rowntree Foundation).

Perspective and knowledge claims about education	The foci	Sites—the locations within foci	Purposes of, and pressures on, the explanations	Policy implications
Functionalist Socially Critical	Micro, Meso, Macro	Individuals, families, schooling, neighbourhoods, peer groups, and/or the system(s)	Explanation and/or intervention/agency	Ways of examining the purpose and enhancing the functionality of the education system at various levels

Box 2: Example of mapping framework—conceptual synthesis of education and poverty

Inclusion criteria

The inclusion criteria for stand-alone studies and also for reviews and qualitative evidence syntheses are documented on page 15.

Data synthesis

The data synthesis for WP2 will involve three activities after screening and the selection of relevant studies:

1. testing and elaborating the preliminary grouping of studies into conceptualisations—this will include the extent to which studies can be located in a particular evolving analytical classification (for example, studies associated with family engagement with education as an explanatory category for the attainment gap); part of this work may mean elaborating such classifications to ensure comprehensive coverage of studies and appropriateness of fit;
2. documenting key findings and explanations for each study associated with a particular conceptualisation;
3. articulating the relationships between different conceptualisations by the development of conceptual connections that might include:
   a. instances where assumptions overlap or differ, for example, overlaps in notions of educational aspiration as a conceptualisation that might include studies that focus on a deficit notion of parental engagement with education and studies that focus on deficit view of student aspiration for education;
   b. instances where there have been actual connections made between conceptualisations, for example, students aspirations and parental educational qualifications; or

c. instances where potential connections might arise, for example, family or community and education conceptualisations and community orientated schooling conceptualisation.

The development of a categorising or mapping framework should enable the mapping of the various conceptualisations onto key dimensions, for example, individual versus societal, functional versus socially critical, proximal versus distal, or school orientated versus community orientated. We will be assisted in the production of conceptual syntheses and mapping framework by software such as Kumu that enables the organisation of complex ideas into relationship maps that relate individual concepts to the bigger picture, for example through the use of Lombardi diagrams or sociograms. The testing of the mapping framework will include exploring the extent to which it enables a comprehensive coverage of the synthesised conceptualisations both in terms of interconnection and separateness where appropriate.

Activity 3 is particularly important since it is at this point where we will attempt a synthesis that will show how different conceptualisations do or could relate to one another. All three tasks, however, have a strong interpretive element and this will require the team to refer back to research questions and aims and to work together to cross-check and interrogate each other's interpretations. These interpretations will be further checked by our advisory group and feedback will be given via advisory group meetings.

WP3: causal explanations

As documented in the scientific rationale section above, the review protocol for WP3 is based on a mixed research synthesis methodology underpinned by a critical interpretative synthesis analysis.

Stage 1 of the review protocol for WP3 will be a *complementary* synthesis activity that will connect the coded data of WP1 with the conceptualisations of WP2. More specifically, the synthesis will interconnect the meta-analysis of explanatory variables and their effect sizes in WP1 with particular and relevant categorised explanatory conceptual accounts in WP2. In many respects the focus of the synthesis will be exploring issues of complementarity recognising that qualitative and quantitative research syntheses generally address different aspects or dimensions of the attainment gap, meaning that they are often complementary to each other (Sandelowski et al., 2006).

Stage 2 of the review protocol for WP3 introduces a structured 'critical interpretive configured synthesis' (CICS) of the complementary synthesis in stage 1. In essence this mean developing a further synthesis by articulating a network of constructs and the relationships between them that connect and configure the separate complementary syntheses. In many respects this will be guided by the mapping framework generated in WP2 and is best understood as a *configuration* of syntheses that arranges the complementary syntheses into a line of argument (see Noblit and Hare, 1988)—one that contains both theory that posits an explanation of relationships among complementary syntheses and a narrative that posits a temporal ordering of such relationships. Together, such a CICS will therefore provide the evidence base for articulating a generalised causal understanding of the attainment gap.

This critical interpretive synthesis will be achieved through a number of tasks.

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Task 1

Task 1 involves putting together the complementary research syntheses. This will require determining the relationships between the syntheses to be synthesised. To enable this, a list of the key metaphors, phrases, ideas, and concepts (and their relations) used in each synthesis will be documented and juxtaposed—a process aided by thinking about what the syntheses are about, the theoretical approach utilised in those syntheses, and the meaning of their concepts, themes, or metaphors.

Task 2

Task 2 involves translating the complementary research syntheses into one another. There are two types of possible translation: reciprocal and refutational (Noblit and Hare, 1988). Reciprocal translation assumes that syntheses can be 'added' together, that is, that they are clearly complementary research syntheses about similar things. In an iterative fashion, each complementary research synthesis is translated into terms (metaphors) of the other's and vice versa. A translation protocol is documented below.

- Describe how meaning was translated from one complementary research synthesis into another, for instance, by reporting one or more examples of how this was done.
- Describe how relationships between concepts within and across syntheses were preserved in the translation, such as by drawing concept maps to show relationships between concepts.
- Clearly indicate whose interpretation is being presented —that of study authors or reviewers.
- Describe how potential alternative interpretations or explanations were considered in the translation.

When the syntheses are not similar enough to be added together then it may be appropriate to conduct *refutational translation* where syntheses are implicitly or explicitly refutations of each other and that require a more elaborate set of translations. Attention will be paid to the assumptions, motivations, and ideology behind a complementary research synthesis. A benefit of conducting a refutational translation is that it allows us to identify whether the theories or ideologies underlying two or more research syntheses differ.

Task 3

Task 3 involves synthesising translations—developing causal explanation. There are two aspects in this task: synthesising translations and explanatory synthesis. The synthesised translations (concepts) represent our interpretation of the translations. An explanatory synthesis aims to provide a fresh interpretation; it goes further than translation and puts any similarities and dissimilarities into a new interpretive context. An explanatory synthesis is our overarching explanation of the attainment gap phenomenon. In undertaking this work we will describe the methods used to develop synthesised translations and how the explanatory synthesis was conducted. In addition, we will describe:

- how many, and which, complementary research syntheses were synthesised;

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- who was involved in the synthesis and explain how synthesis findings have been considered from alternative perspectives; and
- how reviewers remained grounded in relation to key explanatory variables and avoided losing conceptual richness during synthesis.

The outcome of the synthesis process is a description of the interpretive findings of the synthesis of translations. This new synthesis will show, through a combination of narrative, grids and Lombardi diagrams, the interrelationships between the mediating and moderating variables documented in WP1 and WP2 that are explanatory and generalisable of the attainment gap.

Task 4

Task 4 involves expressing the synthesis of translations as causal explanations. We will compare our explanatory theory generated in the synthesis to the existing literature, such as U.K. research and policy publications. We will consider the possible influence of findings from other authors on own conclusions. In addition, we will consider the methodological and other strengths and limitations of our study and how they may influence the final interpretation. We will reflect on and describe the effect of these on the synthesis process and outcomes in terms of assuring the credibility and trustworthiness of the synthesis findings. In critically reflecting on the context of knowledge construction—especially the effect of the research team on the research process—we will comment on how members of the team may have influenced the interpretive process and synthesis findings by making explicit, for example:

- our individual background, perspectives, and experience, such as, but not limited to, epistemological position(s), professional position(s) held, academic discipline, organisation(s), or professional bodies represented;
- whether any members of the team have a specific view, stance, or personal interest, for example, the reviewer's viewpoint on attainment gap issues;
- any influence of the funder on the outcome of the study; and
- any conflicts of interests of the research team which might influence judgement made when conducting the interpretation and synthesis.

Reporting

Findings from the review as a whole will be presented in a final report using the EEF reporting template for evidence reviews. Based on the causal explanation documented in the report, we will also produce a visual representation of the explanation, highlighting where possible the interconnecting causal factors and the strength and robustness of each.

Personnel

Members of the team from the University of Manchester and roles:

Prof. Carlo Raffo (PI) will lead the project and will focus particularly on the conceptual and causal analytical elements of the proposal. Carlo's main area of research is in the area of education and

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poverty and educational equity in urban contexts. He was grant holder for the Joseph Rowntree Foundation projects *Adult and Tertiary Education and Poverty – a review* and *Education and Poverty – a Critical Review of Theory, Policy and Practice*; a co-applicant on the ESRC seminar series "Bridging the Structure/Agency Divide: Interdisciplinary Approaches to Disadvantage and Education" and has been involved in numerous other externally funded and research and development projects that focus on schools and education in areas of urban disadvantage. https://www.research.manchester.ac.uk/portal/carlo.raffo.html

Dr. Maria Pampaka (Co-I) will direct the quantitative methodological aspect of the study leading WP1 an, ensuring that the systematic literature reviews are implemented rigorously, and performing the meta-analyses. Maria has completed various relevant research studies, including the ICCAMS EEF evaluation, and others involving longitudinal surveys and systematic reviews. http://www.manchester.ac.uk/research/maria.pampaka/

Dr Diane Harris (Co-I) brings expertise in systematic literature review methodology having worked on reviews for numerous funders including the Joseph Rowntree Foundation, the British Academy, the Leverhulme Trust and the Education Endowment Foundation. Diane has experience of working in the field of socioeconomic disadvantage in school through various projects including the 'Evaluation of Pupil Premium' for the Department for Education which was completed by a team of colleagues from the University of Manchester and Newcastle University. Working with the two research assistants, Diane will facilitate and organise the literature review aspect of the work to ensure that it reports on time. https://www.research.manchester.ac.uk/portal/diane.harris.html

Dr. Ola Demkowicz (Co-I) provides expertise in risk and resilience mechanisms and processes among children and young people in the context of inequality and socioeconomic disadvantage, and will contribute to the conceptual and causal framing in the project. Ola also brings knowledge and expertise in school-based provision and interventions that seek to address inequalities within the education system, having worked on projects including the Education Endowment Foundation evaluation of Achievement for All and the evaluation of HeadStart, a wellbeing programme implemented across disadvantaged areas in England funded by the National Lottery Community Fund. Ola is experienced in quantitative analysis and modelling and systematic literature review methodology.

Dr Carl Emery – Carl leads the Local Matters research programme that works with schools in areas of high disadvantage to train teachers, parents and pupils as community poverty researchers. Carl also leads the Social Justice in Education - From the Global to the Local unit at both undergraduate and postgraduate levels. His research has recently been incorporated into the National Education Union's, child poverty strategy - https://neu.org.uk/child-poverty/local-matters-educating-sense-place

Dr. Alexandra Hennessey (Co-I) (née Barlow) brings expertise in large-scale school-based

intervention work aiming to improve academic outcomes more broadly, as well as addressing attainment gaps. For example, social and emotional learning and behaviour interventions, PATHS and GBG (NIHR and EEF funded), and the AfA national pilot aiming to reduce the attainment gap for

children with special educational needs and disabilities (DfE funded). Fundamental to this research was, and pertinent to the current project is, analysing and exploring the interplay between a variety of risk and resilience factors for academic outcomes. She also has significant experience in quantitative research design. https://www.research.manchester.ac.uk/portal/alexandra.hennessey.html

We are also in the process of hiring two Research Assistants to support the work - details will be confirmed at the next stage of revisions.

Sofia Eleftheriadou will be the Research Associate performing searches, screening, coding, and conducting analyses (including meta-analyses). Her research expertise is in educational assessment and measurement, systematic literature reviews, and quantitative research methods. Sofia has previously worked in various research projects conducting systematic reviews. She has received the Best Paper Award 2019 by the European Educational Research Association (EERA) for her paper titled "Conceptualisation and Measurement of Collaborative Problem Solving: a Systematic Literature Review", which was part of her thesis (PhD Education, University of Manchester). https://www.research.manchester.ac.uk/portal/sofia.eleftheriadou.html

Other Members not currently affiliated with the University of Manchester:

Prof Emeritus Ruth Lupton (Independent Consultant) joined the University of Manchester in 2013, from the London School of Economics where she was Principal Research Fellow and Deputy Director at the Centre for Analysis of Social Exclusion (CASE). In London, she set up and directed IoE's London Education Research Unit (LERU) and in Manchester led the Inclusive Growth Analysis Unit (IGAU), a partnership between the Joseph Rowntree Foundation and UoM to understand and promote more widely shared prosperity in Greater Manchester.

Dr Clelia Cascella (Co-I) was appointed as researcher in Social Statistics and Psychometrics at the Italian national institute for the evaluation of educational system and then as Marie Curie Fellow at the Manchester Institute of Education before being appointed as Lecturer in Social Statistics at the University of Manchester. Her main research interest is in (mathematics) education focusing on gender differences in learning mathematics, learners' attitudes and dispositions and their relationship with teaching practices.

Conflicts of interest

There are no conflicts of interest as far as the team members are aware.

Registration

This systematic review will be registered on the Open Science Framework registry (https://osf.io/registries) following this protocol being finalised after peer review.

We plan to publish one or more papers in peer-reviewed journals based on the review. A publication outlet has not been decided at this stage.

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Timeline

Date	Task
October 2021	Initial findings from review of reviews based on research team scrutinising protocols, emerging conceptualisations and quantitative/qualitative evidence
November 2021	Draft working protocol Advisory group meeting
Nov – Dec 2021	Pilot search terms/strings and draft coding tools for Task 0
Jan – Feb 2022	Finalise protocol including search terms/strings
March 2022 To mid-April 2022	Task 0: searching and screening studies for inclusion 1. Stage 1 screening for inclusion to WP1 and/or WP2 based on title and abstract [result: Long list] 2. Download resources on the Long list 3. Stage 2 screening of long list for inclusion to WP1 and/or WP2 based on full text and full consideration of inclusion/exclusion criteria
Mid-April – May 2022	Detailed data extraction and coding of studies screened as eligible for WP1 and WP2 recorded on respective data extraction tools
June – July 2022	WP1 quantitative synthesis of evidence via meta-regression and calculation of relevant effect sizes Data synthesis of studies in WP2 into conceptualisations and then categorised via a mapping framework Separate preliminary reports and spreadsheets with coding. Advisory group meeting
July to Sept 2022 [considering annual leave of staff]	WP 3 - stage 1 complementary synthesis of coded data from WP1 with conceptualisation in WP2
October 2022	WP 3 – stage 2 critical interpretive configured synthesis – configuration of syntheses into an explanatory line of argument Advisory group meeting
Nov 2022	Production of draft report
30th November 2022	Final report

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Appendices

Appendix 1: List of references for scoping review of reviews

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Appendix 2: Keywords and pilot searches

The first step of this process involved considering the phrases that define 'attainment gap' based on relevant key-words as shown with Figure 2A.

Figure 2A: Defining key-phrases based on key words for central concept

Table 2A: Initial searching results with Scopus

Search ID (#)	Keywords	Results	Notes
1	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification) AND (gap OR difference OR equality OR inequality OR disadvantage OR disparity OR affordance OR resilience OR constraint OR equity) AND (income* OR socio-economic* OR ses OR class OR poverty OR depriv* OR poor OR capital) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "Young person" OR pupil* OR student*))	44993	Separated "attainment" AND gap" and joined with education and child context
2	TITLE-ABS-KEY (((attainment OR achievement OR performance OR success OR qualification) AND (gap OR difference OR equality OR inequality OR disadvantage OR disparity OR affordance OR resilience OR constraint OR equity OR income* OR socio-economic* OR ses OR class OR poverty OR depriv* OR poor OR capital)) AND (education* OR school* OR learn* OR academic	360165	Combined 'gap' with 'disadvantage' group

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	OR child* OR teen* OR adolescen* OR "Young person" OR pupil* OR student*))		
3	(TITLE-ABS-KEY (((attainment OR achievement OR performance OR success OR qualification) AND (gap OR difference OR equality OR inequality OR disadvantage OR disparity OR affordance OR resilience OR constraint OR equity OR income* OR socio-economic* OR ses OR class OR poverty OR depriv* OR poor OR capital)) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "Young person" OR pupil* OR student*))) AND (uk OR england)	119647	Search #2 restricted to "UK or England" (but everywhere in article)
5	(TITLE-ABS-KEY (((attainment OR achievement OR performance OR success OR qualification) AND (gap OR difference OR equality OR inequality OR disadvantage OR disparity OR affordance OR resilience OR constraint OR equity OR income* OR socio-economic* OR ses OR class OR poverty OR depriv* OR poor OR capital)) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "Young person" OR pupil* OR student*)) AND TITLE-ABS-KEY (uk OR england)) AND PUBYEAR > 1999	6373	As above but with UK and England in Abstract
6	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification) AND (gap OR difference OR equality OR inequality OR disadvantage OR disparity OR affordance OR resilience OR constraint OR equity) AND (income* OR socio-economic* OR ses OR class OR poverty OR depriv* OR poor OR capital) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "Young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	1296	Search #1 Restricted to UK and England post 2000

The results of Search #6 were screened as a preliminary pilot which informed the draft of the protocol reviewed before December 2021

Table 2B: Pilot searches (all re-searched in Scopus @ 23 January 2022)

ID	Keywords Specification	Results
#S1	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "educational inequ*" OR "performance	**3452**

	gap" OR "attainment gap") AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	(initial set-up considering some comments from draft protocol review (e.g. including FSM)
#S2	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "educational inequ*" OR "performance gap" OR "attainment gap" OR "cognitive ability" OR "cognitive test" OR progress*) AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	**4177** Including cognitive ability related terms
#S3	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "educational inequ*" ~~OR "performance gap" OR "attainment gap"~~ OR "cognitive ability" OR "cognitive test" OR progress*) AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	**4177** Removing 'gap'
#S4	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR " inequal*" OR "cognitive ability" OR "cognitive test" OR progress* OR "cognitive score" OR "cognitive ability test" OR "value added" OR trajectory OR SAT* OR "Standard Attainment test*" OR "national exam*" OR GCSE OR IGCSE OR "A levels" OR	**6461** Including test and exam words

"International Baccalaureate" OR "Advanced Subsidiary") AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	**Pilot Screen and Team Feedback**
Comparisons: #2 and #3: to explore whether excluding 'gap' made any difference	

Table 2C: After screening feedback

ID	Keyword Search	Results
S5	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "cognitive ability" OR "cognitive test" OR progress* OR "cognitive score" OR "cognitive ability test" OR "value added" OR trajectory OR SAT* OR "Standard Attainment test*" OR "national exam*" OR GCSE OR IGCSE OR "A levels" OR "International Baccalaureate" OR "Advanced Subsidiary") AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2) AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	5532 Inequality in disadvantaged
S6	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "cognitive ability" OR "cognitive test" OR progress* OR "cognitive score" OR "cognitive ability test" OR "value added" OR trajectory OR SAT* OR "Standard Attainment test*" OR "national exam*" OR GCSE OR IGCSE OR "A levels" OR "International Baccalaureate" OR "Advanced Subsidiary") AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2 OR " inequal*") AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student*)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	5197 Removed inequality
S7	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "cognitive ability" OR "cognitive test" OR progress* OR "cognitive score" OR "cognitive ability test" OR "value added" OR trajectory OR SAT* OR "Standard Attainment test*" OR "national exam*" OR GCSE OR IGCSE OR "A level*" OR "International Baccalaureate" OR "Advanced Subsidiary" OR "Early year* foundation assessment" OR "Early year* learning goals" OR "GNVQ" OR "BTEC*") AND("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*"	5926 With additional terms

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	OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2 OR TUNDRA OR ACORN OR "social background" OR "inequal*" OR "inequit*" OR "disadvantage*") AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student* OR "apprentice*" OR boy OR girl)) AND PUBYEAR > 1999 AND TITLE-ABS-KEY (uk OR england)	
S8	Search #S7 but with UK and England everywhere	93017
S9	TITLE-ABS-KEY ((attainment OR achievement OR performance OR success OR qualification OR "cognitive ability" OR "cognitive test" OR progress* OR "cognitive score" OR "cognitive ability test" OR "value added" OR trajectory OR sat* OR "Standard Attainment test*" OR "national exam*" OR gcse OR igcse OR "A level*" OR "International Baccalaureate" OR "Advanced Subsidiary" OR "Early year* foundation assessment" OR "Early year* learning goals" OR "GNVQ" OR "BTEC*") AND ("free school meal" OR fsm OR income* OR socio-economic* OR "socio economic status" OR ses OR class OR poverty OR depriv* OR poor OR capital OR everfsm OR "social position" OR "service pupil premium" OR "parent* qualification" OR "parent* occupation" OR "parent* employment status" OR "NS-SEC" OR "looked after child*" OR "service child*" OR "family affluence scale" OR idaci OR imd OR polar2 OR tundra OR acorn OR "social background" OR "inequal*" OR "inequit*" OR "disadvantage*") AND (education* OR school* OR learn* OR academic OR child* OR teen* OR adolescen* OR "young person" OR pupil* OR student* OR "apprentice*" OR boy OR girl) AND (uk OR england OR scotland OR wales OR "Northern Ireland" OR "National Pupil Database" OR "Pupil Level Annual School Census")) AND PUBYEAR > 1999	6883 #S7 but with further keywords as national context

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Appendix 3: Further piloting explorations

Criteria to consider for preliminary screening

- 3 to 18 years old students/children/young adults (including those not in schools)- excluding university focused studies with first year undergraduate students - located in England
- The outcome of interest is attainment and studies are only eligible if they report on socio-economic disadvantage using any SES measure.
- As a whole, this review does not exclude any study on the basis of its (research) design.
- WP1 will focus on synthesising studies that quantify the association/relationship between attainment gap and other variables/factors, whether this is causal or simply associative, as a starting point.
- We consider as relevant for our (systematic) review any study that somehow quantifies the association of interest (see Figure 3A for a simple example schematic); this also implies that studies without any moderators/mediators (i.e. missing) will be considered to understand the intensity of the link for the population as a whole.
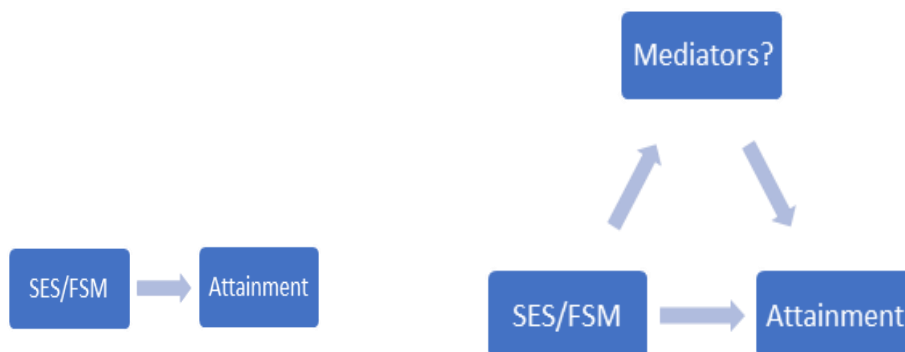

Figure 3A: Simple mediation model

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Table 3A: Sample references we expect to find in search

Journal:	Feinstein, L. (2003), Inequality in the Early Cognitive Development of British Children in the 1970 Cohort. Economica, 70: 73-97. https://doi.org/10.1111/1468-0335.t01-1-00272
	Feinstein, John Jerrim, Anna Vignoles, Harvey Goldstein, Robert French, Elizabeth Washbrook, RaeHyuck Lee, Ruth Lupton, (2015) Comment and Debate: Social class differences in early cognitive development. Longitudinal and Life course studies: International Journal, 6(3), 331-376, DOI: http://dx.doi.org/10.14301/llcs.v6i3.361
	Lupton, R., & Thomson, S. (2015). Socio-economic inequalities in English schooling under the Coalition Government 2010–15. London Review of Education, 13(2), 4-20.
	Steve Strand (2014) Ethnicity, gender, social class and achievement gaps at age 16: intersectionality and 'getting it' for the white working class, Research Papers in Education, 29:2, 131-171, DOI: 10.1080/02671522.2013.767370
	Steve Strand (2014): School effects and ethnic, gender and socioeconomic gaps in educational achievement at age 11, Oxford Review of Education, DOI: 10.1080/03054985.2014.891980
	Sullivan, A., Ketende, S., & Joshi, H. (2013). Social Class and Inequalities in Early Cognitive Scores. Sociology, 47(6), 1187–1206. https://doi.org/10.1177/0038038512461861
	Webber, Richard and Butler, Tim (2007) 'Classifying Pupils by Where They Live: How Well Does This Predict Variations in Their GCSE Results?', Urban Studies, 44:7, 1229 – 1254, DOI: 10.1080/00420980701302353
Reports:	Robert Cassen and Geeta Kingdon (2007). Tackling low educational achievement. York: Joseph Rowntree Foundation.
	Paul Gregg, Carol Propper and Elizabeth Washbrook (2007). Understanding the relationship between parental income and multiple child outcomes: a decomposition analysis. London: ESRC Centre of Analysis of Social Exclusion.
	House of Commons Education Committee (2014). Underachievement in Education by White Working Class Children.
	Sammons, P., Toth, K. & Sylva, K. (with E. Melhuish, I. Siraj, & B. Taggart). (2015). Pre-school and early home learning effects on A-level outcomes. Effective Pre-School, Primary & Secondary Education Project (EPPSE). DfE.

Table 3B: Keywords defining the associated/mediating/moderating/etc aspects of the above relationship

Key Concepts	Key-words [concept]	Notes
Pupil Characteristics (demographics)	Gender Ethnic* OR race (BAME?) Language (other than English/English/EAL) SEN Physical health/disability	Country dependent: Migrant or Immigrant* asylum minority nationality
Pupil characteristics (Socio-psycho/emotional)	Mental health/ well-being sense of alienation/belonging social difference and stereotype threat, locus of control Anxiety Self-concept/confidence	Other non-cognitive outcomes could fit here Aspirations Destinations Dispositions Attitudes Engagement absenteeism
Family	Perinatal factors Physical home environment Social home environment: parental functioning/behaviours victimisation/abuse, attitudes aspirations in the home, childrearing strategies role model , family structure, parental (mother) qualifications, adverse childhood experiences, supported home learning eg homework, EAL, carer responsibilities	smoking/birth weight, breastfeeding Cold/damp/cramped, overcrowded living, lack of computer/internet resources, lack of toys, lack of nutritious food, housing affordability homelessness/mobility eg inter-parental conflict (concerted cultivation, extra-curricular),
Peers	Peer networks	

	Friendships socialising values and behaviours in/out of school bullying (including cyber)	
Teacher - related	Teaching quality Teaching style Practice	
Classroom	Practices Settings/ability groupings	
School characteristics	State-funded etc School funding spending School effectiveness judgments (outstanding, good, requires improvement, inadequate) Practice Policy	
Environment	Region Neighbourhood Community LEA work opportunities Physical: green space, levels of pollution infrastructure and amenities	+social capital Collective efficacy
Educational system	Access Choice Market Funding	This will be particularly useful if/when we consider international literature

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Appendix 4: Data extraction tools (initial drafts)

Table 4A: Data Extraction tool for WP1

Criterion	Coding Variable	Categories/Options
Publication	Publication Type	Journal article Report Dissertation or thesis Technical/research report Book/Book chapter Other
Study design and method	General Study Design	Intervention/Evaluation Survey Cross-sectional Survey Longitudinal Other
Study design and method - Intervention	Intervention Name	
	Intervention Description	
	Intervention Objectives	
	Treatment groups	1/2/3+/NA(not specified)
	Assignment of participants	Random, Non-random/matched Non-random/non-matched prior to treatment natural sample retrospective quasi experimental design Regression discontinuity Unclear
	Level of assignment	individual class school-cluster school whole site region not provided
Location	Study country	England/Other UK

	Additional information	name of city, region or district rural/urban/sub-urban
Educational setting	Type/classification	Preschool/Nursery Primary school Middle school Secondary/High school Residential/Boarding School Private/Independent School Home Further education/Junior or Community College Other educational setting Outdoor adventure setting
Study sample	number of participants	
	Gender	male/female/mixed/no information
	Age/year group	3-18 / Year 1 to 12
	proportion of FSM/low SES children in the sample	add specific indicators of FSM/Low SES
Outcomes	Reported Primary outcomes[12]	Standardised test / Researcher developed test / School-developed test / National test or examination / International tests Other
	Curriculum subjects tested	Literacy (English) • Reading comprehension • Decoding/Phonics • Spelling • Reading other • Speaking/listening • Writing Mathematics/ Science/ Social studies Arts / Other curriculum test
	Other reported outcomes (if yes)	Cognitive outcomes measured /Other types of student outcomes /Other participant outcomes

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[12] This information and other variables relevant to the outcomes and their quantification will also be extracted from survey studies

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Table 4B: Extraction tool for WP2

Variable	Categories/Codes
Publication type	book journal article, book chapter review
Type of research evidence	narrative thematic analysis quantitative/Secondary Data Theoretical
Country	Record country of origin of the study
Loci/factors level	individual peer family school neighbourhood systemic (society, economics)
Scale of research	record details
What the study says?	
What does it say about the relationship between socio-economic disadvantage and educational attainment	
what arguments/claims are made and based on what theories/perspectives	

Appendix 5: Quality assessment criteria (initial example)

Table 5A: Criteria for Assessing Correlates (Based on CQC)

Criteria	Scoring Scheme	Score	
Sampling Method	Total population or random sampling	1	
	Convenience sampling or case control sampling	0	
Response Rates	Response and retention >=70% and differential attrition <=10%	1	
	Response <70% or retention <70% or differential attrition > 10%	0	
Sample Size	>=400	1	
	<400	0	
Correlate measure	Reliability coefficient >=0.75 and reasonable face validity OR Criterion or convergent validity coefficient >=0.3 OR More than one instrument or information source used to assess correlate None of the above	1 0	
Outcome measure	Reliability coefficient >=0.75 and reasonable face validity OR Criterion or convergent validity coefficient >=0.3 OR More than one instrument or information source used to assess correlate None of the above	1 0	

Table 5B: Check list for causal risk factors

Study type	Analysis of change	Score
Without comparison group	No	1
Inadequately controlled study	No	2
Without comparison group	Yes	3
Inadequately controlled study	Yes	4

Controlled non-experimental study	No	5
Controlled non-experimental study	Yes	6
Randomised experiment	Targeting a risk factor (SES/FSM)	7

Appendix 6: Example outputs for WP1 findings

Scenario 1: when attainment outcomes are reported as SES/FSM differences (continuous outcome)

Moderation analyses for variation of SES/FSM differences in academic attainment

Moderator (M)	Number (N) of effect sizes (studies)	Effect size (g)	95%CI of effect size		Q (test of between group differences)
			Lower (Lg)	Upper (Ug)	
Domain (M1)					Q1
English (Language)	N11	g11	Lg11	Ug11	
Mathematics	N12	g12	Lg12	Ug12	
Science	N13	g13	Lg13	Ug13	
etc					
Nation (M2)					Q2
England	N21	g21	Lg21	Ug21	
Scotland	N22	g22	Lg22	Ug22	
Wales	N23	g23	Lg23	Ug23	
Northern Ireland	N24	g24	Lg24	Ug24	
UK	N25	g25	Lg25	Ug25	
Gender (M3)					Q3
Male					
Female					
Age (M4)					Q4
3-5					
6-10					
11-16					
16+ to 18					
Publication status (M5)					Q5
Journal					
Dissertation					
Thesis					
Conference Paper					
Official Report					
Other moderators as in the list of Appendix 3 – Table 3B					Q6…