

Health promotion, inequalities and young people's health

A systematic review of research

Report written by Sandy Oliver, Josephine Kavanagh, Jennifer Caird, Theo Lorenc, Kathryn Oliver, Angela Harden, James Thomas, Adele Greaves and Ann Oakley

EPPI-Centre
Social Science Research Unit
Institute of Education
University of London

EPPI-Centre report no. 1611 • October 2008

AUTHORS

Sandy Oliver, Josephine Kavanagh, Jennifer Caird, Theo Lorenc, Kathryn Oliver, Angela Harden, James Thomas, Adele Greaves and Ann Oakley of the EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

CONFLICTS OF INTEREST

There were no conflicts of interest for this review.

ACKNOWLEDGEMENTS

We would like to thank Mark Petticrew, Amanda Sowden, Claire Stansfield and other members of the EPPI-Centre health team, on whose work and experience we drew in preparing this report.

FUNDING

The work described in this report was undertaken by the EPPI-Centre, which receives funding for a specific programme of work from the Department of Health, England.

This report should be cited as: Oliver S, Kavanagh J, Caird J, Lorenc T, Oliver K, Harden A, Thomas J, Greaves A and Oakley A (2008) *Health promotion, inequalities and young people's health: a systematic review of research*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

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ISBN 978-0-9554810-3-1

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GLOSSARY

Health inequality: describes differences, variations, and disparities in the health status of individuals and groups.

Health inequity: refers to those inequalities in health that are deemed to be unfair or stemming from some form of injustice.

Inequalities research dataset: Dataset in this study of research that explicitly addresses inequalities by making this clear in the title or the abstract sourced from commercially available bibliographic databases.

Interventions research dataset: Dataset in this study of process or outcome evaluations of interventions (also called intervention studies) sourced from a specialist health promotion database, BiblioMap, developed and maintained by the EPPI-Centre.

Outcome or process evaluations of interventions: These are intervention studies and may be sourced from either the inequalities research dataset or the interventions research dataset.

Socio-economic status is assessed in terms of income-related measures of socio-economic position: income, occupation, education, elements of place of residence.

Socio-economic position: The multidimensional concept of 'socio-economic position' is generally preferred today as encompassing and extending the uni-dimensional elements of what UK research has traditionally categorised as 'social class' and US studies as 'socio-economic status'; this includes other socio-demographic factors such as gender, ethnicity and religion.

ABBREVIATIONS

BMI	Body mass index
NHIS	National Health Insurance Scheme (US)
NICE	National Institute for Health and Clinical Excellence (UK)
RCT	Randomised controlled trial
SEP	Socio-economic position
SES	Socio-economic status
STI/STD	Sexually-transmitted infections/diseases

EXECUTIVE SUMMARY

Background

This report describes an attempt to look at how much health promotion and public health research relating to young people has tackled health inequalities, and in what ways it has done this.

Health inequalities are recognised as an important problem nationally and internationally. There is policy interest in improving the health of the most disadvantaged, reducing the gap between the most and least disadvantaged, and reducing gradients across the whole population. Health inequalities arise from variations in social, economic and environmental influences along the life course. Health promotion, particularly when it uses social and structural interventions developed by multi-disciplinary teams working with young people, not merely for them, has the potential to reduce health inequalities among young people immediately, and in their later lives.

Inequalities research draws on a range of evidence. Observational studies describe the magnitude and severity of health problems and of inequalities. The findings of these studies can guide the targeting of interventions to reduce disadvantage or inequalities. Interventions evaluated using controlled trials or some other evaluation design can answer questions about effective ways of reducing inequalities. Research reporting people's views and experiences adds valuable qualitative data to observational and intervention evaluations.

Research questions and methods

The review described in this report had two aims: to provide a descriptive map of the extent to which health promotion and public health intervention research has focused on inequalities in young people's health; and to look in more detail at the methods used by researchers for defining and measuring inequalities. We defined 'young people' as those aged from 11 to 21. Addressing inequalities requires methods for including diverse populations in research and discriminating between them. Methods for the latter are addressed in this report; methods for the former are addressed in another study conducted at the same time.

What research has been done? The systematic map

The first aim of the work was to identify and describe the available research evidence in order to answer the following questions:

- How much research activity in health promotion and public health has addressed health inequalities among young people?
- What types of research have looked at gaps or gradients in health status?
- How much of this research specifically relates to socially disadvantaged and vulnerable young people (those considered at risk in various ways; those with social or complex needs; those living in marginalised communities; looked-after young people; young parents; school non-attendees)?
- How much of the research in this area addresses the impact of structural interventions?

We answered these questions by looking at a group of studies derived from two sources: records of health promotion and public health research included in commercial databases which express an explicit focus on inequalities (the 'inequalities research dataset'); and studies included in BiblioMap, a register rich in intervention evaluations as it contains the Trials Register of Promoting Health Interventions (TRoPHI), a web-based database of randomised controlled trials and controlled trials (non-randomised) of public health and health promotion interventions hosted by the EPPI-Centre (the 'intervention research dataset').

Criteria for studies to form part of the map included comparing the health status of two or more demographic groups and having a publication date of 1996 or later. These criteria were first applied to titles and abstracts. Potentially relevant studies were subsequently re-screened using the full paper. We used a coding scheme to classify studies. The codes enabled us to describe the literature at a broad level, including different study types, settings, topics, populations and outcomes. We also coded studies according to whether they presented an analysis of inequalities in terms of gaps, gradients or both.

How has the research been done? The methods study

The second aim of this work was to look at the methods that researchers have used to define and assess health inequalities in outcome evaluations of interventions. We asked how existing research has:

- described populations and measures of disadvantage;
- described health status and difference between populations;
- incorporated the experiences and opinions of young people into the development and evaluation of interventions; and
- recruited and retained young people participating in intervention evaluations.

To answer these questions we used a different set of studies: intervention evaluations included in previous EPPI-Centre systematic reviews in areas where young people experience health inequalities (healthy eating, mental health, physical health, teenage pregnancy and teenage parent support) (Harden et al. 2001, Harden et al. 2006, Rees et al. 2001, Shepherd et al. 2001).

A key issue for researchers in the area of health inequalities is how to define and assess socio-economic position (SEP). In examining this, we used the classificatory framework PROGRESS (Place of residence, Race¹/ethnicity, Occupation, Gender, Religion, Education, Socio-economic status and Social capital) (Evans and Brown 2003). We expanded PROGRESS to form PROGRESS-Plus (Kavanagh et al. 2008) with the addition of the three further variables of age, disability and sexual orientation, which are also implicated in health inequalities and addressed by discrimination legislation to support equal opportunities and human rights, (Department of Health 2007, US Department of Health and Human Services 2000) and specific vulnerable or excluded groups.

¹ The term 'race' relates to human population types based on external phenotypes. It is now understood that such categorisation is not meaningful and can be considered pejorative. We use the term 'ethnicity' alone throughout the rest of this report.

Results

What research has been done? The systematic map

Our systematic map of the research included studies across a wide range of health promotion and public health topics, settings and study designs. There were a total of 191 studies: 154 were found in the inequalities research dataset and 43 in the intervention research dataset, with 6 common to both. The most common health status measured in the inequalities research was physical health (Body Mass Index (BMI), disease) and, in the intervention research, health-related behaviours. Most of the studies were conducted in the USA (55% in the inequalities and 72% in the intervention research datasets).

Most of the studies used observational designs. We found only 46 outcome evaluations of health promotion and public health interventions that addressed health inequalities by comparing distinct groups; only 12 of these studies evaluated structural interventions or environmental modifications, and 6 evaluated interventions at the level of social networks. Most studies sampled broad populations rather than well-defined disadvantaged groups.

The most common difference examined in the research was gender (56% of the inequalities and 81% of the intervention research datasets), followed by ethnicity (56% and 35%) and SES-relevant differences (55% and 21%). Almost half the studies included comparisons relevant to SES. A wide range of methods were used to measure socio-economic status, including single measures such as occupational class, parental education and income, and multiple measures comprising combinations of these. Ten studies used nine different composite measures of SES.

The bulk of the studies in the inequalities dataset contained data relevant to both gaps and gradients (51% compared with 23% of the studies in the intervention dataset). In the inequalities dataset, 25% of the studies focused on gaps only (mostly gender comparison) and 23% on gradients. The comparable figures for the intervention research dataset were 67% gaps studies (again, mostly focused on gender) and 9% gradients studies.

How has the research been done? The methods study

Most of the outcome evaluations of interventions we reviewed in depth recruited young people through schools or agencies such as social services. In many studies the recruitment methods used would have excluded the most disadvantaged. A notable feature of these studies was that, although most (n=21 of 28) gave figures for attrition, only about half of these (n=11) reported on the socio-demographic characteristics of participants who dropped out.

Few studies involved young people or their parents actively in choosing research priorities or intervention aims (n=2), or developing interventions (n=3). More elicited their views as research participants for the needs assessment (n=4) or process evaluation (n=7).

Most studies did not explicitly aim to measure or reduce inequalities. Half the studies (n=15) provided subgroup data, but this was not always analysed appropriately.

Recommendations and implications

There is an extensive research literature to inform policy interest about the causes of health inequalities and how they develop along the life course. There is less research directly addressing how to reach the policy goal of reducing inequalities. We sought a literature about health promotion, inequalities and young people's health, but found instead largely

disconnected literatures of: observational studies addressing inequalities; discourses about inclusive research and public involvement for tackling inequalities; evaluations of health promotion (but not of its effects on inequalities); and methodologies for assessing health inequalities that had been applied almost exclusively to observational studies. Knowledge from these different literatures needs to be joined up in order to build an evidence base to support effective health promotion for young people that reduces, or at least does not increase, health inequalities. There are implications throughout the research pathway for: research priorities, the research community, study designs, methods for data collection and analysis, reporting and publishing.

Research priorities

Systematically mapping the literature and critiquing health promotion intervention studies in terms of inequalities research methods exposed a number of gaps in the evidence base. There is a need:

- to investigate appropriate research methods for the evaluation of interventions intended to reduce inequalities. This includes questions of when to conduct subgroup analysis and with which groups.
- to conduct high quality outcome evaluations of interventions which compare outcomes between different PROGRESS-Plus groups, especially SES comparisons. There is a particular need to conduct such evaluations in the UK. There is also a particular need to conduct such research with vulnerable groups.
- for rigorous evaluations of the effects of structural and social support interventions which earlier reviews have highlighted as having potential for reducing inequalities.
- for process evaluations which can provide information on the implementation of interventions and their acceptability to young people and their families.

These research needs should be considered alongside the findings of the priority setting exercises undertaken by the Cochrane Equity Field and the Cochrane Health Promotion and Public Health Field that are to be discussed at the Cochrane Colloquium in October 2008.

Research community

To address the effects of interventions on health inequalities, the research community, when funding, designing, reporting or publishing research, or reviewing its science or ethics, needs to draw on its knowledge and experience of:

- developing interventions for reducing inequalities, such as structural interventions or social support;
- experimental study designs for evaluating social interventions;
- measures of health inequalities;
- working with disadvantaged or marginalised groups in order to develop and implement inclusive recruitment strategies and minimise attrition;
- working in partnership with potential recipients in guiding public health research which addresses their health needs.

When considering individual studies, and in the course of wider debate, it is beneficial to convene mixed groups, in terms of academic disciplines and professional and personal roles, in order to exchange such knowledge and experience.

Study design

Investigating inequalities requires study designs to take into account dimensions of inequalities pertinent to the focus of study, and whether the study aims to generate hypotheses or draw conclusions about the effects of interventions on inequalities.

- Much of the literature about investigating inequalities argues for attending to dimensions of inequality other than SES both for their own sake and in order to describe their interactions with SES as determinants of health; similar thoughtful approaches are needed to inform intervention studies taking into account health inequalities.
- The overlapping discourses of social determinants of health and equality of opportunity can inform the choice of population descriptors in studies of health inequalities. PROGRESS-Plus is a practical tool spanning these discourses for characterising populations when planning and reporting primary research, including sampling frames, recruitment and data collection, and analysis (including attrition). Data need not be collected for every dimension of PROGRESS-Plus; rather it provides a framework from which to choose appropriate dimensions for investigation.
- Primary studies drawing conclusions about the effects of interventions on inequalities need to be sufficiently large to allow subgroup analyses sensitive to statistically significant differences.
- Smaller studies may explore potential differences with subgroup analyses for the purpose of hypotheses generation. Hypotheses may be tested subsequently in sufficiently powered primary studies or in systematic reviews with statistical meta-analyses.

Data collection

The choice (or dearth) of socio-demographic data reported in some intervention studies suggests that this literature largely fails to draw on lessons learnt from the wider inequalities literature.

- It is essential to determine whether or not a study has an explicit focus on inequalities baseline socio-demographic data which is collected, reported and linked to outcomes data, in order to expose instances of interventions inadvertently increasing inequalities.
- Studies of inequalities in socio-economic status need to employ measures of SES that are meaningful and feasible for particular populations and settings. For instance, young people may offer more accurate descriptions of housing conditions than of parental occupations.
- There is a need to assess the validity of composite measures of socio-economic status for young people.

Analysis

Analytical methods need to be theoretically and technically sound:

- The rationale for comparing different socio-economic groups should be clear.
- In particular, there is a need for better theorising about the role of gender and ethnicity in addressing inequalities through subgroup analyses.
- Where subgroup analyses are used to investigate inequalities, they should be pre-specified and have an appropriate rationale. Subgroup analyses which are under-powered to investigate differential effects in evaluations of interventions should only be used for hypothesis generation.
- Attrition data should be reported and linked to socio-demographic data.
- There is a need to explore the potential of area measures for experimental designs, particularly the value of using area measures: as background information comparable to official national statistics; as inclusion criteria; and as analytical factors for understanding the effects of interventions and effect modifiers.

Reporting and publishing

To build an evidence base, individual studies need to contribute comprehensive reporting of socio-economic data, either in journals or in publicly accessible reports. Funders and publishers are well placed to encourage:

- better and fuller reporting of socio-demographic data of participants in primary research, if necessary through publicly accessible electronic appendices.
- reporting comparisons of health status between different socio-economic groups in abstracts.

This accumulative evidence base would be more accessible through bibliographic databases where structured abstracts and keywords include terms relating to health inequalities.

1. BACKGROUND

This report describes a study funded by the English Department of Health to examine health promotion and public health research and health inequalities research related to young people (Oliver et al. 2006a). The first aim of the study was to provide a descriptive map of the available research evidence. The second aim was to look in more detail at the methods researchers have used to define and measure health inequalities, population diversity and the involvement of young people and their carers in developing and implementing health promotion and public health interventions. The emerging findings informed a subsequent study (Kavanagh et al. in preparation) consisting of a systematic review of cognitive behavioural interventions aimed at reducing inequalities in young people's mental health. A parallel study has reviewed the methodology and practice for including diverse populations of children and young people in controlled trials and views studies of health promotion (Lorenc et al. 2008).

The work described in the report builds on previous EPPI-Centre reviews which have examined interventions for young people's health in the areas of physical activity, healthy eating, mental health, and teenage pregnancy and parenting (Harden et al. 2006, Oliver et al. 2007, Rees et al. 2006, Shepherd et al. 2006). This earlier work gave us immediate access to data relevant to investigating health inequalities: data about effectiveness of interventions targeting societal structures, communities, families and individuals, and data about young people's views and their involvement in identifying the need for interventions and developing and evaluating interventions (Oliver et al. 2006b, 2006c).

The term 'health inequalities' is commonly understood as referring to inequalities between the health of less and more disadvantaged social groups (Graham and Kelly 2007, p6). Inequalities in health are recognised to be a major problem in many countries, with many reporting increases during the 1980s and 1990s (Acheson 1998, Black and Whitehead 1992, Crombie et al. 2005a, 2005b). Unjust or unfair variations are termed 'inequities' (Dahlgren and Whitehead 1991). Judgements about what is unjust, unfair, avoidable or unnecessary are subjective and depend upon what is known about the genesis of health inequalities (Kawachi et al. 2002) and what has been established in prevention research. To avoid making these subjective judgements, we have chosen in our work to focus on health inequalities.

1.1 Policy interest

Health inequalities have been a continuing subject of policy interest since and before the Black report (Department of Health and Social Security 1980). The Black report confirmed the existence of social class gradients in mortality and morbidity, and in the availability and use of health services (particularly preventive health services). Many of the recommendations related to monitoring and improving children's health, especially regarding accidents, healthy eating, child health services, day care and reducing child poverty. It recommended greater preventive approaches in all areas of health. In relation to health promotion, these included the further development of 'health promoting schools', initially focused on, but not limited to, disadvantaged communities. In particular, the report recommended measures to improve the nutrition provided at school, including: the promotion of school food policies; the development of budgeting and cooking skills; the preservation of free school meals entitlement; the provision of free fruit at school; and the restriction of less healthy food.

Although much of the evidence about health inequalities relates to the health of adults, there is also strong evidence of health inequalities in childhood and among young people with respect to physical and psychological ill health, accidental injury risk and aspects of family processes that shape health (Macfarlane et al. 2004, Sweeting and West 1995, Thomas et al. 2007). As with the picture for adults, factors related to socio-economic status (SES), gender, ethnicity and place of residence interact in shaping health profiles. Key axes of social differences in populations – class, status, education, occupation, income/assets, gender, ethnicity, caste, religion, national origins, age and residence – ‘intersect, interact, overlap and cluster together in their effects’ (Kelly et al. 2007, p12).

Currently, tackling health inequalities is one of the aims underpinning the eleven standards promoted within the National Service Framework (NSF) (Department of Health 2004a). Other aims are responding to the needs of children and young people in age-appropriate ways; involving them in decisions about services provided; and promoting equitable access and use. These, too, relate to tackling inequalities (see section 1.6). The emphasis in the *Every Child Matters: Change for Children* programme (Department for Education and Skills 2004) of which the NSF is a part, is on five domains key to health and well-being which are also fundamental to health promotion and public health: be healthy; stay safe; enjoy and achieve; make a positive contribution; and achieve economic well-being. A third recent policy development, marked by the recommendations of *The Chief Nursing Officer's Review of the Nursing, Midwifery and Health Visiting Contribution to Vulnerable Children and Young People* (Department of Health 2004b), highlights the need for more efficiently targeted preventive strategies and more effective action to build health resources at the community level.

Reliable information about what existing research can tell us about the role of health promotion and public health in promoting health equitably for all groups of children and young people to achieve these aims is echoed in the first evidence-based assessment of the long-term resource requirements for the NHS (Wanless 2004): the importance of work to improve the methodology of public health evidence and evaluation.

There are three goals for interventions seeking to reduce health inequalities (Graham and Kelly 2004). The immediate goal is to improve the health of the most disadvantaged groups. The second is to reduce the gap between the most and least disadvantaged groups. Since absolute disadvantage may be of limited significance (see section on measuring inequalities, below), an effective policy needs to achieve both an absolute and a relative improvement in health, thereby narrowing the gap. The third goal is to reduce gradients across the population, seeking to improve outcomes for all groups and not only the most disadvantaged: ‘as the penalties of inequalities affect the whole social hierarchy and usually increase from the bottom to the top ... if policies only address those at the bottom of the social hierarchy, inequalities in health will still exist’ (Acheson 1998 cited in Graham and Kelly 2004, p9).

These goals may be achieved either with interventions for particular disadvantaged populations (targeted interventions) or by interventions available to all (universal interventions). However, targeted interventions tend to focus attention on particularly disadvantaged groups at the expense of those intermediate groups who, while not most at risk, still suffer from inequalities. Hilary Graham, among others, has raised concerns about the tendency to focus on targeted interventions because of ‘the conflation of inequality and disadvantage’ that this approach implies (Graham 2006, p542); policies to reduce inequalities must include the diminishing of health ‘gradients’ as well as the closing of ‘gaps’. They should not seek merely to improve the position of the most disadvantaged, but to improve health across the population: ‘a health-gradient approach redefines tackling health inequalities as an inclusive and population-wide goal; like the goal of improving health, it includes everyone’, intermediate socio-economic groups as well as the very poorest (Graham 2006, p547).

The National Institute for Health and Clinical Excellence (NICE), which develops evidence-informed guidelines for health policy and practice, convened a citizens' council to debate inequalities in health (Watts 2006). After several days of informed deliberation, the citizens' council supported the principle of NICE issuing guidance that concentrates resources on trying to improve the health of the most disadvantaged members of our society, thus narrowing the gap between the least and most disadvantaged, even if this has only a modest impact on the health of the population as a whole. Nevertheless, a large minority of the council considered it appropriate for NICE to issue guidance that concentrates resources on improving the health of the whole population (which may mean improvement for all groups) even if there is a risk of widening the gap between the socio-economic groups.

1.2 Causes of health inequalities

Health status varies within and between populations, and this variation is a result of complex interactions between biological, environmental, social, economic and 'lifestyle' factors. Poor living and working conditions impair health and shorten lives (Krieger et al. 1997). Social determinants of health have been summed up in the acronym PROGRESS for Place of residence, Race²/ethnicity, Occupation, Gender, Religion, Education, Socio-economic status and Social capital (Evans and Brown 2003). Age, disability and sexual orientation are also implicated in health inequalities (Department of Health 2007; US Department of Health and Human Services 2000). This more inclusive group of populations we describe collectively as PROGRESS-Plus.

Variations in these social, economic and environmental determinants of health lead to 'health inequalities'. A multi-level model (Dahlgren and Whitehead 1991) proposes an interplay of social determinants from 'upstream' to 'downstream'. Multiple pathways run from the social structure through living and working conditions to health-related beliefs and behaviours. The following levels are important:

- social, cultural, economic and environmental context;
- individuals' living and working conditions;
- social and community networks;
- individual lifestyle factors;
- biological and genetic factors which affect people's vulnerability to illness and injury;
- illness and injury which feed back into the causal chain by weakening individual social position.

Four types of explanations have been proposed for health inequalities: that they are essentially an artefact of how social class is documented; that they result from a selection process in which less healthy people are downwardly mobile; that they are generated

² The term 'race' relates to human population types based on external phenotypes. It is now understood that such categorisation is not meaningful and can be considered pejorative. We use the term 'ethnicity' alone throughout the rest of this report.

through (un)healthy individual behaviour; and that they are caused by hazards inherent in society to which some people have no choice but to be exposed given the distribution of income and opportunity. This latter materialist explanation was preferred by the Research Working Group on Inequalities in Health which produced the Black report (Department of Health and Social Security 1980).

Different mechanisms have been proposed to explain the link between material inequality and health (Kawachi et al. 2002):

Some have focused on the psychosocial harm (for example, the shame, loss of self respect) produced by invidious social comparisons in an unequal society. Others have focused on the patterns of social investment (for example, lower state effort on education and welfare spending) that often accompanies a growing distance between the rich and poor. Erosion of social cohesion and social capital has been cited as an additional mechanism underlying the relation between income inequality and health (p650).

The adverse effects of inequalities may not be restricted to the poorest sections of the population. Research addressing health inequalities needs to consider health status across the population, not merely the health of the most disadvantaged groups.

1.3 Health inequalities, young people and the life course

Evidence that disadvantage at different stages of life affects adult health has prompted a life course approach to studying inequalities (Power and Kuh 2006). A life course approach investigates how social and biological factors operating at different stages of the life course and across generations contribute to the development of inequalities in adult health and disease. Early life experience may affect adult health directly, through subsequent pathways of behaviour and context, and through the accumulative effects of living in unfavourable circumstances.

For young people, social inequalities may already be damaging their health, and current life circumstances may be making inequality in later life more likely. Young people experience inequalities in relation to accidental injury and their mental and sexual health. Accidental injury is the biggest single cause of death in children and young people, and an association between SES and fatal and non-fatal road-related injuries has been established (Diderichsen and Hallqvist 1998, Laflamme and Diderichsen 2000, Laflamme et al. 2004, Roberts 2000, Roberts and Power 1996). Edwards and colleagues (2006) found that when compared with children of parents in professional or higher managerial occupations, children of parents who were long-term unemployed or who had never worked, had a mortality rate 13.1 times higher for deaths due to injury or poisoning and 37.7 higher for deaths due to exposure to smoke, fire or flame. Many indicators of low level early-life SES are associated with later adverse health outcomes (Chittleborough et al. 2006). There are gender and ethnic differences in risk for emotional and eating disorders, and suicide and self-harm, and social disadvantage is strongly related to conduct disorders (Asthana and Halliday 2006). Mental health problems in youth can also impact negatively on physical and mental health in adulthood. Young people aged 16-24 are disproportionately affected by sexually transmitted infections (STIs). In 2006, they accounted for 65% of all chlamydia, 55% of all genital warts and 48% of gonorrhoea diagnoses in genito-urinary medicine (GUM) clinics across the UK in 2006 (Health Protection Agency 2007). There are gender, ethnic and geographical inequalities in the prevalence of different STIs (Asthana and Halliday 2006).

While young, some people are also accruing health inequalities that they will experience later in life, some of which will be related to their current unhealthy behaviours such as unhealthy

eating, lack of physical activity and smoking. Health damaging behaviours that result in poor health outcomes later in life are often strongly linked to socio-economic position (e.g. young women smoking, disadvantaged families' poor diet).

A life course approach to policy calls for a range of interventions appropriate for each age group; for interventions that take into account inequalities that already exist; and for interventions that reduce the development of inequalities in later life. Health promotion and structural interventions which aim to influence the social determinants of health have an important role to play in reducing inequalities and are the subject of considerable policy interest.

1.4 The role of health promotion and public health

Health promotion is the science and art of helping people change their lifestyle to move toward a state of optimal health. Optimal health is defined as a balance of physical, emotional, social, spiritual and intellectual health. Lifestyle change can be facilitated through a combination of efforts to enhance awareness, change behaviour and create environments that support good health practices. Of the three, supportive environments will probably have the greatest impact in producing lasting change' (O'Donnell 1989).

This expectation of lifestyles and health changing through enhanced awareness, changed behaviour and supportive environments offers a role for health promotion and public health at several levels of social determinants of health:

- general social, cultural, economic and environmental context;
- individuals' living and working conditions;
- social and community networks;
- individual lifestyle factors.

A systematic review of 'up-stream' interventions is being conducted by the Department of Health-funded Public Health Research Consortium (Bambra et al. in preparation). These 'up stream' or 'system' interventions aim to change the general social, cultural, economic and environmental context, or individuals' living and working conditions.

In addition to this there is a role for the public health and health promotion workforce to address inequalities by intervening in social and community networks and individual lifestyle factors while taking into account people's living and working conditions and broader contexts.

In searching the literature on inequalities and young people's health we found five relevant existing systematic reviews. Two looked at effectiveness (Arblaster et al. 1996, Gepkens and Gunning-Schepers 1996); two at the views of children and young people themselves (Attree 2004, Starfield et al. 2002), and one at both effectiveness and young people's views (Roberts 2000).

Arblaster et al. (1996) included studies of interventions aimed at improving the health of disadvantaged groups as well as those examining gaps or gradients in health status. They found 94 evaluations with an experimental design. Characteristics of successful interventions included: systematic and intensive approaches to delivering effective health care; improvement in access and prompts to encourage the use of services; strategies employing a combination of interventions and those involving a multi-disciplinary approach; interventions addressing the expressed or identified needs of the target population; and the

involvement of peers in the delivery of interventions. However, these characteristics alone were not sufficient for success, nor were they universally necessary.

In their review, Gepkens and Gunning-Schepers (1996) also concluded that structural measures appear to be effective most often for reducing health inequalities, but cannot be taken to affect all social determinants of health. Interventions including health education only appear to be successful if this is combined with social support or structural measures.

Systematic reviews of observational studies (Starfield et al. 2002), children's perspectives on disadvantage (Attree 2004) and children's services (Roberts 2000) all emphasise the role of social inequalities in children's health and the potential for improvement. In the review of observational studies, the likelihood of being satisfied with one's health, of being more resilient (better family involvement, better problem solving, more physical activity, better home safety), of having higher school achievement, and of having the best health profiles was significantly and progressively greater with higher social class (Starfield et al. 2002). A review of interventions in the early years of life published in 2000 concluded that the biggest differences to child health will not be made by the NHS, but by changes in other sectors (Roberts 2000). For example, for some children and young people, family relationships, friendships and neighbourhood social networks can help to reduce the impact of disadvantage, but children's accounts demonstrate that such resources are not always and unambiguously experienced as supportive and protective (Attree 2004).

Taken together, these systematic reviews suggest that success is more likely from social support and community or structural interventions developed by multidisciplinary teams working with young people, not merely for them.

1.5 Inclusive research

Listening to people who are offered a service is an ethical imperative in terms of assessing the acceptability and appropriateness of interventions for them. Taking into account what people say about their health needs, what they see as influencing their health either negatively or positively, is an important step in developing effective interventions and shaping evaluations. The aim is to 'give a voice to the voiceless' (Whitehead and Dahlgren 2006), to involve marginalised people who are most intimately affected by any efforts to improve health on a population-wide basis. Engaging disadvantaged groups, particularly those hard to reach, in the use of services and as research participants is particularly challenging. In terms of the PROGRESS framework, this means meeting the challenge of developing public health interventions for people who, for instance, live in particular areas and have particular biological or cultural roots, employment (or lack of it), beliefs and education, by addressing their concerns and experiences.

For research to engage disadvantaged groups, members of such groups must first be recruited to research studies, then consent to participation, and be encouraged to stay in the study. Barriers to the participation of disadvantaged groups exist at all these stages. Age, gender, social class, level of education, marital status and disability have all been shown to influence participation in research (Dunn et al. 2004, Korkeila et al. 2001, Sexton et al. 2003).

1.6 Public involvement

The people have the right and duty to participate individually and collectively in the planning and implementation of their health care (World Health Organization 1978).

Early public health research in the nineteenth century was rich with the expertise of 'ordinary' people ... we need to revisit this tradition – to privilege the voice of experience (Popay, in her evidence to the Select Committee on Health 2001).

Greater involvement of the public in the development and evaluation of services may resolve problems of access and acceptability. Working with people who have personal ties with their community can yield advantages in terms of recruitment into research studies of participants from marginalised and hard to reach communities (Hanley et al. 2003). Communities have the potential to promote health from the bottom up (MacDonald and Davies 1998). The importance of empowerment and working in partnership with individuals, communities and organisations is often highlighted in the context of promoting the health of traditionally disadvantaged groups (Harden and Oliver 2001). There is now an established body of theories, guidance and evidence supporting active public involvement in evidence-informed public health (Hanley et al. 2003, Oliver in press, Parker et al. 2003, Popay and Williams 1996, Putland et al. 1997). Enabling disadvantaged people and communities to be involved in decisions about their health, has the potential to improve confidence in, understanding and use of the health service. Given the policy focus on increasing patient and public choice in the NHS, increasing the active involvement of disadvantaged groups may be essential to avoid an increase in the level of 'choice inequalities', whereby existing health inequalities are reinforced by empowering some groups and further disempowering those groups which are already disadvantaged (London Patient Choice Project 2004).

Article 12 of the UN Convention on the Rights of the Child states that children and young people should be involved in all decisions that impact upon their lives (Kirby 2004). Calls have been made for the active participation of young people in creating and evaluating programmes that can meet their own health needs, rather than top-down expert-led models of health promotion. However, most health promotion and public health interventions targeted at young people that have been well evaluated for their impact have not been implemented on the basis of young people's stated health needs (Harden and Oliver 2001). There is little qualitative research focused specifically on inequalities, and paradoxically this is especially true for those who are most likely to be exposed to disadvantaging environments (Blaxter 1997). Some research suggests that structurally-oriented explanations of health inequalities are more likely to be offered by middle class research participants when talking about the wider social and political context of health (Bolam et al. 2004).

1.7 Research evidence for tackling inequalities

An evidence-informed public health service needs various types of research evidence (Armstrong et al. 2006, Brownson et al. 2003, Rychetnik et al. 2004). Firstly, it needs research that describes risk–disease relations, and identifies the magnitude, severity and preventability of public health problems. This points to the fact that 'something should be done'. Secondly, evidence-informed public health requires studies of the relative effectiveness of specific interventions aimed at addressing a problem. This can help to determine that 'this should be done'. Thirdly, there is evidence about the design, implementation, contexts and receipt of interventions. This evidence tells us 'how something should be done'.

Synthesis of the research evidence for tackling health inequalities needs to include all these approaches.

Studies of the views and experiences of young people can contribute to all three types of evidence: needs assessments, for example, can highlight the areas in which young people think 'something should be done'; listening to young people may contribute knowledge about

interventions and how their impact is assessed; and process evaluations can provide data on young people's views of the acceptability of an intervention.

Relevant research addressing the effects of interventions is likely to be heightened following priority-setting exercises by the Cochrane Collaboration. The Cochrane Health Promotion and Public Health Field identified 26 priority systematic review titles, addressing interventions such as community building activities, pre-natal and early infancy psychosocial outcomes, and improving the nutrition status of refugee and displaced populations (Doyle et al. 2005); these are all areas relevant to health inequalities. More recently, the Cochrane Collaboration has funded a number of projects focusing on priority-setting exercises for titles of Cochrane Reviews, one of which is currently being led by the Cochrane Health Equity Field. Debate is encouraged by the conference hosted by the US Cochrane Centre in July 2008 and a Cochrane Colloquium workshop in October 2008.

1.8 Measuring health inequalities: gaps and gradients

The definition and measurement of health inequalities are complex issues. Three strategies are needed to measure health inequalities:

- a description or measure of SEP (or disadvantage);
- a valid description or measure of health status (or change in health status);
- a (statistical) method for summarising the magnitude of health differences between people in different groups.

Valid descriptions of health status include clinical measures, risk factors and the intermediate measures for physical and psychosocial health commonly used in health promotion (knowledge, attitudes, intentions and behaviour) (Munro et al. 2007).

Disadvantage can be measured in absolute or relative terms. For example, economic poverty can be measured by looking at absolute income (or whether an individual has sufficient resources to purchase what is necessary for life). However, such definitions are inadequate on their own, since even basic needs such as food and shelter are defined relative to a social standard (Kawachi et al. 2002). Using this absolute approach ignores the contribution of relative disadvantage to marginalised populations with lower health status. It also focuses on the poorest members of society, and ignores those less disadvantaged who, nevertheless, suffer relative to others.

The alternative notion of relative disadvantage can be assessed in one of two ways: either by comparing the gap between a deprived group and another standard group, such as a national average; or by measuring the gradient of disadvantage across three or more groups (Kawachi et al. 2002). Describing and measuring gaps between populations or against averages addresses relative disadvantage, but does little to illuminate the relationship between inequalities and health, in particular whether these are directly and proportionately related or whether there are important thresholds. A focus on health gradients addresses differences between social classes across the spectrum of advantage and disadvantage, not just the link between poverty and ill health.

Methods for measuring gaps and gradients have been extensively developed. However, much of this work – and in particular the most methodologically sophisticated approaches – has focused rather narrowly on the economic determinants of health inequalities, such as disparities in income and occupational class (e.g. Kawachi et al. 2002). Investigating inequalities within and between populations calls for a wider focus. Coherent descriptions

and measurements of individuals and groups need to address the complex interrelationships of social class (forged by, for instance, employment status, capital assets, educational credentials and skills), socio-economic status (based on resources and prestige), and socially structured characteristics (such as gender, ethnicity) and context (household, neighbourhood and community characteristics), over the lifespan (Krieger et al. 1997). These factors are integral to an understanding of SEP (Graham and Kelly 2004, pp4-5):

To date, socio-economic position has been singled out for attention. Studies have highlighted how an adult's socio-economic position ... is powerfully shaped by the socio-economic position of their parents, with evidence that family background has become a more, not less, important influence on the future socio-economic position of children. Studies are highlighting, too, how a person's socio-economic position is shaped by their position in other structures of inequality.

Concepts such as the distinction between absolute and relative disadvantage, which have been developed to deal with economic or occupational inequalities, cannot readily be applied to this wider concept of disadvantage. To understand the whole range of health inequalities across populations, we need to use methodologies which are applicable to all these determinants of health.

At the most general level, any comparison of health status between demographic groups is of relevance to the study of inequalities. However, there are also reasons for inequalities research focusing on the most disadvantaged using gaps-based approaches. A gradients-based approach brings with it the risk that the most disadvantaged – that is those who have multiple and complex needs, and are at risk across a range of health and other outcomes – will not be considered in formulating policy, since they are numerically too few to impact substantively on population gradients. Thus, gaps and gradients analyses, and studies specifically addressing disadvantage, all make valuable contributions to health inequalities research.

1.9 Characterising populations

Carr-Hill and Chalmers-Dixon (2005) describe three broad categories generally employed in the literature to characterise populations when considering health inequalities. The first is demography (e.g. age, sex) and social demography, (e.g. area of residence, ethnicity). The second is social and economic status and other socio-economic groupings (e.g. car ownership, employment, income, occupational social class, socio-economic groupings, tenure status) . The third is the social environment (e.g. housing conditions and rural versus urban) and social capital (e.g. social networks and social supports). One specific tool for describing populations along these lines is the mnemonic PROGRESS, as described in section 1.2.

However, describing populations according to these variables, with or without additional categories, is far from straightforward. With respect to ethnicity, for example, individuals' self-identification as members of particular ethnic groups may be multiple and unstable, and any fixed set of categories can be inadequate to capture this complexity (Gunaratnam 2003). The use of standardised ethnic categories may overemphasise the homogeneity of 'ethnic groups' and the contrast between them, and result in stereotypical categorisations (Bradby 2003). To a greater or lesser extent such criticisms can be made of any measurement tool employed for any PROGRESS indicator.

The conceptualisation and measurement of individuals' relationships to the social structure has long been a contested area in epidemiology and other disciplines. The multidimensional concept of 'socio-economic position' (SEP) is generally preferred today as encompassing

and extending the uni-dimensional elements of what UK research has traditionally categorised as 'social class' and US studies as 'socio-economic status' (Chittleborough et al. 2006, Galobardes et al. 2006). This complexity needs to be borne in mind when investigating how studies characterise their populations and how the populations may be analysed in a systematic review. Considerable effort has focused on developing methods for measuring SEP on the grounds that it is 'the most fundamental of the social determinants of health' (Acheson 1998). However, the practical question of which measures to employ is contested. Various different measures of socio-economic status are routinely in use, including income, occupational class and level of education attained. These cannot be used interchangeably: correlations between them are 'low to moderate', they measure different phenomena and they tap into different causal mechanisms (Geyer et al. 2006). The different variables interact in sometimes unpredictable ways with other variables such as gender and ethnicity (Braveman et al. 2005). In the UK, occupational class has been the most widely used measure, with the five-level social class system recently replaced for official purposes by the eight-level National Statistics Socio-economic Classification (Office for National Statistics 2005). Occupational class is relatively easy to measure (for those in employment), but does not capture all relevant dimensions of socio-economic position, and functions better as a discriminator of SES for men than for women or children and young people.

Measuring the SES of children and young people poses particular difficulties. Since most young people are not economically independent, measures such as cash income or occupational class cannot be applied directly; educational attainment is also not an appropriate measure, since many young people have not yet completed formal education. Researchers have sometimes used parental or family SES to define that of children and young people. However, this poses difficulties of its own. Children and young people may be unable to provide a reliable response to questions about parental education, occupation or income. Currie and colleagues (1997), in a large school-based survey of 4,079 11 to 15-year-olds, found that more than 20% could not provide a substantive response about father's occupation. However, other studies suggest that the validity and reliability of children's and young people's answers to questions about parental occupation are greater than many researchers suggest (Ensminger et al. 2000, Lien et al. 2001). The use of 'home affluence' scales may be a useful strategy for gathering reliable data on family SES from children and young people (Wardle et al. 2002). Another response to the difficulty of defining young people's SES is to use the socio-economic profile of the community or neighbourhood in which they live. This method has the advantage of being relatively easy and cheap (since a home address or postcode is the only information required from participants). However, using area-based data may mask individual differences in SES and underestimate the extent of inequalities. Personal and area-based measures of SES appear to be only weakly correlated for adults (Deonandan et al. 2000). On the other hand, it can be argued that for young people of secondary school age and older, parental or family SES may contribute less than for adults to health inequalities (Asthana and Halliday 2006 p219, West 1997), so the average socio-economic status of their area of residence or school may be at least as relevant a measure.

For these reasons, it is of particular interest to examine how researchers have measured the SES of the young people included in their studies (section 3.4 below).

1.10 Measuring health status

Health behaviour theories distinguish two broad types of outcome for measuring health status: direct measurements of health, either physical or psychological, on the one hand; and health-related behaviours such as physical activity or smoking, along with measurements of knowledge or beliefs related to particular health issues and intentions as to future health

behaviours, on the other. Where research on young people's health is concerned, the former type of measure may be associated with a concern with present inequalities, and the latter with a life course perspective emphasising the consequences for young people's future health of inequalities in current behaviour and life experiences.

Measuring health status to assess the outcomes of interventions needs to take into account the passage of time following intervention – time for outcomes to be revealed, and time in which the impact of interventions may decline. Changes in behaviour and knowledge may be easier than physical health to measure over relatively short time spans. In particular, where the outcome of interest is a relatively rare event (e.g. suicide), measuring the incidence of the event with sufficient statistical power may call for larger samples than some researchers can manage, so behaviour or intentions may be used as intermediate outcomes. The limitation of this strategy is that knowledge and attitudes are poor predictors of behaviour change and health outcomes (Munro et al. 2007).

1.11 Combining inequalities research and interventions research

In this section we argue that observational data and observational research methods could be applied to intervention research. A substantial body of research now exists on how inequalities can be measured across populations in observational studies (for summaries see Keppel et al. 2005, Mackenbach and Kunst 1997). However, relatively little work has been carried out on how to evaluate the impact of interventions on inequalities:

Much of the public health research effort internationally over the past decades has focused on documenting and explaining the trends in health inequalities, i.e. the nature of the problem. ... However, much less policy and research attention has focused on testing and evaluating the effectiveness of policies and interventions (Killoran et al. 2006, p4; similarly, Graham and Kelly 2007, p9).

A key priority in the field of health inequalities is thus to 'invest in the development of research designs and evaluation strategies to better capture the effects of policies on health determinants and health outcomes' (Graham and Kelly 2007, p7).

It is important to establish how observational research on health inequalities can inform intervention research. There are two questions:

- How can the *data* produced in observational research (i.e. the description of what inequalities exist in a population) be used to inform the design and evaluation of interventions to reduce these inequalities?
- To what extent can the *methods* developed for observational research be applied to outcome evaluations of interventions so as to evaluate whether interventions intended to reduce inequalities are effective?

Questions about how the impact of interventions on health inequalities can be measured are inseparable from questions about the most promising ways of targeting interventions. In a study which targets disadvantaged groups, measures of the impact of an intervention on the selected outcome may be taken directly as evidence of an effect on inequalities. Where a universal or population-based approach is adopted, the intervention may be evaluated in terms of differential impacts on subgroups of the population.

1.11.1 Targeting disadvantaged groups

Much existing intervention research in the field of health promotion and public health addresses disadvantaged groups. Researchers and practitioners have concentrated on identifying groups at risk of adverse outcomes, and have targeted interventions at improving outcomes for those groups. Further work is required to address health inequalities. When developing a targeted intervention, observational data can be used to target the intervention appropriately. When evaluating a targeted intervention, an improvement in the outcomes for a disadvantaged group is assumed to mean the intervention is effective in reducing inequalities. However, this assumption may not be justified if there are coincidental changes in the wider population or if interventions are open to wider, less disadvantaged groups who may also benefit more.

Moreover, as disadvantaged groups are not homogeneous, more may be learnt by applying methods developed for observational research to investigate the impact of an intervention on inequalities within a disadvantaged group. For example, is an intervention for low-income families more or less effective for specific groups, such as families from different ethnic groups, or for single mothers? Whether, or how, researchers directly address health inequalities when developing or evaluating interventions for disadvantaged groups is unclear.

1.11.2 Universal interventions

One approach to reducing health inequalities is to focus on universal interventions in order to 'shift the mean' of the population as a whole. This may be regarded as preferable 'because it is non-stigmatising, and because it affects a greater number' (Roberts 2000, pp18-19). However, one effect of such an approach may be to increase existing inequalities. This is particularly likely when the health outcome of interest is strongly correlated with social determinants. 'Universal' interventions targeting broad samples may benefit high-status groups more than low-status ones and therefore actually increase health inequalities. There are currently two options for assessing such effects. An evaluation might either compare the effects of an intervention on pre-specified subgroups, or it might measure the inequality in health across the whole study population.

The first option, subgroup analysis, has been applied in clinical trials in order to identify subgroups that may benefit (or benefit more) from an intervention, and in theory, the same methods might be applied to health promotion trials for the same purpose. However, there are a number of diverging opinions on the inclusion of subgroup analyses in outcome evaluations of interventions. These differences in opinion largely relate to when or if they should be conducted (National Institutes of Health 2001, Oakley 2006, Rothwell 2005), and the potential for statistical error in both the conduct and interpretation of subgroup analyses (Brookes et al. 2001, Rothwell 2005).

In clinical trials it has been argued that subgroup analyses are indicated where there are potentially important differences in outcomes to specific groups of trial participants (Rothwell 2005). For example, an RCT of vaginal prostaglandins for inducing labour in women could include subgroup analyses on women who have had a previous caesarean section or who have never given birth before. Evaluating the impact of a health promotion intervention on health inequalities requires analysis of population subgroups according to some of the socio-demographic variables included in PROGRESS. Whatever form this evaluation takes – in particular, whether or not it involves testing the hypothesis that the intervention reduced a particular inequality – it will require some analysis of data by population subgroups.

Debate is ongoing as to whether outcome evaluations of interventions should routinely include subgroup analyses according to key factors (gender, ethnicity, SES). Some researchers argue that carrying out such subgroup analyses is an important tool for

monitoring diversity and inequalities. For example, in the US, the National Institutes of Health's 2001 guidelines strongly recommend routine subgroup analysis by gender, ethnicity and other relevant variables, whether or not there is prior reason to think that outcomes may vary across these groups (National Institutes of Health 2001). Other researchers hold that all subgroup analysis should take the form of testing pre-specified hypotheses for which an appropriate rationale can be given (Brookes et al. 2001, Oakley 2006, Rothwell 2005), hence ruling out routine subgroup analysis. It has further been argued that the routine collection of data on some population groups (e.g. on the basis of ethnicity or gender) without an adequate rationale (e.g. epidemiological evidence demonstrating unequal health status, or a pre-specified hypothesis that there is likely to be a differential impact of the intervention between groups due to factors such as acceptability or accessibility), may in fact obscure the importance of social hegemonies in determining health inequalities (Oakley 2006).

Subgroup analyses conducted post hoc and with insufficient power to detect meaningful differences can be unreliable and should be treated with caution. Post hoc analyses of data by subgroup without an adequate rationale may amount to data dredging and generate misleading results. However, even when subgroup data cannot be used to support specific causal inferences due to insufficient power, they may still be of value in assisting future research, for example by generating further hypotheses, and for inclusion in statistical meta-analyses within systematic reviews.

Current good practice requires that subgroup analyses should be chosen in advance, have some justification and aim to be adequately powered; tests should be chosen with care to avoid false positive results (Brookes et al. 2001, Rothwell 2005).

The second option, of measuring health inequalities across a population, involves measuring the strength of correlation (with regression analyses) between health status and socio-economic characteristics (Keppel et al. 2005, pp10-14). Theoretically, in a study of effectiveness, these methods could be used to measure whether an intervention weakened the correlation, signifying that it reduced inequalities, or strengthened it, signifying that the intervention increased inequalities. For instance, inequality might be measured across the study participants in a school or a workplace before and after an intervention. Such a trial could assess how effective the intervention was for this setting, and how effective it was for reducing inequalities within this setting. Additional information about the wider population would be required to assess how effective it was in reducing inequalities between different schools or workplaces.

1.11.3 What we do not know

Whether, or how, researchers directly address health inequalities when developing or evaluating universal interventions will vary according to the research context. It requires researchers to be familiar with existing observational data on the outcomes and populations of interest and with methods for investigating inequalities; wherever possible, research should be informed by the involvement of the population under study. In his preface to the *Public Health Observatory Handbook of Health Inequalities Measurement* (Carr-Hill and Chalmers-Dixon 2005), Sir Donald Acheson wrote:

The evidence base about 'what works' is still fairly weak, but there is now a commitment to address this. Resources are going into research and development to advance our knowledge and understanding of what works. In parallel with that we need to be able to measure inequalities, in order to plan, set targets, monitor and evaluate.

Although Acheson commends the Handbook to anyone involved in addressing health inequalities, it has little to offer directly to intervention research. It draws together methods for investigating inequalities but without taking into account experimental study designs.

A review of the literature is required in order to know whether and how experimental studies have employed data and methods to target interventions appropriately, or to attribute relative changes in health status between different groups of people to specific interventions.

1.12 Summary

Health inequalities are recognised as an important problem nationally and internationally. There is policy interest in improving the health of the most disadvantaged, reducing the gap between the most and least disadvantaged, and reducing gradients across the whole population. Health inequalities arise from variations in social, economic and environmental influences along the life course. Health promotion, particularly when it involves community or structural interventions, has the potential to reduce health inequalities among young people immediately, and in their later lives. The principle of involving young people in decisions about their lives is widely held as particularly important for countering the challenges of disadvantage. Systematic reviews suggest that greater success may be achieved by working with young people, not merely for them.

Inequalities research draws on a range of evidence. Observational studies describe the magnitude, severity and preventability of health problems. The findings of these studies can guide the targeting of interventions to reduce disadvantage or inequalities. Observational research methods are well established for measuring SES (or disadvantage), health status and the magnitude of differences between people in different groups. In theory, subgroup analyses and measures correlating health status and SEP can be adapted from observational research to studies assessing the effects of interventions. But there are important questions about the challenges involved in doing this.

Whether, or how, researchers directly address health inequalities when developing and evaluating interventions is unclear.

2. RESEARCH QUESTIONS AND METHODS

The aim of the work described in this report is to assess what can be learnt from the literature about health promotion, health inequalities and young people (we took the age range 11-21 years). This exercise has three major components: (a) a systematic descriptive map of the available research; (b) a study of the methods used by health promotion researchers studying young people to take into account health inequalities, population diversity and the involvement of young people in research; and (c) a review of the effect of health promotion on health inequalities. The first two stages are reported here. The third stage of the work will report separately on cognitive behavioural interventions for young people's mental health (Kavanagh et al. in preparation).

The review presented in this report was undertaken at the same time as a parallel review, also drawing on previous EPPI-Centre health promotion and public health work, examining the extent to which research has included diverse groups of children and young people (Lorenc et al. 2008). This report complements that work by addressing how to discriminate between populations. Diversity and health inequalities are overlapping agendas, so researchers and policy-makers interested in these areas will find it valuable to read both reports.

2.1 Research questions

2.1.1 What research has been done? The systematic map

The first aim of this work was to identify and describe the available research in order to answer the following questions:

- How much research activity in health promotion and public health has addressed health inequalities among young people?
- What types of research have looked at gaps or gradients in health status?
- How much research specifically relates to socially disadvantaged and vulnerable young people (those considered at risk in various ways; those with social or complex needs; those living in marginalised communities; looked-after young people; young parents; school non-attendees)?
- How much of the research in this area addresses the impact of community or structural interventions?

For the purposes of this report, studies were considered to address health inequalities if they compared health status between two or more demographic groups.

2.1.2 How has the research been done? The methods study

The second aim of this work was to investigate the methods researchers have used to define and assess health inequalities in outcome evaluations of interventions. We asked how existing research has:

- described populations and measures of disadvantage;
- described health status and difference between populations;
- incorporated the experiences and opinions of young people into the development and evaluation of interventions;
- recruited and retained young people participating in intervention evaluations.

The aim of each of these studies, their research questions and data sources and how they relate to two other studies, are summarised in table 2.1.

Table 2.1: Summary of the two studies in this report

	Aim	Research questions	Data sources
Systematic map	To identify and describe research about health inequalities, health promotion and public health in relation to young people	How much research activity in health promotion and public health addresses: <ul style="list-style-type: none"> • health inequalities among young people? • gaps or gradients in health status? • socially disadvantaged and vulnerable young people? • the impact of community or structural interventions? 	Inequalities research dataset: Studies in commercial databases explicitly addressing health inequalities Interventions research dataset: Outcome and process evaluations in a specialist health promotion/public health interventions research database
Methods study	To investigate the methods used to define and assess health inequalities in outcome evaluations of interventions	How has existing research: <ul style="list-style-type: none"> • described populations and measures of disadvantage? • described health status and difference between populations? • incorporated the experiences and opinions of young people into the development and evaluation of interventions? • recruited and retained young people participating in intervention evaluations? 	Outcome evaluations of interventions drawn from earlier systematic reviews conducted by the EPPI-Centre

2.2 Methods for describing the research evidence

We drew on two overlapping literatures for our systematic map: health inequalities research located through searches of electronic databases (the 'inequalities research dataset'); and health promotion interventions research held in BiblioMap, a register rich in intervention evaluations as it contains the Trials Register of Promoting Health Interventions (TRoPHI), a web-based database of randomised controlled trials and controlled trials (non-randomised) of public health and health promotion interventions hosted by the EPPI-Centre (the 'intervention research dataset').

2.2.1 Searching

Dataset 1: Inequalities research

The following major databases were searched for health promotion and public health research about young people with a specific focus on health inequalities:

- ASSIA
- CINAHL
- Cochrane Library
- Medline
- Embase
- PsycINFO

These were supplemented with searches of BiblioMap, the King's Fund Information and Library Service database and Health Education Board Scotland/Health Scotland (www.hebs.scot.nhs.uk/, since incorporated into www.healthscotland.com/). For full search strategies see Appendix 1.

In addition, two recently published bibliographies of the health inequalities literature were handsearched for relevant literature. One was located through the King's Fund (King's Fund Information and Library Service 2006), the other through a search of the archive of the Health Equity Network list on JISCMail (Redmond et al. 2005).

Dataset 2: Intervention research

This research was located through searches of the EPPI-Centre's database of health promotion research, BiblioMap. At the time of searching, this contained approximately 13,000 records. BiblioMap represents a data source particularly rich in health promotion interventions studies about young people. The Cochrane Health Promotion and Public Health Field's specialised trials register, TRoPHI (Trials Register of Promoting Health Interventions) is housed within BiblioMap.

TRoPHI contains over 2,500 randomised controlled trials and controlled trials. In addition to trials identified in the course of EPPI-Centre systematic reviews, TRoPHI has been updated with trials identified through prospective searches of Medline, Embase and the Cochrane Collaboration's Central Register of Controlled Clinical Trials since August 2004, and with trials identified through handsearching activities co-ordinated by the Field. Records of studies

keyworded for the population group 'children and young people' and for the study type 'outcome evaluation or process evaluation' were located for screening. These studies did not necessarily state an explicit focus on reducing inequalities. Records of studies keyworded for the population group 'young people' and for the study type 'outcome evaluation or process evaluation' were screened for relevance.

2.2.2 Screening

Studies were excluded if:

- No abstract was available.
- They were published in a non-English language.
- They were not about young people aged 11-21 years.
- They did not have a health focus or report on health outcomes.
- No data were reported.
- They evaluated already sick populations outside the scope of health promotion and public health.
- They were of public health genetics (genetic and molecular science for improving public health) (Stewart et al. 2007).
- They only made comparisons between different age groups in the 11-21 range.
- They did not address health inequalities by comparing the health status of two or more demographic groups.

In addition, reviews of research which did not also contain primary data were excluded.

Studies remaining were subsequently re-screened using the full paper. Due to constraints on time and resources, we then further excluded papers published prior to 1996.

2.2.3 Studies included in the descriptive map

All relevant identified studies were coded according to a standardised classification system for public health and health promotion research (Peersman and Oliver 1997). Codes cover: study design (e.g. survey, cohort study); the focus of the study (e.g. physical activity, healthy eating); and characteristics of the study population (e.g. female, homosexual). A further coding scheme for study populations was developed using the PROGRESS approach (see Table 2.2). PROGRESS was adapted first by including three other axes of health inequalities (age, disability and sexual orientation), and second by noting 'other vulnerable groups' (which included, for example, teenage parents, young people not in school, and young offenders). Table 2.2 also shows the codes for SEP we developed. We distinguished between SES as defined in economic terms directly or indirectly related to income (coded SES) and other social characteristics such as education or occupation whether or not researchers made an explicit link with SES (which were coded both with the individual terms, for instance 'education' or 'occupation', and also with 'All SES'). We termed this expanded framework PROGRESS-Plus) (Kavanagh et al. 2008).

Table 2.2: Categories included in the PROGRESS-Plus schema

PROGRESS	
Place of residence	Rural/urban, country/state, area deprivation, housing characteristics
Ethnicity	Ethnic background
Occupation	Professional, skilled, unskilled, unemployed etc.
Gender	Male or female
Religion	Religious background
Education	Years in and/or level of education attained, school type
Social capital*	Neighbourhood/community/family support
Socio-economic status (SES)	Income-related measure e.g. means-tested benefits/welfare, affluence measures etc.
Plus	
'All SES'	SES and other income-related measures of SEP:: occupation, education, elements of place of residence.
Age	Age range
Disability	Existence of physical or emotional/mental disability
Sexual orientation	Heterosexual, gay, lesbian, bisexual, transgender
Other vulnerable and socially excluded groups (review specific)	School non-attenders, looked-after young people, young people in the criminal justice system, victims of abuse, runaways, teenage parents

* 'Social capital' describes support available through informal social networks of neighbourhoods, communities and families; in relation to young people, we recognised social capital as largely related to family structure and the form and quality of family relationships.

We made a distinction between studies that addressed gaps in health status between populations, and those that addressed gradients in health status across populations. We judged that studies were investigating gradients if they compared three or more groups within a single PROGRESS-Plus dimension. Thus, for example, studies comparing three or more ethnic groups were considered to be investigating health gradients.

Finally, studies were distinguished as:

- observational studies, which identify a problem and indicate that something should be done;
- outcome evaluations, which identify the relative effectiveness of specific interventions and indicate what should be done;
- process evaluations, which identify the context in which the intervention is implemented and the responses of the people involved and indicate how something should be done.

Thus, all studies were coded according to:

- PROGRESS-Plus category of the study populations targeted by interventions (if any);
- PROGRESS-Plus categories of populations compared;
- whether an inequality 'gap' (between two populations) or 'gradient' (across three or more populations) was addressed;
- types of evidence produced by the study design.

They were also coded according to:

- health status or outcomes reported in the study; and
- whether or not the views or experiences of participants were recorded.

2.3 How has the research been done? Methods used in the methods study

In our more detailed study of research methods, we analysed the methods used in intervention evaluations included in previous EPPI-Centre systematic reviews in areas where young people experience health inequalities or where their circumstances and behaviour may lead to inequalities in later life (mental health, healthy eating, physical activity, teenage pregnancy and teenage parent support) (Harden et al. 2001, Harden et al. 2006, Rees et al. 2001, Shepherd et al. 2001). No further exclusion criteria were applied to these studies.

Data had already been extracted from the studies for the previous reviews. For the current study, we re-examined these individual study data to find questions related to measuring inequalities and involving young people in research (see Appendix 2). These tasks were undertaken by two reviewers independently, who subsequently met to discuss and resolve discrepancies.

3. WHAT RESEARCH HAS BEEN DONE? THE SYSTEMATIC MAP: RESULTS

In this section of the report we describe the findings of our systematic map. What research has been done in the area of health promotion and public health and inequalities relating to young people aged 11-21 years?

3.1 The studies

Our searches found a total of 4,926 records. Figure 3.1 describes how these records were sifted to identify those studies relevant to the research questions. Records were screened on the basis of title and abstract (where abstracts were available). Most (n=4,457, 90%) did not meet the inclusion criteria and so were excluded from the map.

Records were most commonly excluded (n=1,318, representing 28% of the 4,681 records excluded either on abstract or subsequently on full text) because no comparison of health status between different PROGRESS-Plus groups was reported in the abstract (or, if the full report was retrieved on the basis of the promise of such a comparison in the abstract, no comparison could be found in the full report). These records either reported no comparisons at all, or only between groups created by the researchers themselves (e.g. intervention and control groups). For intervention research, subgroup analyses were included as comparisons as long as they included data on outcomes of interest, and not merely a demographic description of the sample. A smaller number of records was excluded because the only comparisons reported were between age groups (n=27, 0.6%), or because the focus was public health genetics (n=8).

Approximately one-sixth of the records (n=790, 17%) were excluded because the age group covered by the sample did not fall within the 11-21 years range. A further 660 (14%) did not report health status, and 250 (5%) reported only on populations with a diagnosed illness and not on the general population. Some, 373 (8%), either provided no data at all (e.g. commentary papers) or did not clearly report on the 11-21 years age group within their samples.

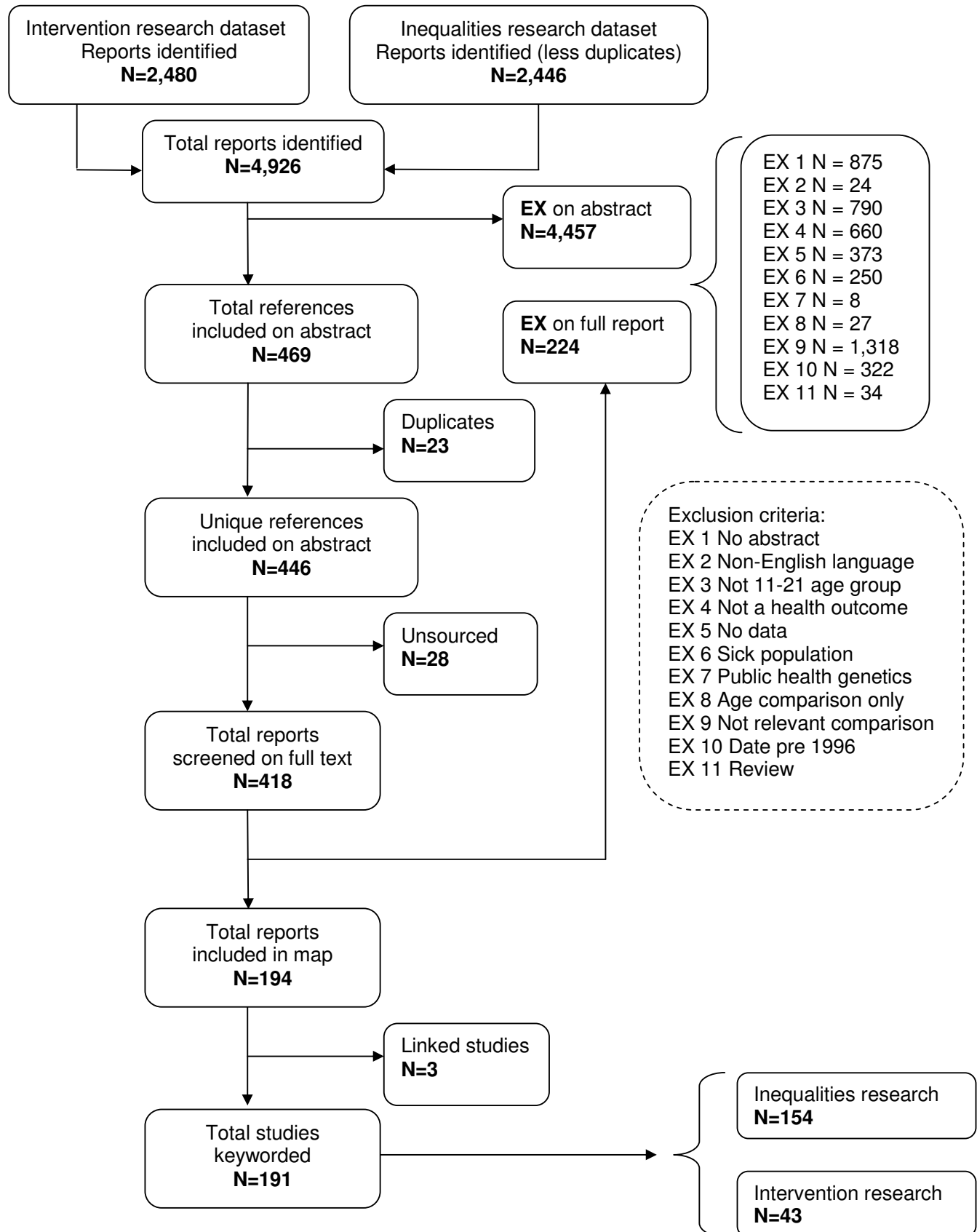
A few records were excluded because they were not in English (n=24, 0.5%). A much larger number were excluded at the abstract stage because no abstract could be found (n=875, 19%). A further 322 records (7%) were excluded because they were published prior to 1996, the cut-off date for inclusion in the review. Finally, 34 records (0.7%) were excluded because they reported on reviews and not on primary research.

After removal of duplicates, this sifting process resulted in 446 records remaining. Of these, 28 (6%) could not be located in time to be included. This left 418 retrieved reports (94%), which were screened for inclusion again on the basis of the full report. A further 224 were excluded on the basis of more detailed information in the full report.

The remaining 194 records included three pairs of linked studies. After one of each pair was removed we were left with a final total of 191 included records. This represents only 4% of the records originally located (n=4,926). Had we applied the date cut-off (1996 or later) at the

outset, 45% (n=2,217) would have been excluded on this basis. The included records represent 7% of the located references published in 1996 or later (n=2,709).

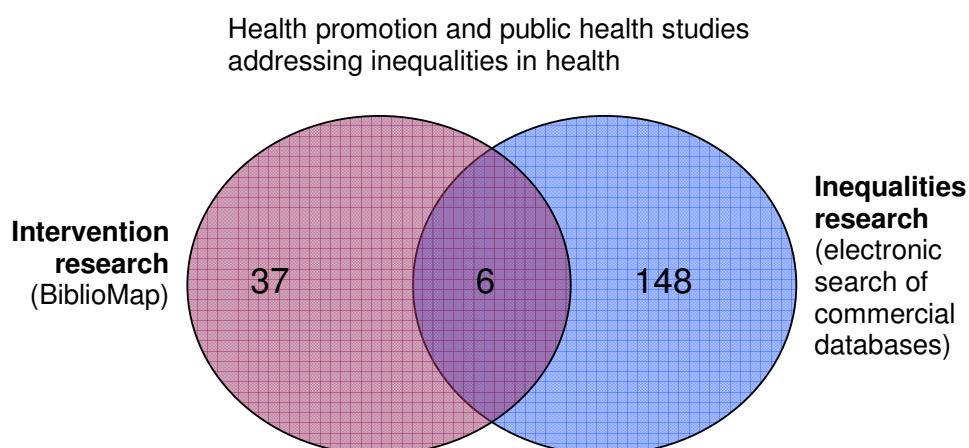
Figure 3.1: Flow of literature through the map



3.2 The ‘inequalities’ and ‘intervention’ research datasets

Of the 191 records remaining in the map, 154 were labelled the ‘inequalities research’ dataset because they were studies explicitly addressing health inequalities, having been captured by an electronic search using inequalities terms. Searching of TRoPHI captured 43 reports – the ‘intervention research’ dataset. Six studies were identified in both sources. This overlap is illustrated in Figure 3.2.

Figure 3.2: The ‘inequalities’ and ‘intervention’ datasets



Below we describe the two datasets separately according to population, comparison groups, outcomes of interest, and whether the studies presented an analysis of gaps (two comparison groups only) or gradients (three or more groups). The fact that the two datasets have six studies in common needs to be borne in mind when reading these descriptions.

3.2.1 Populations studied

Many of the studies used broad or general population sampling frames (e.g. a national survey of the health behaviours of young people). Others focused on one or more PROGRESS-Plus populations (e.g. an evaluation of an intervention with low-income young parents).

Inequalities research dataset (n=154)

Most of the studies in the inequalities research dataset included people from across a whole population (69%, n=106). Figure 3.3 shows the remaining studies which sampled people from particular PROGRESS-Plus populations (31%, n=48). Some studies sampled populations which met more than one of the PROGRESS-Plus categories, for example studies of low-income women. Young parents were most often the population under consideration (31% of the studies sampling a particular PROGRESS-Plus population, n=15 of 48). There were several studies of single gender groups (17%, n=8), groups linked by ethnicity (15%, n=7), SES (10%, n=5) or residency of a particular area (10%, n=5). One

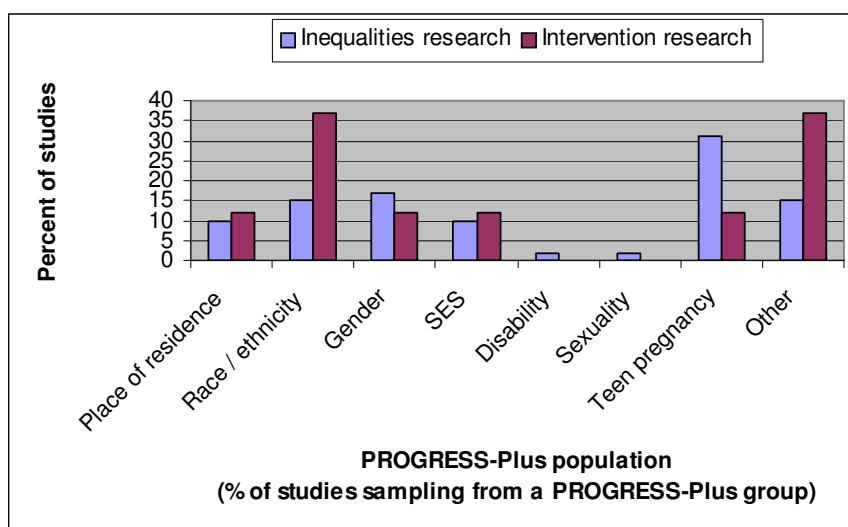
study focused on young people with disabilities, and one on young people who identified themselves as bisexual or homosexual. Seven studies addressed 'other' disadvantaged populations not included in PROGRESS, such as young people in correctional institutions or who had run away from home. No inequalities studies specifically focused on populations defined by their occupation, education or religion.

Intervention research dataset (n=43)

A similar proportion of the intervention dataset studies also included broad populations (81%, n=35). Just under a fifth (19%) of the studies (n=8) included people from PROGRESS-Plus populations and are shown in Figure 3.3. A third (37%, n=3) of these studies included populations linked by ethnicity, and 12% (n=1) by place of residence. Young parents, young women and young people from low-income families were each the focus of a single study (12%). The three studies which sampled 'other' populations included young people in correctional institutions and those who had run away from home (two of these were also included in the inequalities dataset). No intervention studies focused specifically on populations defined by occupation, religion, education, social capital, disability or sexuality.

Figure 3.3 compares the percentages of studies focused on specific PROGRESS-Plus populations in the two datasets. The intervention studies targeted place of residence or ethnicity more than other PROGRESS-Plus groups. Teenage parents (all mothers) were most likely to be targeted by studies in the inequalities research.

Figure 3.3: Specific populations targeted in the studies (N=56 studies)



3.2.2 Comparison groups

Above (section 1.8) we argue that one of the keys to developing an understanding of health inequalities is identifying the contribution of *relative* disadvantage. In order to do this, it is necessary to examine research that includes comparisons of health status and other variables between different groups. Therefore, in addition to identifying the study population groups, we also identified comparisons between population groups.

Inequalities research dataset

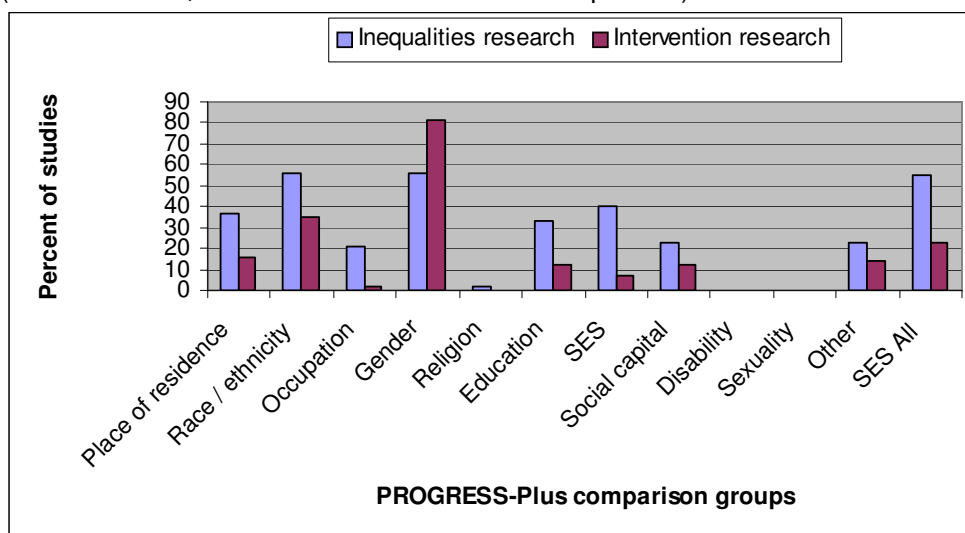
The most common comparisons in the inequalities research were between males and females (56%, n=87) and between different ethnic groups (56%, n=86), followed by comparisons of groups with different SES (40%, n=61). Place of residence was used in 37% of the studies (n=57) as a comparison. Most of these (29%, n=45) compared urban and rural populations. Smaller numbers of studies compared groups according to education (33%, n=51), occupation (21%, n=33) or social capital (23%, n=35). Aggregating SES, education and occupation with the relevant place-of-residence comparisons to create our 'All SES' group, we found that more than half of the studies made such comparisons (55%, n=85).

Intervention research dataset

Comparisons between the genders dominated the intervention research, with 81% of the studies (n=35) making male–female comparisons. Relatively few studies made comparisons according to other factors such as ethnicity (35%, n=15), place of residence (14%, n=6), education (12%, n=5), social capital (12%, n=5), SES (7%, n=3) or occupation (2%, n=1). When SES and component measures of socio-economic status (e.g. place of residence, education) are combined, less than a quarter of the intervention studies provided comparative data based on socio-economic status (21%, n=9).

Figure 3.4 shows the percentage of studies in each dataset which compare data on different groups by PROGRESS-Plus indicators. Over 80% of the studies in the intervention research dataset make comparisons by gender, compared with 56% in the inequalities dataset. The inequalities dataset makes more comparisons across All SES and ethnicity measures.

Figure 3.4: PROGRESS-Plus comparison group and percentage of studies (N=191 studies; some made more than one comparison)



3.2.3 Gaps and gradients

In addition to identifying comparison groups, studies were also coded according to whether they compared two groups, thereby investigating an inequalities gap, or compared three or more groups, thereby investigating an inequalities gradient.

Inequalities research dataset

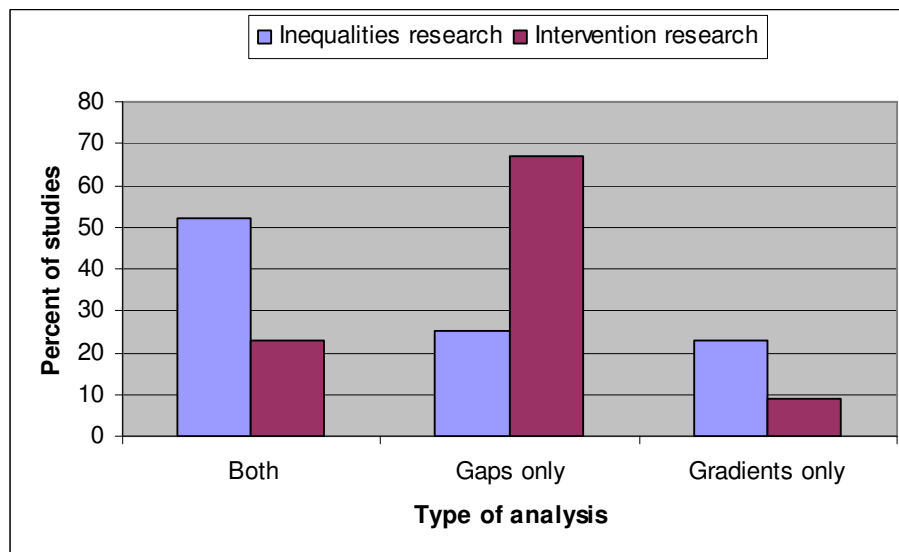
Over half the studies (52%, n=80) in the inequalities research dataset contained data relevant to both gaps and gradients, for instance, studies which reported both a gender comparison and a socio-economic status or ethnicity comparison of three or more groups. The remaining studies were almost equally divided between gaps (25%, n=38) and gradients (23%, n=36) analyses. The most frequent gradients analyses were of ethnicity, SES, place of residence and parental education. Gender was overwhelmingly the most common factor in studies analysing gaps (83% of studies analysing gaps, n=98 of 118).

Intervention research dataset

Nearly a quarter (23%, n=10) of the 43 intervention research studies contained data relevant to both gaps and gradients; 67% (n=29) looked at gaps only and 9% (n=4) at gradients only. Gender comparisons were again the most common factor for gaps analyses (92%, n=36 of 39). None of the studies that provided data suitable for an analysis of gradients could be used to analyse differential effects according to SES. The most common type of gradient analysis (50% of gradients analyses, n=7 of 14) involved comparisons between more than two ethnic groups; all these studies were trials conducted in the USA. Five studies compared three or four different geographical areas.

Figure 3.5 shows the differences between the inequalities and intervention research datasets. Inequalities research is more likely than intervention research to analyse data using a combined gap and gradient approach. The predominance of gaps-based analyses in the intervention research reflects the focus on gender comparisons.

Figure 3.5: Gaps and gradients and percentage of studies (N=191 studies)



3.2.4 Health status

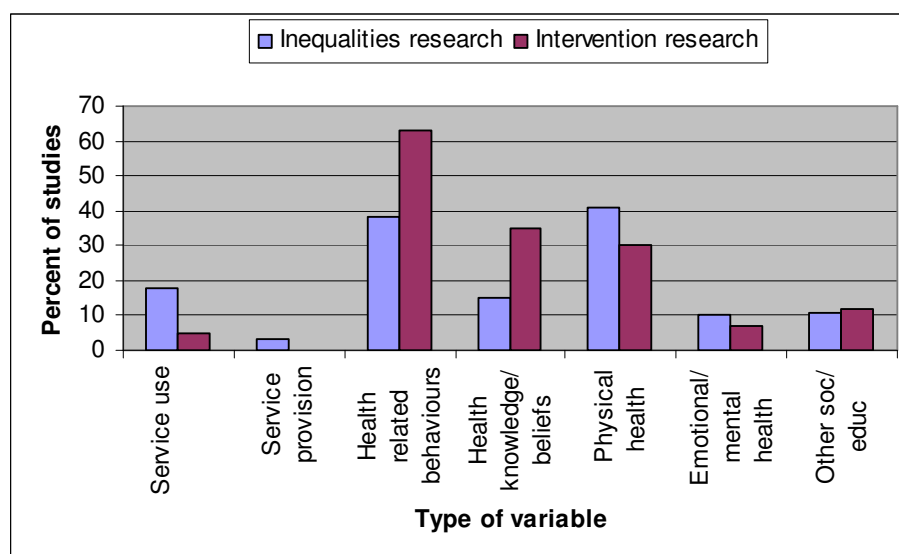
Inequalities research

Figure 3.6 shows the percentage of studies according to the different aspects of health status they measured. The most common physical health measures were Body Mass Index (BMI) or diagnosed disease (41%, n=63). Almost as many studies (38%, n=58) measured health behaviours such as smoking or physical activity. A further 10% of studies (n=15) reported mental or emotional health measures. Other social or educational measures such as attendance at school or criminal conviction were reported by 11% of studies (n=17). Nearly a fifth of the studies (18%, n=27) measured participants' use of health services, and 3% (n=4) the provision of these services. Finally, 15% of studies (n=23) examined participants' knowledge of health issues or determinants, their beliefs about their own health, or their future intentions regarding health or behaviour.

Intervention research

Health-related behaviours (figure 3.6) were the most common aspect of health status measured in the intervention studies (63%, n=27). Smaller numbers of studies measured knowledge, beliefs or intentions (35%, n=15) or physical health status (30%, n=13). Relatively few studies measured social or educational status (12%, n=5), emotional or mental health (7%, n=3), or service use (5%, n=2), and none measured service provision.

Figure 3.6: Types of variables measured and percentage of studies (N=191 studies; some studies measured more than one)



3.2.5 Health focus of the studies

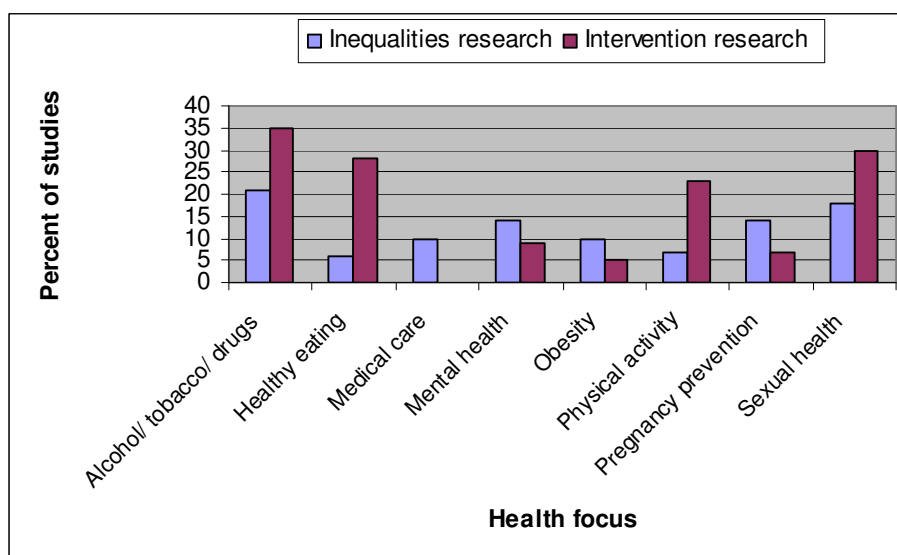
Inequalities research

The studies covered a broad range of health topics within the field of health promotion and public health. The most common topic in the inequalities research was alcohol/tobacco or drug behaviours (21%, n=32), with many studies also concerned with sexual health (18%, n=28), pregnancy prevention (14%, n=22), and mental health (14%, n=21). Fewer studies focused on obesity (10%, n=16), medical care (10%, n=15), physical activity (7%, n=11) or healthy eating (6%, n=10).

Intervention research

The most common topic in the intervention research was also alcohol/tobacco or drug behaviours (35%, n=15), followed by sexual health (30%, n=13), healthy eating (28%, n=12) and physical activity (23%, n=10). Figure 3.7 shows the percentage of studies according to the health topics on which they focused (note that only the most common topics are included in the figure).

Figure 3.7: Topic focus and percentage of studies (N=191 studies; some covered more than one topic area)



3.2.6 Vulnerable young people

Thirty-three studies focused on vulnerable young people; this included young people within the criminal justice system, runaways, those who had suffered sexual and physical abuse, and teenage parents.

Inequalities research

Thirty-two studies in the inequalities research (21%) described research focused on vulnerable young people. Fifteen of these focused on young parents, with the remainder distributed fairly evenly across a range of vulnerable young people: victims of sexual or physical abuse; runaways; young people within the criminal justice system; looked-after young people; young people with disabilities; young people exposed to community violence; those excluded from the education system; and young people described as high risk due to a number of factors including parental alcohol and drug abuse.

Intervention research

Only six of the intervention studies (14%) described research focused on vulnerable young people. The six studies focused on different groups of vulnerable young people: young mothers, runaways, young people in correctional institutions, those victimised by their peers, and young people considered at risk due to exposure to community violence or drugs.

3.2.7 Country of study

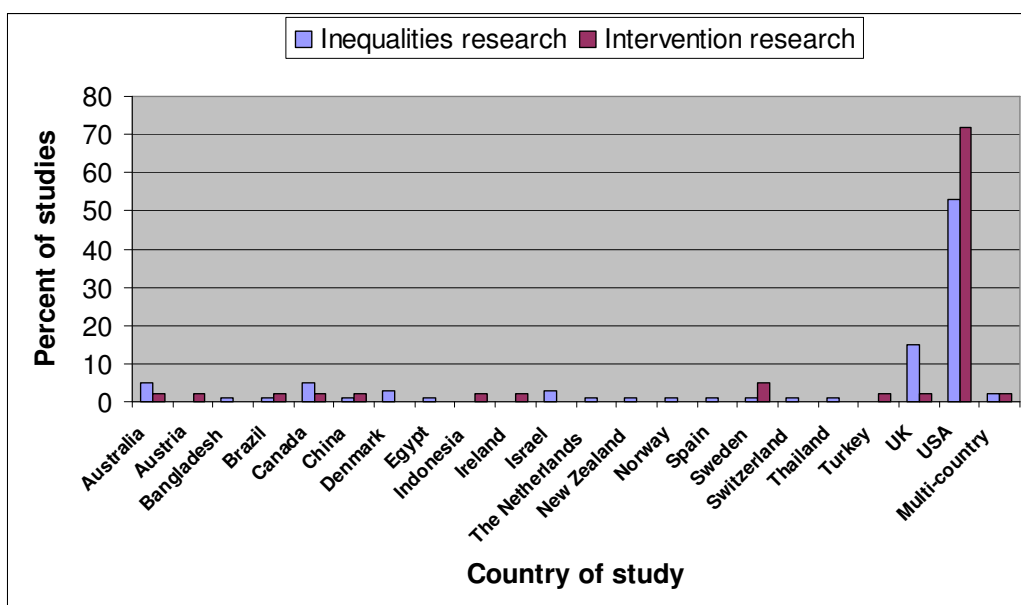
Inequalities research

Over half of the studies (55%, n=85) were conducted in the USA and 16% (n=25) in the UK. A few of the studies (5%, n=7) were conducted in Canada, 5% in Australia (n=7), and 3% each (n=4) in Denmark and Israel. The remaining 25 studies were conducted in a further 19 different countries. These figures include three studies which reported data from several countries.

Intervention research

Studies conducted in the USA were even more predominant in the intervention research, representing 72% of the total (N=31 of 43). Five percent of the studies (n=2) were conducted in Sweden. The UK and a further eight countries were represented by one study each. One study reported data from more than one country. Figure 3.8 shows the percentage of studies carried out in each country (note that multi-country studies have been counted separately).

Figure 3.8: Country setting of studies (N=191 studies)



3.2.8 Study design and type of evidence

In the previous sections we have presented our findings on the two datasets separately. In this section we bring together the two datasets in order to examine study design and the types of evidence relevant to health promotion activities designed to address inequalities in young people's health.

Types of evidence

As we noted earlier, evidence-informed health promotion and public health needs to draw on different types of evidence: observational studies describing the scale of public health problems and risk-disease relations; studies of the relative effectiveness of specific

interventions aimed at addressing a problem; and information on the design, implementation, contexts and receipt of interventions. Some studies provided more than one type of evidence and/or covered more than one topic (table 3.1). Only the more commonly addressed topics are listed in the table.

Table 3.1: Distribution of types of evidence (N=191 studies)

	Observational studies	Outcome evaluations	Process evaluations
Accidental injury	10	1	0
Mental or emotional health	19	4	0
Sexual health	20	11	2
Pregnancy prevention	21	3	1
Smoking	13	7	0
Alcohol	9	4	0
Drugs	6	4	0
Physical activity	9	9	1
Healthy eating	9	13	1

Most of the studies consisted of evidence from observational studies (75%, n=144), with only about a quarter presenting evidence from outcome evaluations (24%, n=46) and few studies including process evidence (4%, n=7). Most of the observational studies were surveys (n=134); there were few cohort (n=8) or case control studies (n=2).

Observational studies were most frequently available in the areas of pregnancy prevention (n=21), mental or emotional health (n=19) and sexual health (n=20). Only 10 studies provided observational evidence related to accidents and injury, despite this being the most common cause of death in young people. With respect to health behaviours related to future health inequalities, most of the observational evidence related to smoking (n=13), with nine studies each in the areas of alcohol use, physical activity and healthy eating. In only four of the topic areas with observational evidence is there a matching body of effectiveness evidence from outcome evaluations informing what should be done: sexual health (n=11), healthy eating (n=13), physical activity (n=9) and smoking (n=7).

We identified 46 studies providing effectiveness evidence. These studies included 27 randomised controlled trials and 11 non-randomised controlled trials. Most of the outcome evaluations were carried out in the USA (n=32). Only one (which was also an RCT) was conducted in the UK (Stephenson et al. 2004). The most common topic area studied were health-related behaviours such as healthy eating (n=13) and physical activity (n=9), and sexual health (n=11) which included sexual health behaviours and sexually transmitted infections (STIs). Smaller numbers of studies focused on smoking (n=7), with only four studies each focusing on mental health, and drug and alcohol use. The high level of observational evidence on pregnancy prevention was not matched by outcome evaluations informing what should be done (n=3). The outcome measures used most often were health-related behaviours such as smoking or diet (n=30) and knowledge, beliefs and intentions (n=18). Relatively few studies measured actual health status as an outcome, either physical (n=14) or mental and emotional (n=5) (not shown in table).

There was limited process evidence. Five of the intervention studies also contained process data, and there were two studies which consisted of process evaluations alone.

Studies examining young people's views

Thirteen of the 191 studies in the combined dataset (7%) presented the views and experiences of young people themselves, or their parents, guardians and teachers.

The views studies included research on young people's attitudes to broad health topics (e.g. smoking, violence, sexual activity) as well as evaluations of attitudes to particular interventions. Most of the views studies (38%, n=5) related to sexual health, followed by smoking (31%, n=4) and physical activity (23%, n=3). No views studies were found for accidental injury or drug use. Of the views studies, five (38%) were outcome or process evaluations, while the remainder were observational study designs.

Smoking was the most frequent health topic (n=4 studies) presenting observational evidence in views studies, followed by mental/emotional health and pregnancy prevention (n=2 studies each). There were no views studies contributing observational evidence in the area of accidental injury. Two studies contributed effectiveness evidence: these studies were in the area of young people's sexual health. Three studies provided process evidence – two for sexual health and one in the area of physical activity.

3.3 Studies addressing different populations

The combined dataset of health inequalities and interventions research addressed, in descending order of frequency, inequalities relating to gender, ethnicity, place of residence, education, occupation and social capital.

We discuss each of these below in relation to study design and types of evidence provided. Table 3.2 provides a summary overview of the numbers of studies reporting comparisons according to each of the above variables, showing how many used observational study designs, how many were outcome evaluations of interventions, how many reported on participants' views and how many included vulnerable groups.

Table 3.2: Overview of studies by comparison group (N=191)

	Gender	Ethnicity	Place of residence	Education	Occupation	Social capital
Total	118	97	63	55	34	38
Observational	80	80	55	48	31	31
Outcome evaluation	38	17	8	7	3	7
Views	10	3	5	1	2	2
Vulnerable groups	13	6	2	5	5	7

Those studies which address SES have been analysed in more depth and are discussed in section 3.4.

3.3.1 Gender

Of 118 studies which compared males and females, 87 came from the dataset of inequalities research and 35 from the dataset of intervention research, with four found in both. In terms of study design, just under a third of studies were outcome or process evaluations. Nine studies, including one RCT, were conducted in the UK.

Eighty of the studies that analysed gender differences were observational studies and the most common topics were obesity-related (including healthy eating and physical activity) (n=21) and sexual health (including pregnancy prevention) (n=19). Some covered mental health (n=10) and substance use (n=10).

There were 38 outcome evaluations of interventions that analysed gender differences, of which 24 were RCTs. The most frequent outcome measures in these studies were health-related behaviours (n=17) and health knowledge, beliefs or intentions (n=10). Only six studies measured physical health outcomes such as BMI or blood pressure. Almost half the RCTs (n=11) both evaluated interventions across the general population and made no comparisons other than by gender.

Ten of the studies which compared gender differences also included data on young people's views and experiences. Most of these related either to STD or HIV prevention (n=4) or to aspects of healthy eating or physical activity (n=4). Two studies were conducted in the UK: one about children's and young people's views about planning and environmental health (Davis 2001), and the second about the importance of school, family and neighbourhood in relation to health inequalities (Morgan et al. 2006).

All the 13 studies analysing gender differences which provided data on vulnerable young people were observational studies. Three included data on young people who had experienced physical or sexual violence (Farrell et al. 1996, Howard and Wang 2005, Saewyc et al. 1998). The remaining studies included young people with a diverse range of life experiences which made them vulnerable. These included: runaways (Rotheram-Borus et al. 2003); young people in detention (Richey et al. 1997); young people receiving a range of services from the social care system (Garland et al. 2005); and children not attending school (Yip and Berman 2001).

3.3.2 Ethnicity

Ninety-seven studies compared different ethnic groups; 15 of these came from the intervention and 86 from the inequalities research, with 4 found in both. Most of the studies (N=81) were conducted in the USA. Four were UK studies and there were two each from Switzerland and Canada, and one each from Denmark, Israel, the Netherlands, New Zealand, Norway, South Africa, Sweden and Taiwan. The four UK studies included an analysis of data on STD diagnoses from genito-urinary medicine clinics (Hickman et al. 1999); a survey of drug use (Jayakody 2006); a survey of childhood chronic disease (Cooper et al. 1998); and a survey of mechanisms and severity of unintentional injuries (Hippisley-Cox et al. 2002).

Eighty of the studies comparing different ethnic groups used observational designs. The most common topic areas were sexual health and STDs (n=18), with many studies having more than one focus. Other topic areas included pregnancy prevention (n=12), obesity (n=11), alcohol and drugs (n=10), mental health (n=9), smoking (n=9), healthy eating and physical activity (n=9) and medical care (n=8). Less frequently addressed topics included diabetes, skin cancer, disability, parenting and oral health.

Seventeen of the studies reporting an ethnicity comparison were outcome evaluations of interventions, and these included 12 RCTs. Two of these studies addressed particular vulnerable groups such as young people who had run away from home (Rotheram-Borus et al. 2003), and young parents (Stevens-Simon et al. 1997). Interventions evaluated in the remaining studies were aimed at the general population, and were based either in schools or in outreach or community sites.

Information on young people's views and experiences were collected in three studies covering a range of topics: sexual risk behaviours (Richey et al. 1997), body image and weight control (Adams et al. 2000) and smoking (Alexander et al. 1999).

Six studies in this group, all from the USA, presented data on vulnerable populations, including young people in a correctional institution (Lebeau-Craven et al. 2003), young people who had been sexually abused or raped (Howard and Wang 2005, Taylor et al. 1999) and those exposed to parental alcoholism (Duncan and Rees 2005).

3.3.3 Place of residence

Sixty-three studies compared residents of different locations, with the scale of the locations compared ranging from wards or census tracts to whole countries. Frequently, the intention was to compare urban and rural areas rather than areas of lower and higher social deprivation. A few studies compared distinct countries, with reference either to the level of inequality within each country (Elgar et al. 2005, Torsheim et al. 2006), or to different cultural and policy factors (Rowling and Holland 2000, Stephenson et al. 2006). A relatively small subset of studies examined place of residence as a primary research aim, with the intention of mapping the spatial distribution of health outcomes (Caiaffa et al. 2005, Clements et al. 1998).

Fifty-five of the studies comparing place of residence used observational designs. These covered over 20 different health topic areas. The most common topic areas were pregnancy prevention (n=9) and smoking (n=8), followed by mental health (n=6) and medical care (n=6).

Of the eight outcome evaluations of interventions comparing place of residence, six were RCTs. Four studies were evaluations of large multi-site interventions, in which the comparison by place was intended to identify differences in health outcomes by geographic position (e.g. Canadian provinces) (Lytle et al. 1996, Morris and Michalopoulos 2000, Nader et al. 1996, Webber et al. 1996). Two studies set out to compare urban and rural areas (Brown and Schoenly 2004, Graham et al. 1997). One study (Berg-Kelly et al. 1997) was a natural experiment, in which communities with different public health policies were compared. In one study (Shani et al. 2003) a place of residence measure was used in an analysis of socio-economic status. This was a study of a Bedouin population in Israel where type of residence (e.g. shed, concrete dwelling, tent) was used in conjunction with other measures such as occupation and education to establish the socio-economic status of participants.

Information on young people's views and experiences were collected in five studies, covering a range of topics: teenage pregnancy (Jewell et al. 2000), the importance of school family and neighbourhood to health (Morgan et al. 2006), exposure to community violence (Irwin 2004) and smoking (Alexander et al. 1999, Turner and Gordon 2004).

Two studies in this group presented data on vulnerable populations, including those not attending school (Husein et al. 1996) and those exposed to parental alcoholism (Duncan and Rees 2005).

3.3.4 Education

Fifty-five studies compared groups according to their level of education, usually that of parents. A few studies made other comparisons: between young people attending and not attending school (Yip and Berman 2001); between young people who had dropped out of school and those who had not (Stevens-Simon et al. 1997); and between public and private schools (Moreno et al. 2001, Nath 2004, Schatz and Dzvimbo 2001) or comprehensive and grammar schools (Dämon et al. 2005).

Forty-eight of the studies used observational designs; these covered over 20 different health topics. The most common topic areas were medical care (n=9), pregnancy prevention (n=7) and STDs (n=7), followed by mental health (n=6) and smoking (n=5).

Seven of the studies in this group were outcome evaluations of interventions (including four RCTs), focusing on different health topics.

Information on young people's views and experiences was collected in only one Scottish study of smoking behaviours (Gordon and Turner 2003).

Five studies in this group presented data on vulnerable populations, including young people exposed to parental alcoholism (Duncan and Rees 2005), high-risk young people (Garland et al. 2005, Wood et al. 2005) and young parents (Stevens-Simon et al. 1997, Taylor et al. 1999).

3.3.5 Occupation

Thirty-four studies compared groups according to occupation or employment status. A range of measures of occupational position were used. In most cases it was the occupation of participants' parents, rather than participants themselves, which was measured. A few studies only measured paternal occupation; most used either both parents' occupations or the occupation of the parent with the highest occupational position. In some instances, measures were based on rates of employment and unemployment in a family.

Most of the studies that compared young people according to occupation were observational studies (n=31); 28 of these were surveys and the remainder cohort studies.

Only three outcome evaluations of interventions, two of which were RCTs, compared groups of young people according to parental occupation. One study (Berg-Kelly et al. 1997) was a natural experiment, in which communities with different public health policies were compared. Morris and Michalopoulos (2000) reported the findings of an RCT to evaluate a cash incentive intervention designed to encourage single parents to come off welfare benefits and return to work. An RCT of a burns prevention programme in Israel (Shani et al. 2003) used occupation in conjunction with other measures, such as place of residence and education, to establish the socio-economic status of participants.

Only two of the studies, both conducted in the UK, reported the views and experiences of young people. One of these was in the area of teenage pregnancy (Jewell et al. 2000), and one explored the importance of school, family and neighbourhood factors to health and social inequalities in young people (Morgan et al. 2006).

Of five studies in this group which focused on vulnerable young people, four were in the area of teenage pregnancy and parenting (Chen et al. 2005, Clements et al. 1998, Harding et al. 1999, Jewell et al. 2000), and one looked at the impact of health inequalities on the work of health visitors (Reading and Allen 1997).

3.3.6 Social capital

Thirty-eight studies compared groups according to social capital. Although this is a broad concept, encompassing all the resources available to individuals through their participation in family or community networks (Hawe and Shiell 2000), the comparisons in these studies were mostly concerned with family type or structure, and many were comparisons between single-parent and two-parent families, with a few studies making comparisons based on marital status. Some studies used more psychosocial definitions for their comparison groups, such as measures of the quality of young people's relationships with their families (Butters 2005, Vicary et al. 2004) or their wider social environments (Morgan et al. 2006).

Thirty-one of the studies comparing groups on the dimension of social capital used observational designs.

Seven of the studies in this group were intervention studies (four of these were RCTs).

Two studies in this group examined the views and experiences of young people (Irwin 2004, Morgan et al. 2006).

Seven studies presented data on vulnerable young people, including those with disrupted families (Butters 2005), children whose parents were alcoholics (Duncan and Rees 2005), young people at high risk of experiencing violence (Irwin 2004), runaways (Rotheram-Borus et al. 2003), young mothers (Stephenson et al. 2006), young people at risk of drug use (Vicary et al. 2004), and a disparate group of 'high-risk' young people (Garland et al. 2005).

Six studies were conducted in the UK. Of these, all but one (Morgan et al. 2006) compared groups according to family structure or marital status. However, 16 studies which used multiple measures of SES also made comparisons between groups defined by social capital.

3.4 Studies addressing socio-economic status

Sixty-two studies compared groups of differing socio-economic status, based on measures directly or indirectly related to income. However, as described above (section 3.2.1), other PROGRESS-Plus categories, such as education and occupation, are components of socio-economic status and are sometimes employed as proxy measures for the latter. In order to examine in more depth how socio-economic status was examined in the dataset, we have aggregated all studies which reported relevant information. In other words, we have brought together all studies coded as explicitly reporting socio-economic status as such, together with those reporting Education, Occupation, and (where relevant) Place of residence. Place of residence studies have not been included where, for example, the only comparison was between rural and urban areas, but have been included where the comparison appeared to be between more and less disadvantaged areas. This information includes both measures of individual position and measures of the status of larger groups (such as schools or geographically defined communities) in which individual research participants were included. In this section we look in more detail at these comparisons and at the measures researchers have used.

A total of 91 studies made comparisons between groups of young people on the basis of composite, multiple or single measures of SES in the broader sense. Eighty-five of these were from the inequalities research dataset and 9 were from the intervention research, with three common to both datasets. A wide range of measures were used. There was variety not only in what was measured but also in the number of measures used: 31 studies used single

measures, 50 studies used multiple measures and 10 studies used established measures of socio-economic status based on a composite score of a number of measures.

3.4.1 Single measures of socio-economic status

Thirty-one studies assessed SES using single measures (see Table 3.3, and for further details see Appendix 3). In total eight different measures were used.

Table 3.3: Single measures of SES (N=31)

	N
Education	14
Occupation	5
Income	3
Free/reduced-cost school lunch	3
Poverty	2
Health insurance	2
Housing	1
'Disadvantage' not further specified	1

The most frequently used single measure of SES was education, used in 14 studies. Six of these studies measured parental education, and five measured participants' own educational level or status. Three studies used type of school and/or level of fees paid (Dämon et al. 2005, Moreno et al. 2001, Vega Alonso et al. 2005).

Occupation was used in five studies. Three shared the approach of basing SES on the occupation of the higher-status parent (Borup 1998, Borup and Holstein 2004, Vilhjalmsson and Kristjansdottir 2003).

Three studies used different household or family income measures as SES indicators. Two further studies reported poverty levels (Howell et al. 2005, Spence et al. 2002). Entitlement to free or reduced-cost school lunches was used in three studies.

3.4.2 Multiple measures of Socio-economic status

Fifty studies used multiple measures of SES that were not established indices (see Table 3.4, and for further details see Appendix 4). There were 16 different types of measures. Studies used between one and nine separate measures with a mean of three separate measures per study.

The most frequently used component of SES was education, used in 30 studies. The majority of these studies measured the educational level of participants' parents or 'heads of household' (n=23), using a variety of measures including level attained and age at leaving school. Six studies measured participants' own educational level, while one measured education at the neighbourhood level (Oliver and Hayes 2005).

Twenty-four studies used income as an indicator of SES. As with parental education, a wide variety of measures were used, at individual, group, neighbourhood and country levels. Some studies took weekly and annual measures of income, while others described income sufficiency and insufficiency. A further ten studies estimated family poverty, six at the level of neighbourhoods or communities and four at the level of families or households. Other income-related measures included receipt of free or reduced-cost school meals, which was used in four studies. Three of these considered individual free school meal entitlement

(Morgan et al. 2006, Neumark-Sztainer et al. 2002, Rickert et al. 1997), and one looked at the proportions of recipients at a school or class level (Vicary et al. 2004). Entitlement to welfare benefits, an income-related measure, was used in six studies (Cooper 1998, Duncan and Rees 2005, Haines et al. 2002, Neumark-Sztainer et al. 2002, Schneiders et al. 2003, Sellstrom et al. 2003).

Fourteen studies reported measures of parental occupation at the individual, group or neighbourhood level. As with parental education, measures varied. At a family level, eight studies used either the occupation of the 'head of household' or the family member with the highest occupational status. Two used father's occupation alone (Lamont et al. 1998, Shani et al. 2003), and two used both mother's and father's occupation (Friestad and Klepp 2006, Valle et al. 2005). One study examined occupational status at a neighbourhood level (Lee and Cubbin 2002).

Ten studies reported a wide range of housing variables that were considered to be component measures of SES. These variables included housing tenure (Harding et al. 1999, Jewell et al. 2000), household composition (Lee and Cubbin 2002) and type of house and/or degree of overcrowding (Schatz and Dzvimbo 2001, Shani et al. 2003). Measures of social mobility (Irwin, 2004, Lee and Cubbin 2002), food security (Nath et al. 2004, Simbayi et al. 2004), educational aspirations (Friestad and Klepp 2006, Valle et al. 2005) and health insurance status (Stevens et al. 2006, Witt et al. 2003) were each reported by two studies. One study each reported measures of illiteracy (Antunes et al. 2004), deprivation (Shucksmith et al. 1997), car access (Harding et al. 1999) and school fee status (Schatz and Dzvimbo 2001).

Table 3.4: Components of multiple measures of SES reported (N=50*)

	N
Education	30
Income	24
Occupational status	14
Poverty status	10
Housing variables	10
Employment status	8
Benefits recipient/eligible for benefits	6
Free or reduced-cost lunch programme	4
Social mobility	2
Health insurance	2
Food security	2
Educational aspirations	2
Illiteracy rate	1
Deprivation	1
Access to car	1
School fee status	1

* Total number of components is greater than 50, as multiple measure were used.

3.4.3 Composite measures of socio-economic status

Nine different composite measures of socio-economic status, which combine several elements in a measure, were used in ten studies, all surveys. Most frequently used were two composite measures of neighbourhood or community socio-economic status, the Townsend Deprivation Index (Townsend 1987) (n=3: Clements et al. 1998, Fletcher 2004, Hippisley-Cox et al. 2002), and the Carstairs Deprivation Index (n=2: Brown et al. 2005, Clements et

al. 1998), and one measure of family socio-economic status, the Family Affluence Scale (n=3: Elgar et al. 2005, Inchley 2005, Torsheim et al. 2006).

The Townsend Material Deprivation Index was devised to provide a measure of deprivation and disadvantage. It is based on four different Census variables:

- unemployment – unemployed residents over 16 as a percentage of all economically active residents over 16;
- non-home ownership – households not owning their own home as a percentage of all households;
- overcrowding – households with one or more persons per room as a percentage of all households; and
- non-car ownership – households with no car as a percentage of all households.

The four variables each contribute 25% to an overall score. High scores mean more deprivation and disadvantage.

The Carstairs Deprivation Index (Carstairs and Morris 1991) is a composite measure also using four variables: overcrowding (persons in private households living at a density of more than one person per room as a proportion of all persons in private households); male unemployment (proportion of economically active males who are seeking work); social class IV or V (proportion of all persons in private households with head of household in social class IV or V); and no car (proportion of all persons in private households with no car).

The Family Affluence Scale (Currie et al. 1997) employs indicators for social standing other than occupation. Its questions deal with the possession of various commodities, equipment and objects reflecting the level of material well-being in families. This scale is recommended as especially useful when investigating the material circumstances of children and young people, for many of whom parental occupation and employment are only indirectly relevant.

Five other composite measures of socio-economic status were also used in surveys from both datasets, although none more than once. These were the SEIFA Index of Relative Disadvantage (used in Armfield 2005); the Jarman Index (used in Clements et al. 1998); the DOE index (used in Clements et al. 1998); the Index of Multiple Deprivation (used in Morris and Landes 2006) and the Household Asset Index (used in Stephenson et al. 2006).

3.5 Structural interventions and social support

Twelve of the 46 outcome evaluations of interventions identified in this map sought to change structural or environmental factors, for example by making alterations to the physical environment, or seeking to empower communities to take action to improve health. One study evaluated comprehensive community-based public health programmes (Berg-Kelly et al. 1997). Two sought to increase access to preventive health services delivered in community settings (Lou et al. 2004, Sieverding et al. 2005). Three studies evaluated interventions which, although based in schools, involved the broader community in various ways in order to address broader determinants of health behaviours (Kirby et al. 2004, Perry et al. 1998, Winkleby et al. 2004). Two studies evaluated multi-component school-based interventions which involved substantial changes to the physical and/or social environment within the school (Farrell et al. 1996, Sallis et al. 2003). Two studies evaluated whole-school preventive health programmes offering screening (Harrison et al. 2003) or immunisation

(Middleman 2004). Finally, two studies addressed economic or financial determinants of behaviour by providing monetary incentives (Stevens-Simon et al. 1997) or systemic changes to welfare provision (Morris and Michalopoulos 2000).

Gepkens and Gunning-Schepers (1996) argue that educational interventions are more likely to reduce health inequalities in conjunction with personal support. In our dataset, six outcome evaluations of interventions (including two which also operated at the structural and environmental level) sought to use smaller-scale social networks to support participants. In all of these studies, participants' peers, for example fellow students, were involved in delivering the intervention (Caron et al. 2004, Ergene et al. 2005, Kirby et al. 2004, Merati et al. 1997, Stephenson et al. 2004, Stevens-Simon et al. 1997).

The remaining 30 interventions operated at a more individual level. These focused on increasing individuals' knowledge or on changing their attitudes primarily through education or training programmes; a few also implemented changes to the environment or to social networks, but these were not a central component of the intervention.

4. HOW HAS INTERVENTION RESEARCH BEEN DONE? THE METHODS STUDY FINDINGS

To complement our systematic map of studies, we undertook a further methodological study of health promotion and public health research with young people, in order to examine how and to what extent such research has employed appropriate methods to address health inequalities. Given the importance of working with, not only for, young people, we focused both on passive involvement (how research has recruited and retained young people and on how it has incorporated their experiences and opinions) and on active involvement (how young people have been involved in developing, delivering and evaluating interventions). We also assessed how data relevant to inequalities were collected and reported by researchers, and how these data were analysed.

4.1 Dataset of studies

As described earlier, in this part of our review which focused on methods, we re-analysed research included in five previous reviews of health promotion interventions for young people. There were a total of 28 studies. All used a controlled trial design (randomised or non-randomised) to evaluate intervention effectiveness. All had been included in the previous reviews because they were judged to be sound evaluations of effectiveness. Five of the 28 studies addressed mental health, three healthy eating, four both healthy eating and physical activity, and 16 teenage pregnancy or teenage parenting.

Most (n=17) of the 28 studies were conducted in the 1990s, eight in the 1980s and three later. The majority took place in the USA (n=24), two in England, one in Finland and one in Norway.

4.2 Including young people as research participants

The 28 studies varied widely in the methods used to include young people as study participants, and in the extent to which these methods were reported.

4.2.1 Recruitment

Table 4.1 summarises the main methods used (some studies used more than one).

Table 4.1: Methods of recruitment (n=28 studies)

	N
Recruited via schools (all pupils in given school/year/class)	9
Recruited via schools with selection by teacher or researcher	2
Volunteered (from school or elsewhere)	7
Recruited by other agency (social services, health services, nursery)	9
Outreach	1
Unclear/not stated	3

Most of the school-based studies recruited participants simply by enrolling all pupils in chosen classes or year groups. Non-school-based programmes (principally for teenage mothers) generally recruited through referrals from agencies such as social services, welfare departments, hospitals, or health promotion workers. As an attempt to increase recruitment rates, three studies offered incentives to would-be participants. Almost all these studies would have failed to recruit marginalised or disadvantaged young people who do not attend school or are not in contact with agencies such as social services. Recruitment methods were passive in the sense that researchers selected participants from those already known to these agencies. Generally, even those studies which targeted particularly disadvantaged groups relied on young people who were claiming welfare benefits or using medical services as a source of study participants

One study (Philliber et al. 2001) was exceptional in going beyond this to use 'a variety of recruitment strategies including outreach in the schools, distributing fliers throughout the neighbourhood, contacting families on the agency's mailing lists or recruiting teens involved in general recreation activities at the agency' (p3).

4.2.2 Attrition

Attrition is a common problem in many types of research. The kinds of participants who drop out of studies or fail to provide data can affect the validity and reliability of research findings. Most of the studies (n=21) reported attrition rates. Nineteen of these provided some data on participants who dropped out of the study. Five studies described attrition in terms of reasons for drop-out, and seven described participants who dropped out in terms of the outcomes measured in the study. One study reported simply that participants who dropped out and those who remained were 'not systematically different' (Hahn et al. 1994, p5).

Eleven studies described participants who dropped out in terms of demographic characteristics such as those in the PROGRESS-Plus framework (see table 2.2). Four of these only stated that no significant differences were found for selected variables. The remaining seven studies reported sufficient data on attrition to verify the authors' conclusions about the effects of the intervention (Aber et al. 1998, Berrueta-Clement et al. 1984, Cave et al. 1993, Hawkins et al. 1999, Klepp and Wilhelmsen 1993, Nicklas et al. 1998, Solomon and Liefeld 1998). The variables used for reporting attrition data are shown in Table 4.2.

Table 4.2: Demographic data on attrition (N=7 studies)

	N
Gender	5
Ethnicity	5
SES	5
Social capital	3
Education	2

4.3 Involving young people in guiding research

4.3.1 Developing interventions

Few studies involved young people or their parents actively in the sequential steps of choosing research priorities or intervention aims (n=2), or developing interventions (n=3).

More elicited their views as research participants for the needs assessment (n=4) or process evaluation (n=7).

4.3.2 Delivering interventions

More involvement was seen in methods of delivering interventions. In 8 of the 28 studies, young people or parents were themselves involved in delivering the intervention. Three of these studies provided special training in how to deliver the intervention.

4.3.3 Evaluating interventions

There were opportunities for passive and active involvement of young people in the evaluations (table 4.3).

Table 4.3: Involvement of research participants in evaluating interventions (N=28 studies)

	N
Passive involvement	
Process data collected from the study population	14
Methods conducive to involvement used in the process evaluation	13
Active involvement	
Study population involved in identifying the processes/outcomes to be addressed	0
Views on the outcome evaluation sought	3
Views on the process evaluation design sought	3
Study population involved in carrying out the process evaluation	1

Passive roles were more frequent. Half the studies (n=14) sought some form of process data on the intervention from participants. Most of these (n=13) used open-ended qualitative methods such as interviews or self-completion reports. Few studies involved young people actively in the evaluation. Three studies directly sought participants' views on the evaluation design for either outcome or process measures. In one study participants were actually involved in carrying out the process evaluation. No studies sought to involve participants in setting the questions to be addressed by the evaluation.

4.4 Measuring inequalities

All the studies assessed health status. Most described their populations according to demographic variables such as those included in the PROGRESS-Plus classification, although some were very vague. None explicitly aimed to assess health inequalities, although some presented data relevant to health inequalities.

4.4.1 Describing study populations and measuring disadvantage

Studies varied in the extent to which they described their samples at baseline according to demographic variables such as PROGRESS-Plus and compared outcomes between demographic groups.

Socio-economic status

Most of the studies did not provide adequate information about the socio-economic status of their samples. Socio-economic status was frequently not provided at all for evaluations of universally-provided interventions. For interventions targeted at specifically disadvantaged groups, SES was usually described at least in general terms, but detailed information on how and why interventions were targeted at particular groups was often lacking.

Twenty-one of 28 studies provided some description of the SEP of their samples. Two drew from across a range of SESs, thirteen included primarily working-class or lower-SEP populations, and six primarily middle-class or higher-SES populations. Eleven studies used no specific measures of SES and gave only a qualitative characterisation of the sample or of the community from which the sample was drawn (as, for example, 'disadvantaged' or 'middle-class'). Of the ten studies which used specific measures, seven used only single and three multiple measures. No studies used composite measures of SES (see table 4.4).

Table 4.4: Measures of socio-economic status used in the studies (N=10 studies)

	N
Single measures	
Eligibility for or receipt of welfare/benefits/free school meals	6
Parental occupation	1
Multiple measures	
Eligibility for or receipt of welfare/benefits/free school meals	2
Parental education	2
Parental income	1
Parental occupation	1
Parental unemployment	1

Measures of SES, particularly single measures, were dominated by welfare eligibility. Existing criteria applied by welfare agencies have the benefit for researchers of being clear and readily applied. In addition, most of the studies which were derived from the review on teenage pregnancy and parent support were targeted specifically at very low-income or disadvantaged groups, and designed at least partially as adjuncts to, or modifications of, existing welfare systems. Few studies used direct measures of individual SES such as occupational class or income (although, in most cases, participating welfare agencies presumably had criteria of their own).

Among the 21 studies which did report the SES of the sample, 5 provided a comparison of outcomes between higher- and lower-SES groups. Cave et al. (1993) gave subgroup impact differences for participants who received AFDC (Aid for Families with Dependent Children) or food stamps. Hawkins et al. (1999) provided a graph (p233) illustrating the interaction of intervention effect with poverty. The sample was divided into two categories labelled 'poverty' and 'middle and working class' on the basis of participants' eligibility or ineligibility for free school meals (p229). Polit et al. (1987) provided subgroup outcomes for participants from families eligible for AFDC. Quint et al. (1997) also used family eligibility for AFDC, analysing selected outcomes by income (in two groups with the dividing line at \$3,000 p.a.). Allen et al. (1997) used parental education as an indicator of socio-economic status in a regression analysis (p735).

Ethnicity

The ethnicity of the study populations was widely reported. Most studies described four or five ethnic groups (e.g. White/Caucasian,³ Black/African-American, Hispanic, Asian, other). Five studies reported interventions targeted at particular ethnic groups, generally African-Americans (Berrueta-Clement et al. 1984, Campbell et al. 1986, Campbell et al. 2002, Field et al. 1982, Gathron 1990). Many of the interventions which were not targeted at specific ethnic groups nonetheless worked with samples of people who were predominantly non-White.

In seventeen of the studies, ethnic minority participants made up more than 50% of the sample, in eight studies 50% or less, and five studies gave no information on this point. Five studies reported a comparison of outcomes between different ethnic groups. Polit et al. (1987) presented outcomes separately for Black, Mexican American and Puerto Rican participants, Quint et al. (1997) for Black, White and Hispanic groups, and Bos and Fellerath (1997) for Black and 'White, Hispanic or other'. Philliber et al. (2001) gave odds ratios from logistic regressions for selected outcomes according to two variables: African-American versus all others, and Latino versus all others. Allen et al. (1997) presented a single logistic regression according to ethnic minority versus all others.

Place of residence

Most of the studies (n=23) took place in urban locations. Only two of these (Cave et al. 1993, Polit et al. 1987) reported a comparison of outcomes between intervention sites in urban and rural areas. Five studies included only rural areas.

Gender

Most of the studies (n=23) included both young women and men. Five included young women only. One of these five focused on psychosocial health (Haldeman and Baker 1992); the other four concerned teenage mothers (Campbell et al. 1986, Field et al. 1982, Quint et al. 1997, Solomon and Liefeld 1998).

Fewer than half of the studies (n=11) reported a gender comparison of outcomes. Most of the 11 studies presented extensive separate data for each gender, although one (Campbell et al. 2002) reported only limited data focused on significant interactions between gender and intervention.

Social capital

Most of the information in the studies relating to social capital used a limited definition of this as family structure. Five studies reported participants' marital status; six provided data on whether participants came from a single- or two-parent family.

Only three studies compared outcomes according to these definitions of social capital. Two studies compared young people living with their parents and those not living with parents (Cave et al. 1993, Philliber et al. 2001), one compared young women living with their children

³ The Caucasian race is defined variously by the *Compact Oxford English Dictionary of Current English* as 'relating to a broad division of humankind covering peoples from Europe, Western Asia, and parts of India and North Africa' or 'white-skinned; of European origin' or 'relating to the region of the Caucasus in SE Europe'. The concept's existence is based on the now disputed typological method of racial classification.

with those who were not (Cave et al. 1993), two compared young people from two-parent and one-parent families (Philliber et al. 2001, Polit et al. 1987), and two compared married and unmarried young people (Cave et al. 1993, Polit et al. 1987).

Vulnerable groups

Several studies included data on particularly vulnerable young people, often using broad concepts of disadvantage which varied between studies. A number of studies used composite indices of various PROGRESS-Plus factors (e.g. SES + educational level + family structure) to identify young people at risk. Three studies identified vulnerable young people using measures other than PROGRESS-Plus. One of these combined PROGRESS measures with measures of psychosocial problems to form an index of high risk (Campbell et al. 1986). Another (Philliber et al. 2001) used a more complex composite measure of 'barriers in a young person's life' (p5), which included the following: a 'negative peer group'; parental substance abuse, illness, domestic violence or incarceration; poor relationship with mother; unsafe neighbourhood; 'no relationship with a church or faith center'; and low socio-economic status. This composite measure was then used in a logistic regression analysis to identify the impact of multiple barriers on intervention outcomes. Wiggins et al. (2005), while not using a formal criterion for vulnerable groups, focused particular attention on at-risk groups of teenage parents such as those experiencing homelessness or domestic violence.

4.4.2 Health status outcome measures

Table 4.5 shows the range of measures used in the 28 studies for outcomes. Health-related behaviours were the most widely used (n=11), including healthy eating (n=7), smoking (n=6), alcohol use (n=4), drug use (n=4) and contraceptive use (n=3). Emotional and mental health outcomes were measured in eight studies, usually in the form of standardised psychological tests. Health knowledge was measured in eight, generally in the form of a quiz or test on participants' knowledge of the topics covered in the intervention. Physical health outcomes were measured in seven studies. These outcomes included such measures as BMI, blood pressure etc. (n=3) and reproductive outcomes such as pregnancy, birth, abortion etc. (n=4). Variables relating to the services offered to participants were measured in relatively few studies.

Many studies also reported education outcomes, such as rates of school attendance or grades attained (n=10), or outcomes related to individual participants' occupational or financial status such as employment, income or welfare receipt (n=10). Several other social or educational outcomes such as delinquency or involvement in community activities were also used (n=7).

Table 4.5: Outcome measures used in the studies (N=28 studies; some studies used more than one)

	N
Health related behaviours (e.g. smoking, physical activity)	11
Educational outcomes (e.g. school attendance, grades)	10
Personal financial outcomes (e.g. employment, income)	10
Emotional and mental health outcomes (e.g. self-esteem, depression)	8
Health knowledge, beliefs or intentions	8
Physical health outcomes	7
Other social or educational outcomes/behaviours	7
Health service use	3
Health service provision	2

4.4.3 Measuring and analysing health inequalities

In this section we examine how researchers measured inequalities and analysed inequalities data. As noted above, most of the studies did not have an explicit focus on measuring or reducing inequalities. Even where interventions were targeted at disadvantaged groups, the aims were usually focused on reducing welfare burdens on state finances rather than on reducing inequalities. The analytic effort in these studies was therefore more directed at pinpointing variables which might impact on the effectiveness of the intervention with different groups, than at assessing the impact of the intervention on inequalities.

Almost half the studies (n=13) did not make any comparisons between different groups. Table 4.6 shows the comparisons made in the other 15 studies.

Table 4.6: Methods for measuring inequalities (N=15 studies)

	N
Interaction test	6
Tests of differences between subgroups (without interaction tests)	5
No statistical analysis of subgroup differences	4

Of these 15 studies, 4 simply presented data for the groups separately in tables, but did not use statistical methods to analyse differences between groups. Six studies used regression analysis or other formal interaction tests to explore the relationships between subgroup determinants and outcomes. Five studies used only significance tests of inter-subgroup differences in outcomes. Very few studies addressed issues relating to the statistical power of their subgroup analyses, or to the potential problems arising from post hoc analysis, despite some studies presenting dozens of subgroup analyses with significance tests for each.

5. DISCUSSION

In this section, we draw together the findings from the systematic map and the methods study, and reflect on the development and implementation of the methods used.

5.1 Summary of findings

5.1.1 What research has been done? The systematic map

Our systematic map of the literature covered studies across a wide range of health promotion and public health topic areas, settings and study designs. Most of the 191 studies we found were observational in nature. Forty-six were outcome evaluations of interventions that addressed health inequalities by comparing distinct groups; 12 of these evaluated community, structural or environmental interventions, and six evaluated peer-delivered interventions.

Most of the 191 studies sampled broad populations; few focused specifically on PROGRESS-Plus populations or other disadvantaged groups.

Studies explored differences between genders more often than any other population characteristic. However, substantial numbers of studies also compared different ethnic or socio-economic groups. Employing a broad notion of SES (including education and occupation), almost half the studies included some SES comparison.

A wide range of methods was used to measure SES. These included single measures such as occupational class, parental education and income, as well as multiple measures comprising combinations of these, and several composite measures of SES.

5.1.2 How has intervention research been done? The methods study

In the second part of our review, we looked more closely at the methods used by intervention studies of health promotion and public health relevant to inequalities. For this exercise, we analysed controlled trials included in five previous systematic reviews.

There were 28 studies. Most (n=21) recruited young people through schools or agencies such as social services. Although most studies (n=21) reported attrition, only about half of these described the socio-demographic characteristics of participants who dropped out (n=11).

Few studies involved young people or their parents actively in choosing research priorities or intervention aims (n=2), or developing interventions (n=3). More elicited their views as research participants for the needs assessment (n=4) or process evaluation (n=7).

Most studies did not explicitly aim to measure or reduce inequalities. Half the studies (n=15) provided outcomes data by subgroup, but this was not always analysed appropriately.

5.2 Strengths and limitations of the review

This review adds to the relatively small body of existing literature which has looked at how health promotion and public health researchers have tackled the topic of inequalities in young people's health.

5.2.1 What research has been done? The systematic map

Our map of the research literature was not intended to provide a complete and exhaustive account of the literature on young people and health inequalities. Its aim was to take a descriptive 'snapshot' of the size and scope of the available research. Undertaking a systematic map as distinct from a full systematic review of research has inherent limitations to do with the way studies are found. Although the searches for this map were systematic and explicitly reported, they were not fully comprehensive. 'Grey' literature, reference lists of relevant studies and all available electronic databases were not comprehensively searched. As is usual in descriptive maps of research, we did not critically appraise the research reports.

A large number of studies (n=875) found in the searches were excluded during the first stage of screening because they lacked an abstract. We carried out a re-analysis of a sample of these studies for which abstracts could be found by other means, and calculated that we may have missed approximately 40 papers which would have been included on full text if they had passed the first stage of screening.

A strength of our review was that we only included in the map studies which compared two or more different groups of young people using the framework of PROGRESS-Plus indicators, and which reported such a comparison in the title or abstract. This approach enabled us to move beyond a narrow focus on socio-economic disadvantage to a broader definition of the social and material factors which shape patterns of health. In addition, by searching a dedicated health promotion and public health intervention research database (TRoPHI) as well as doing general electronic searches of the inequalities literature, we were able to broaden the scope of the review beyond studies which had the description or reduction of inequalities as an *explicit* aim. Using TRoPHI may have given undue emphasis to those topics on which the EPPI-Centre has previously conducted systematic reviews: sexual health, mental health, healthy eating, physical activity, pregnancy prevention and peer delivered health promotion for young people.

In using a criterion that studies should report in their abstract a comparison of two or more groups of young people, we may have discriminated against certain types of research. For example, evaluations of interventions may be less likely than observational studies to report such comparisons in their abstracts because their main focus is on intervention effectiveness, and not on variations between subgroups in their populations. Re-analysis of a sample of the studies excluded on this criterion bears out this point. Of 36 references to inequalities research which were identified through searches of commercial databases and then excluded on abstract as not reporting a comparison, and for which the full text could be retrieved, 11 (31%) did report a comparison in the full text and would have been included. Seven of these 11 studies were reports of interventions, including six outcome evaluations of interventions. A similar exercise for the intervention research sourced from TRoPHI found two papers of a sample of 20 excluded on the 'no comparison' criterion which would have been included on the basis of the full text. This re-analysis indicates that substantial numbers of studies which reported relevant data were not included because this data was not available in the published abstract, and underlines the difficulty of locating research – particularly intervention research – which addresses inequalities.

An alternative approach has been taken by the Cochrane Equity Field (Beardmore and Cochrane Health Equity Field 2006). This included all studies that look at disadvantaged groups and not only those which include comparisons between groups. Identifying and reviewing studies of particular disadvantaged groups or health conditions associated with health inequalities is more straightforward, but does not take into account fully the implications of relative disadvantage.

5.2.2 How has intervention research been done? The methods study

The research included in the methods study was drawn from previous EPPI-Centre reviews in the topic areas of mental health, physical activity, healthy eating, teenage pregnancy prevention and teenage parenting support. Many of these reviews paid particular attention to issues relevant to health inequalities – vulnerable young people and community, structural or peer-delivered interventions. However, research in some areas where young people experience inequalities (for example accidental injury, substance abuse) was under-represented in the methods study. Although several of the 28 studies we included aimed to improve the health status of disadvantaged groups, very few adopted an explicit focus on inequalities.

5.3 Addressing health inequalities: the map and the methods study

The systematic map and methods study raise a number of concerns about coverage, reporting and research methods when seeking to discriminate between diverse groups. This is in addition to issues raised when seeking to include diverse groups in research, which are addressed in a parallel study (Lorenc et al. 2008).

5.3.1 Research gaps

Research gaps were identified through an analysis of the studies in the systematic map. Relatively few intervention studies have an explicit focus on inequalities, and even fewer report any comparisons other than gender. The predominance of gender-based analyses can be attributed to their relative simplicity; theoretical or other evidence-based rationales for gender comparisons were notably scarce. As Macintyre and Hunt (1997) have noted, socio-economic variations in health often differ by gender, but the study of causal mechanisms has been hampered by a separation between ‘gender’ and ‘inequalities’ research.

Very few of the intervention studies reported any comparisons by SES, and only one of these was an RCT.

Other gaps include the low number of process evaluations capable of providing information on the implementation of interventions, and a lack of studies presenting the views and experiences of young people.

Research in this area is dominated by US studies – 86% (164/191). Of the 27 UK studies, all but one were observational. Thus, while there is a substantial body of descriptive work on health inequalities in the UK, there is a dearth of evidence on the effectiveness of interventions to reduce inequalities. A significant gap in the UK studies concerns the comparisons used: while socio-economic status was widely reported (n=17), very few studies examined ethnic variation (n=2).

5.3.2 Reporting

Electronic searches for studies that address inequalities in terms of gaps or gradients are hampered by lack of reporting in abstracts of comparisons of different socio-demographic populations. As we noted above, in our study, 40 relevant studies may have been excluded because they had no abstract. Additionally, a substantial number of inequalities studies reported such comparisons in the main text, but not the abstract, with more than half of these being intervention studies. If tackling health inequalities is to be informed by the evidence from single studies, or systematic reviews, the reporting of inequalities in abstracts available on bibliographic databases needs to improve.

In addition, there is some reason to think that researchers may be in possession of outcome data which could be analysed by subgroup, but for which such analyses are not presented in published research reports. This may represent a lost opportunity for studying the ways in which different health promotion and public health interventions may impact on health inequalities. It suggests a particular challenge for systematic reviewers in this area – that of contacting authors of primary studies to collect missing data.

5.3.3 Characterising populations

We began investigating inequalities between groups with the help of the mnemonic PROGRESS. Here we reflect on the utility of the components of the PROGRESS-Plus framework for research with young people.

Place of residence

Targeting an intervention towards a particular location or place of residence is a frequent approach in health promotion. Comparing groups resident in different places is also commonly employed, for example, to compare outcomes between different intervention sites. Therefore, the relevance of place of residence to inequalities may not always be clear.

There are strong arguments for using some components of 'place of residence' as descriptors for SES for young people (see section 1.9), and neighbourhood measures have been incorporated into composite measures of SES (see section 3.4). Our map of the literature found that some comparisons of place of residence were undertaken because of the information they provide about SES. Examples include comparisons of neighbourhoods characterised by deprivation, but do not include many comparisons of rural and urban settings.

Evidence about health inequalities and young people could be strengthened by the use of neighbourhood measures in intervention studies.

Ethnicity

The race/ethnicity descriptor of PROGRESS is problematic for a number of reasons. Categorising ethnicity is difficult when self-identified ethnicity may be multiple and unstable, and using a fixed system of categories may be too simplistic an approach (Bradby 2003, Gunaratnam 2003).

Despite these difficulties, our map revealed ethnicity to be a frequent analytical category, especially in the USA, where the collection of ethnic data on study populations may be more routine. The methods study found ethnicity widely reported, often with up to four or five ethnic groups compared.

Only 16 studies from countries other than the USA compared outcomes between different ethnic groups. While our dataset contained too few non-USA studies to draw firm conclusions, it appears that the absence of data on ethnicity outside the USA is an important gap in the evidence base.

Research in the UK and elsewhere could benefit from more consistent use of analyses by ethnicity (Senior and Bhopal 1994). However, it is important that researchers have a clear rationale for undertaking comparisons by ethnicity (Oakley 2006).

Occupation

Occupational class, which has long been used for adults (usually men), is more difficult to apply to young people directly, and applying occupation of parents as an indirect measure may raise problems for accurate data collection from the young people rather than parents (Currie et al. 1997, Ensminger et al. 2000, Lien et al. 2001).

Our map found that most studies reporting occupation focused on participants' parents' occupation, and used this either as a proxy for SES or alongside other measures of SES.

While there is little consensus on the appropriateness of measuring young people's own occupation, the use of parental occupation as an SES measure is widespread. In most cases, descriptions falling under the 'occupation' term in PROGRESS-Plus were used as proxies for SES.

Gender

Both the systematic map (section 3.3.1) and the methods study found more comparisons by gender than by any other group. The prominence of gender comparisons may reflect the convenience of gender as an analytical category rather than a particular concern in the literature with inequalities between males and females. Several studies did, indeed, focus specifically on gender inequality. However, in many studies gender comparisons were part of an analysis whose focus on inequalities lay elsewhere. For example, the primary focus of an intervention to promote healthy eating and physical activity described by Stevens et al. (2003) was the greater prevalence of obesity in American Indian communities, but the study entered our map because the results were also analysed by gender.

Where studies focused on outcomes marked by gender disparities (e.g. eating disorders, sexual health, physical activity), the relevance of the gender comparison in the study to the wider issue of inequalities was often unclear. Few studies which carried out comparisons by gender linked these analyses to existing inequalities between males and females, or aimed to investigate or reduce such inequalities.

Religion

We found no studies focusing on populations defined by religion, or making comparisons between religious groups. It is unclear whether the 'religion' descriptor in PROGRESS-Plus adds any information to the 'ethnicity' descriptor, although in certain contexts it may be independently relevant.

Education

Our map found that comparisons of groups according to educational variables were frequent. The purpose of these comparisons varied. While some studies investigated educational variables for their own sake, in the majority of cases they formed a measure of SES, singly or in conjunction with other relevant variables (section 3.4). Parental educational level was the

predominant variable used to measure SES, although participants' own educational level and school type (e.g. public vs private) were also used for this purpose.

Using either participants' or their parents' education as a measure of SES may pose problems. Educational attainment is not an appropriate measure for young people, since many have not yet completed formal education. As with parental occupation, using parental education as a measure of SES is problematic because young people may not be able to provide a reliable response to questions about parental education.

Social capital

'Social capital' describes support available through informal social networks of neighbourhoods, communities and families; in relation to young people, we found that measures of social capital were largely related to family structure and the form and quality of family relationships.

In our map, a substantial number of studies, although relatively few outcome evaluations of interventions, compared groups according to their social capital. Many of these were comparisons between single-parent and two-parent families, but some studies used other variables, such as family type or structure or the quality of young people's relationships with their families or their wider social environments.

'Social capital' as a descriptive term overlaps with the PROGRESS-Plus category of 'other vulnerable groups' (see below).

Socio-economic status

In the preceding sections we have already observed that several PROGRESS-Plus terms are frequently used as measures of socio-economic status. In our map, in order to capture the complexity of SES, we used an 'SES' term to code for measures which related directly or indirectly to income, and an 'All SES' term to code for all information which is relevant to SES.

The findings of our systematic map indicate that a wide variety of indicators are used to measure SES, both singly and in combination (section 3.4). The findings of the methods study (section 4.4.1) indicate further that many studies which give some indication of the SES of their samples do not use reliable measurement tools to do so.

The lack of attention to the need for careful measurement and collection of SES data has been highlighted by others (Kelly et al. 2007), as has the paucity of studies using the same or similar indicators of SES (Starfield et al. 2002). SEP measures for public health may need to capture more of the social context than simple indicators of income, education, or occupation allow, but much research has not reached the level of methodological sophistication needed to address this challenge (Oakes and Rossi 2002). The examination of 'place effects' on health and their contribution to health inequalities is a related issue which has been singled out as needing more methodological attention (Macintyre et al. 2002).

PROGRESS-Plus

We found that the framework of PROGRESS (Place of residence, Race/ethnicity, Occupation, Gender, Religion, Education, Social capital and SES), which has been developed from the literature about social determinants of health, did not capture all the dimensions for characterising populations in the health inequalities literature. A more comprehensive framework for characterising the socio-economic profiles of people included in research was developed by supplementing PROGRESS with additional characteristics that

received attention from the social equality, anti-discrimination agenda before influencing the health inequalities agenda: namely, disability, sexual orientation and age.

However, even this expanded framework omits some kinds of vulnerability that are particularly relevant to young people: school non-attenders, looked-after young people, young people in the criminal justice system, victims of abuse and runaways. To capture this range of vulnerable young people we added a category of 'Other vulnerable groups' and captured the descriptions used. However, we found relatively little research which both identifies groups at particular risk of disadvantage and makes an explicit comparison with groups not at risk.

From this experience, we anticipate that the expansion of the mnemonic PROGRESS to PROGRESS-Plus will provide a useful core framework for any research with a focus on inequalities. PROGRESS-Plus has the advantage of including core concepts that span what we know about health inequalities arising from biological and social determinants of health as well as agendas for promoting equal opportunities and legislating against discrimination. In addition, it provides flexibility in prompting a purposive searching for socially excluded and vulnerable groups.

5.3.4 Composite measures of socio-economic status

Composite measures are used much less frequently than single or multiple measures in observational studies (see section 3.4). However, some have the advantage of being available as part of data collected and published routinely for analysing inequalities or informing planning. For instance, the UK Office for National Statistics publishes multiple and composite measures, and the Australian Bureau of Statistics reports areas according to their Index of Relative Socio-Economic Disadvantage (SEIFA Index). Although personal and area-based measures of socio-economic status appear to be only weakly correlated for adults (Deonandan et al. 2000), area measures may be more relevant to health inequalities than parental or family measures for young people of secondary school age and older (Asthana and Halliday 2006 p219; West 1997).

None of the studies in our methods study employed composite area measures. However, the Jarman Index has been used to describe the setting of a randomised trial of housing improvements (Somerville et al. 2002); and the 'Index of children in low income households' (Department of the Environment, Transport and the Regions 1998) was an inclusion criterion for disadvantaged inner-city postcode areas in a randomised trial of postnatal support for mothers of young children (Wiggins et al. 2004).

5.3.5 Recruitment and attrition

In the methods study, we found that methods for recruiting young people as study participants varied. Many studies would not have recruited young people who were not in school or in contact with health or social services. Almost all studies reported how participants were recruited to the studies. However, few studies considered how their recruitment strategies might have affected the samples obtained.

Most studies reported overall attrition rates, the majority of which provided some information on participants who dropped out. However, only a quarter reported an analysis of attrition according to demographic factors. Hence, it is difficult to assess the impact of differential attrition on the validity and reliability of published research findings.

5.3.6 Actively involving young people

Despite widely held principles about the importance of actively involving people in developing solutions to their health problems, our methods study found few studies which reported the involvement of young people or their parents in developing, delivering or evaluating interventions. Our findings on the active involvement of young people are in line with those of an earlier study looking at this issue (Harden and Oliver 2001). The challenges of discussing inequalities with disadvantaged groups (Blaxter 1997, Bolam et al. 2004) should not prevent discussions about the need, development, delivery and evaluation of interventions for particular disadvantaged groups.

5.3.7 Structural interventions and social support

Most of the intervention studies in our systematic map (n=30 out of 46) sought to change behaviour at the individual level by increasing knowledge or changing attitudes or motivations. Relatively few studies evaluated interventions which addressed the broader structural, social or environmental determinants of health-related behaviours. Most of these sought to change either the provision of or access to preventive health services, welfare benefits or the physical and/or social environment within schools.

5.3.8 Measuring difference

As noted earlier, measuring differences between populations requires choosing appropriate health status measures and analytical methods. Our map found that studies in the inequalities dataset commonly measured physical health (41%) and health behaviour (38%). Despite the poor correlation between physical health and health behaviour (Munro et al. 2007), far more studies from the intervention dataset measured health behaviours (63%) than physical health (30%). Health knowledge and beliefs were also far more frequently measured in studies from the intervention dataset (34%) than in those from the inequalities dataset (15%). The methods study confirmed the greater attention paid to health-related behaviour (11 studies) compared with physical health (7 studies).

Our map included only studies that compared health status between different PROGRESS-Plus groups. Approximately half of the studies in the inequalities dataset investigated both gaps and gradients in health status. Approximately one quarter investigated gaps only, and a further one quarter gradients only. In comparison, two-thirds of the studies in the much smaller interventions dataset reported only gaps (67% of the studies).

The dataset used for our methods study included only sound evaluations of effectiveness drawn from a series of reviews. Almost half these reports made no comparisons of health status between different PROGRESS-Plus groups. Of the evaluations which did address health inequalities by comparing PROGRESS-Plus groups, eleven used statistical tests to explore outcome differences between population subgroups, and of these, six used regression analysis or other interaction tests to quantify the strength of interactions between the intervention and demographic variables.

5.4 Recommendations and implications for research addressing health inequalities

There is an extensive research literature about the causes of health inequalities and how they develop along the life course to inform policy interest. There is less research directly

addressing how to reach the policy goal of reducing inequalities. We sought a literature about health promotion, inequalities and young people's health, but found instead largely disconnected literatures of: observational studies addressing inequalities; discourses about inclusive research and public involvement for tackling inequalities; evaluations of health promotion (but not of its effects on inequalities); and methodologies for assessing health inequalities that had been applied almost exclusively to observational studies. Knowledge from these different literatures needs to be joined up in order to build an evidence base to support effective health promotion for young people that reduces, or at least does not increase, health inequalities. There are implications throughout the research pathway: for research priorities, the research community, study designs, methods for data collection and analysis, reporting and publishing.

5.4.1 Research priorities

Systematically mapping the literature and critiquing health promotion intervention studies in terms of inequalities research methods exposed a number of gaps in the evidence base. There is a need:

- to investigate appropriate research methods for the evaluation of interventions intended to reduce inequalities. This includes questions of when to conduct subgroup analysis, and with which groups.
- to conduct high quality outcome evaluations of interventions which compare outcomes between different PROGRESS-Plus groups, especially SES comparisons. There is a particular need to conduct such evaluations in the UK. There is also a particular need to conduct such research with vulnerable groups.
- for rigorous evaluations of the effects of structural and social support interventions which earlier reviews have highlighted as having potential for reducing inequalities.
- for process evaluations which can provide information on the implementation of interventions and their acceptability to young people and their families.

These research needs should be considered alongside the findings of the priority setting exercises undertaken by the Cochrane Equity Field and the Cochrane Health Promotion and Public Health Field that are to be discussed at the Cochrane Colloquium in October 2008.

5.4.2 Research community

To address the effects of interventions on health inequalities, the research community, when funding, designing, reporting or publishing research, or reviewing its science or ethics, needs to draw on its knowledge and experience of:

- developing interventions for reducing inequalities, such as structural interventions or social support;
- experimental study designs for evaluating social interventions;
- measures of health inequalities;
- working with disadvantaged or marginalised groups in order to develop and implement inclusive recruitment strategies and minimise attrition;

- working in partnership with potential recipients in guiding public health research which addresses their health needs.

When considering individual studies, and in the course of wider debate, it is beneficial to convene mixed groups, in terms of academic disciplines and professional and personal roles, in order to exchange such knowledge and experience.

5.4.3 Study design

Investigating inequalities requires study designs to take into account dimensions of inequalities pertinent to the focus of study, and whether the study aims to generate hypotheses or draw conclusions about the effects of interventions on inequalities.

- Much of the literature about investigating inequalities argues for attending to dimensions of inequality other than SES both for their own sake and in order to describe their interactions with SES as determinants of health; similar thoughtful approaches are needed to inform intervention studies taking into account health inequalities.
- The overlapping discourses of social determinants of health and equality of opportunity can inform the choice of population descriptors in studies of health inequalities. PROGRESS-Plus is a practical tool spanning these discourses for characterising populations when planning and reporting primary research, including sampling frames, recruitment and data collection, and analysis (including attrition). Data need not be collected for every dimension of PROGRESS-Plus; rather it provides a framework from which to choose appropriate dimensions for investigation.
- Primary studies drawing conclusions about the effects of interventions on inequalities need to be sufficiently large to allow subgroup analyses sensitive to statistically significant differences.
- Smaller studies may explore potential differences with subgroup analyses for the purpose of hypotheses generation. Hypotheses may be tested subsequently in sufficiently powered primary studies or in systematic reviews with statistical meta-analyses.

5.4.4 Data collection

The choice (or dearth) of socio-demographic data reported in some intervention studies suggests that this literature largely fails to draw on lessons learnt from the wider inequalities literature.

- It is essential to determine whether or not a study has an explicit focus on inequalities baseline socio-demographic data which is collected, reported and linked to outcomes data, in order to expose instances of interventions inadvertently increasing inequalities.
- Studies of inequalities in socio-economic status need to employ measures of SES that are meaningful and feasible for particular populations and settings. For instance, young people may offer more accurate descriptions of housing conditions than parental occupations.
- There is a need to assess the validity of composite measures of socio-economic status for young people.

5.4.5 Analysis

Analytical methods need to be theoretically and technically sound:

- The rationale for comparing different socio-economic groups should be clear.
- In particular, there is a need for better theorising about the role of gender and ethnicity in addressing inequalities through subgroup analyses.
- Where subgroup analyses are used to investigate inequalities, they should be pre-specified and have an appropriate rationale. Subgroup analyses which are under-powered to investigate differential effects in evaluations of interventions should only be used for hypothesis generation.
- Attrition data should be reported and linked to socio-demographic data.
- There is a need to explore the potential of area measures for experimental designs: particularly the value of using area measures as background information comparable to official national statistics, as inclusion criteria, and as analytical factors for understanding the effects of interventions and effect modifiers.

5.4.6 Reporting and publishing

To build an evidence base, individual studies need to contribute comprehensive reporting of socio-economic data, either in journals or in publicly accessible reports. Funders and publishers are well placed to encourage:

- better and fuller reporting of socio-demographic data of participants in primary research, if necessary through publicly accessible electronic appendices.
- reporting comparisons of health status between different socio-economic groups in abstracts.

This accumulative evidence base would be more accessible through bibliographic databases where structured abstracts and keywords include terms relating to health inequalities.

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Appendix 1: Search strategy

ASSIA

1987 – present

((DE="children") or
 (DE="adolescence") or
 (KW=(child or children or adolescent*) or KW=(adolescence or youth or
 youngster*) or KW=(teenage* or (young people))))
 and
 ((DE="health promotion") or
 (DE=("public health" or "public health care")) or
 (DE=("health education" or "public health" or "public health care")) or
 (DE=("prevention" or "preventive health care" or "preventive mental health care"
 or "public health" or "public health care"))
 or (KW=((health promotion) or (public health))))
 and
 ((DE=("health equity" or "health inequalities" or "public health" or "public health
 care")) or
 (KW=(inequality or inequalities or equality) or KW=(inequities or inequity or
 equity) or KW=(disparity or disparities or unequal)) or (KW=(gap or gaps or
 gradient) or
 KW=(gradients or variation* or disadvantage*)))

BIBLIOMAP

1. “children and young people” AND “inequalities”

CINAHL

1982 to date

1. CHILD.W..MJ. OR CHILD-CARE.MJ. OR CHILD-HEALTH.MJ. OR
CHILD-HEALTH-SERVICES.MJ.
2. ADOLESCENCE.W..MJ. OR ADOLESCENT-HEALTH.MJ. OR
ADOLESCENT-HEALTH-SERVICES.MJ.
3. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER\$ OR YOUNG ADJ
PEOPLE OR TEENAGE\$ OR ADOLESCENT\$ OR
ADOLESCENCE).TI,AB.
4. 1 OR 2 OR 3
5. HEALTH-PROMOTION.MJ.

6. PREVENTIVE-DENTISTRY.MJ. OR PREVENTIVE-HEALTH-CARE.MJ.
7. PUBLIC ADJ HEALTH
8. PUBLIC-HEALTH.MJ. OR PUBLIC-HEALTH-DENTISTRY.MJ. OR COMMUNITY-HEALTH-NURSING.MJ.
- 19
9. HEALTH-EDUCATION.MJ. OR HEALTH-EDUCATION.MJ. OR DENTALHEALTH-EDUCATION.MJ. OR SCHOOL-HEALTH-EDUCATION.MJ. OR STUDENT-HEALTH-EDUCATION.MJ.
10. (HEALTH ADJ PROMOTION OR PUBLIC ADJ HEALTH).TI,AB.
11. 5 OR 6 OR 8 OR 9 OR 10
12. (INEQUALITY OR INEQUALITIES OR EQUALITY OR INEQUITY OR INEQUITIES OR EQUITY OR DISPARITY OR DISPARITIES OR GAP OR GAPS OR GRADIENT OR GRADIENTS OR UNEQUAL).TI,AB.
13. (DISADVANTAGE\$ OR VARIATION\$).TI,AB.
14. 12 OR 13
15. 4 AND 11 AND 14
16. 15 AND LG=EN

COCHRANE LIBRARY

Issue 3, 2006

1. MeSH descriptor Child explode all trees
2. MeSH descriptor Child Health Services explode all trees
3. MeSH descriptor Adolescent explode all trees
4. MeSH descriptor Adolescent Health Services explode all trees
5. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER* OR YOUNG NEXT PEOPLE OR TEENAGE* OR ADOLESCENT* OR ADOLESCENCE):ti or (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER* OR YOUNG NEXT PEOPLE OR TEENAGE* OR ADOLESCENT* OR ADOLESCENCE):ab
6. (#1 OR #2 OR #3 OR #4 OR #5
7. MeSH descriptor Health Promotion explode all trees
8. MeSH descriptor Preventive Health Services, this term only
9. MeSH descriptor Primary Prevention, this term only
10. MeSH descriptor Healthy People Programs, this term only
11. MeSH descriptor Health Education, this term only
12. MeSH descriptor Health Education, Dental, this term only
13. MeSH descriptor School Health Services, this term only
14. MeSH descriptor School Dentistry, this term only
15. MeSH descriptor School Nursing, this term only
16. MeSH descriptor Public Health, this term only
17. MeSH descriptor Public Health Dentistry, this term only
18. MeSH descriptor Public Health Nursing, this term only
19. MeSH descriptor Public Health Practice, this term only

20. MeSH descriptor Schools, Public Health, this term only
21. MeSH descriptor United States Public Health Service, this term only
22. MeSH descriptor Students, Public Health, this term only
23. (health NEXT promotion):ti or (health NEXT promotion):ab
24. (public NEXT health).ti or (public NEXT health):ab
25. (#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #23)
26. (inequality OR inequalities OR equality OR inequity OR inequities OR equity OR disparity OR disparities OR gap OR gaps OR gradient OR gradients OR unequal OR variation* OR disadvantage*):ti or (inequality OR inequalities OR equality OR inequity OR inequities OR equity OR disparity OR disparities OR gap OR gaps OR gradient OR gradients OR unequal OR variation* OR disadvantage*):ab
27. (#6 AND #25 AND #26)

EMBASE

1974 to date

1. CHILD.W..MJ. OR CHILD-CARE.MJ. OR CHILD-HEALTH.MJ. OR CHILD-HEALTH-CARE.MJ.
2. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER\$ OR YOUNG ADJ PEOPLE OR TEENAGE\$ OR ADOLESCENT\$ OR ADOLESCENCE).TI,AB.
3. ADOLESCENT.W..MJ. OR ADOLESCENT-HEALTH.MJ.
4. 1 OR 2 OR 3
5. HEALTH-PROMOTION.MJ.
6. PREVENTIVE-MEDICINE.MJ. OR PREVENTIVE-MEDICINE.MJ. OR PREVENTIVE-HEALTH-SERVICE.MJ.
7. PRIMARY-PREVENTION.MJ.
8. HEALTH-EDUCATION.MJ. OR DENTAL-HEALTH-EDUCATION.MJ.
9. PUBLIC-HEALTH.MJ. OR PUBLIC-HEALTH-SERVICE.MJ. OR COMMUNITY-HEALTH-NURSING.MJ.
10. (HEALTH ADJ PROMOTION OR PUBLIC ADJ HEALTH).TI,AB.
11. 5 OR 6 OR 7 OR 8 OR 9 OR 10
12. (INEQUALITY OR INEQUALITIES OR EQUALITY OR INEQUITY OR INEQUITIES OR EQUITY OR DISPARITY OR DISPARITIES OR UNEQUAL OR GAP OR GAPS OR GRADIENT OR GRADIENTS).TI,AB.
13. (VARIATION\$ OR DISADVANTAGE\$).TI,AB.
14. 12 OR 13
15. 4 AND 11 AND 14
16. 15 AND LG=EN
17. 16 AND HUMAN=YES

KINGS FUND

1979 – date

1. HEALTH-INEQUALITIES.DE.
2. (INEQUALITY OR INEQUALITIES OR EQUALITY OR INEQUITY OR INEQUITIES OR EQUITY OR DISPARITY OR DISPARITIES OR GAP OR GAPS OR GRADIENT OR GRADIENTS OR VARIATION\$ OR DISADVANTAGE\$).TI,AB.
3. CHILDREN.W..DE.
4. CHILD-HEALTH-SERVICES#.DE.
5. YOUNG-PEOPLE#.DE.
6. YOUNG-PEOPLES-HEALTH-SERVICES.DE.
7. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER\$ OR YOUNG ADJ PEOPLE OR TEENAGE\$ OR ADOLESCENT\$ OR ADOLESCENCE).TI,AB.
8. 1 OR 2
9. 3 OR 4 OR 5 OR 6 OR 7
10. 8 AND 9
11. HEALTH-PROMOTION#.DE.
12. PREVENTIVE-MEDICINE#.DE.
13. PUBLIC-HEALTH#.DE.
14. (HEALTH ADJ PROMOTION).TI,AB.
15. (PUBLIC ADJ HEALTH).TI,AB.
16. 11 OR 12 OR 13 OR 14 OR 15
17. 1 AND 7
18. 17
19. 10 AND 16
20. 17 OR 19

MEDLINE

1950 to date

1. CHILD.W..MJ. OR CHILD-HEALTH-SERVICES.MJ.
2. ADOLESCENT.W..MJ. OR ADOLESCENT-HEALTH-SERVICES.MJ.
3. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER\$ OR YOUNG ADJ PEOPLE OR TEENAGE\$ OR ADOLESCENT\$ OR ADOLESCENCE).TI,AB.
4. 1 OR 2 OR 3
5. HEALTH-PROMOTION.MJ.
6. PREVENTIVE-HEALTH-SERVICES.MJ.
7. PRIMARY-PREVENTION.MJ.
8. HEALTHY-PEOPLE-PROGRAMS.MJ. OR HEALTH-EDUCATION.MJ. OR HEALTH-EDUCATION-DENTAL.MJ. OR PATIENT-EDUCATION.MJ. OR HEALTHY-PEOPLE-PROGRAMS.MJ. OR SCHOOL-HEALTHSERVICES.MJ. OR SCHOOL-DENTISTRY.MJ. OR SCHOOLNURSING.

MJ.

9. PUBLIC-HEALTH.MJ. OR PUBLIC-HEALTH-DENTISTRY.MJ. OR ENVIRONMENT-AND-PUBLIC-HEALTH#.MJ. OR PUBLIC-HEALTHNURSING.MJ. OR PUBLIC-HEALTH-PRACTICE.MJ. OR SCHOOLS PUBLIC-HEALTH.MJ. OR UNITED-STATES-PUBLIC-HEALTHSERVICE.DE. OR STUDENTS-PUBLIC-HEALTH.MJ.
10. (HEALTH ADJ PROMOTION).TI,AB.
11. (PUBLIC ADJ HEALTH).TI,AB.
12. 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11
13. (INEQUALITY OR INEQUALITIES OR EQUALITY OR DISPARITY OR DISPARITIES OR INEQUITY OR INEQUITIES OR EQUITY OR GAP OR GAPS OR GRADIENT OR GRADIENTS OR UNEQUAL).TI,AB.
14. (VARIATION\$ OR DISADVANTAGE\$).TI,AB.
15. 13 OR 14
16. 4 AND 12 AND 15
17. 16 AND LG=EN
18. 17 AND HUMAN=YES

PsycINFO

1806 to date

1. CHILD-ATTITUDES.MJ. OR CHILD-CARE.MJ. OR CHILDPSYCHIATRY.MJ.
2. ADOLESCENT-ATTITUDES.MJ. OR ADOLESCENT-PSYCHIATRY.MJ.
3. (CHILD OR CHILDREN OR YOUTH OR YOUNGSTER\$ OR YOUNG ADJ PEOPLE OR TEENAGE\$ OR ADOLESCENT\$ OR ADOLESCENCE).TI,AB.
4. 1 OR 2 OR 3
5. HEALTH-PROMOTION.MJ.
6. HEALTH-EDUCATION.MJ.
7. PUBLIC-HEALTH.MJ. OR PUBLIC-HEALTH-SERVICE-NURSES.DE. OR PUBLIC-HEALTH-SERVICES.MJ.
- 21
8. PREVENTION.W..MJ. OR PRIMARY-MENTAL-HEALTHPREVENTION.MJ.
9. (HEALTH ADJ PROMOTION OR PUBLIC ADJ HEALTH).TI,AB.
10. 5 OR 6 OR 7 OR 8 OR 9
11. EQUITY-SOCIAL.MJ.
12. (INEQUALITY OR INEQUALITIES OR EQUALITY OR INEQUITY OR INEQUITIES OR EQUITY OR GAP OR GAPS OR GRADIENT OR GRADIENTS OR UNEQUAL OR DISPARITY OR DISPARITIES OR DISADVANTAGE\$ OR VARIATION\$).TI,AB.
13. (INEQUALITY OR INEQUALITIES OR EQUALITY OR INEQUITY OR

INEQUITIES OR EQUITY OR GAP OR GAPS OR GRADIENT OR GRADIENTS OR UNEQUAL OR DISPARITY OR DISPARITIES).TI,AB.

14. (DISADVANTAGE\$ OR VARIATION\$).TI,AB.

15. DISADVANTAGE\$.TI,AB.

16. (DISADVANTAGE\$ OR VARIATION\$).TI.

17. 11 OR 13 OR 16

18. 4 AND 10 AND 17

19. 18 AND LG=EN

Appendix 2: Coding scheme

A.1 Which of the following categories most usefully describes the sample?

Tick more than one where appropriate.

A.1.1 Place of residence – please specify.

A.1.2 Race/ethnicity

A.1.3 Occupation

A.1.4 Gender

A.1.5 Religion

A.1.6 Education

A.1.7 Socio-economic status (SES)

A.1.8 Social capital

A.1.9 Teenage parent(s)/pregnancy

A.1.10 Disability

A.1.11 Sexual orientation

A.1.12 General population

A.1.13 Having a condition which is epidemiologically associated with other PROGRESS factors (e.g. obesity – associated with low SES, HIV – sexual orientation)

A.1.14 Other

A.1.15 Unclear

A.2 Are data provided on 'vulnerable' or 'at risk' children or young people?

These terms are taken to include:

children of refugees, asylum seekers, or travellers; looked-after children; children and YP on 'at risk' registers; children excluded from school; young carers etc.

A.2.1 Yes (please add details)

A.2.2 No

A.2.3 Unclear

A.3 In what way(s) do the comparison groups differ?

A.3.1 Place of residence

A.3.2 Race/ethnicity

A.3.3 Occupation

- A.3.4 Gender
- A.3.5 Religion
- A.3.6 Education
- A.3.7 Socio-economic status (SES)
- A.3.8 Social capital
- A.3.9 Teenage parent(s)/pregnancy
- A.3.10 Disability
- A.3.11 Sexual orientation
- A.3.12 Health status epidemiologically linked to PROGRESS factors (e.g. obesity, HIV) – please specify.
- A.3.13 Other (please specify)
- A.3.14 Unclear

A.4 Does the study include an analysis of the views and experiences of children and young people, their parents/carers, or others?

- A.4.1 Yes (describe)
- A.4.2 No
- A.4.3 Other (describe)
- A.4.4 Unclear

A.5 Is the study relevant to a 'gaps' or 'gradients' analysis?

Gaps – compares two groups

Gradients – compares three or more

- A.5.1 Gaps
- A.5.2 Gradients
- A.5.3 Other (details)
- A.5.4 Unclear

A.6 What is measured in the study?

- A.6.1 Physical health outcomes (e.g. BMI, absence or presence of disease/ condition) – please specify.
- A.6.2 Emotional and mental health outcomes (e.g. self esteem, depression) – please specify
- A.6.3 Health knowledge, beliefs or intentions – please specify.
- A.6.4 Health-related behaviours (e.g. smoking, physical activity) – please specify
- A.6.5 Other social or educational outcomes/ behaviours (e.g. school attendance, presence within criminal justice system) – please specify.
- A.6.6 Service use – please specify
- A.6.6 Service provision – please specify
- A.6.6 Other (describe)

A.7 Reviewers additional comments

A.7.1 Yes (add details)

A.7.2 No

Appendix 3: Single measures of socio-economic status

Table A3.1: Single measures of SES used in the studies (N=31)

Education (N=14)
<ul style="list-style-type: none"> • Father's education – two studies (Moreau-Gruet et al. 1996, Winkleby et al. 2004) • Parental education – less than high school/ completion of high school/ some additional training/college graduation (Kaestle et al. 2005) • Education level – less than 10 years/more than 10 years (Lifson et al.1999) • Level of education (Wiwanitkit 2003) • Parental education – high school graduate/college education/college graduate (Graham et al. 1997) • Father and mother's education – no high school/high school/college/not sure (Santelli et al. 2004) • Educational level of parents was classified into three levels – low education (0-9 years)/medium education (10-12 years)/high education (13 or more years). The adolescents were then classified into low, medium or high according to the parent with the higher education level (Larsson et al. 1997) • Teenage mother's education – elementary school/middle school/high school/high school graduate/college (Taylor et al. 1999) • School status at age 18 (Lindberg et al. 2000) • State/private education (Vega Alonso et al. 2005) • Type of school – public/private (Moreno et al. 2001) • Grammar school versus comprehensive (Dämon et al. 2005) • Number of years in education (Phares et al. 2004)
Occupation (N=5)
<ul style="list-style-type: none"> • Social class based on the occupation of the higher status parent – three studies (Borup 1998, Borup and Holstein 2004, Vilhjalmsson and Kristjansdottir 2003) • Occupational class as indicated by Statistics Sweden in the census of 1990 – high level salaried employee/intermediate level salaried employee/low level salaried employee/skilled worker/unskilled worker (LaFlamme et al. 2004) • Father's occupation or mother's occupation if father was absent (Vuille and Schenkel 2001)

Income (N=3)
<ul style="list-style-type: none"> • Household income – <\$15,000 versus >\$15,000 (LMDNIRC 2004) • Family financial situation (Butters 2005) • Income is measured as per capita income in order to control for the effect of household size (Yip and Berman 2001)
Free/reduced-cost school lunch (N=3)
<ul style="list-style-type: none"> • Free or reduced-cost lunch programme – used as a proxy for family income (Furr-Holden et al. 2004) • As subjects were unable to recall their parent's education and income levels, socio-economic status was based on their school's percentage of students enrolled in the free or reduced-cost lunch programme (Adams et al. 2000) • Schools with a high proportion of free or reduced-cost lunch members (Middleman 2004)
Poverty (N=2)
<ul style="list-style-type: none"> • High poverty neighbourhood versus other, based on federal poverty level (Howell et al. 2005) • Poverty classified as total family income in the lowest 10% (Spence et al. 2002)
Health insurance (N=2)
<ul style="list-style-type: none"> • Medicaid status (Beck et al. 2002, Stevens-Simon et al. 1997)
Housing (N=1)
<ul style="list-style-type: none"> • Persons per room (Shakib et al. 2003)
Disadvantage (N=1)
<ul style="list-style-type: none"> • Participants from economically disadvantaged, medically underserved school district (Walter et al. 1996)

Appendix 4: Components of multiple measures of socio-economic status

Table A4.1: Multiple measures of SES used in the studies (n=50; all used more than one)

Education (N =30)
<ul style="list-style-type: none"> • Both parents' age at leaving school (Case 2005) • Parental education beyond secondary level (Shucksmith et al. 1997) • Families headed by an adult with less than high school education (Faelker et al. 2000) • Both parents' education – basic/intermediate/higher (Friestad and Klepp 2006) • Educational attainment of 'responsible' family member (Lee and Cubbin 2002) • Highest level of study completed (Leveque et al. 2004) • Proportion of population in neighbourhood over 20 years old without post-secondary education (Oliver and Hayes 2005) • Maternal education level – primary/secondary/tertiary (Thomson et al. 1996) • Education level – completed education/less than high school education/completed high school/no post-secondary education/some post-secondary education/enrolled in school at baseline (Morris and Michalopoulos 2000) • Level of education – less than high school/high school graduate/beyond high school (Beltran et al. 2005) • Parental education – no high school/some college/college/professional degree (Duncan and Rees 2005) • Parental education – less than high school/high school/more than high school but less than college/college graduate/professional degree (Goodman et al. 2003) • Parental education (mother and father) – number of years in education (Nath 2004) • Education level – lower than secondary/secondary/university or college degree/other post secondary (Irvine et al. 2002) • Level of education – no further detail (Wood et al. 2005) • Parental education (mother and father) – less than high school/completed high school/some post-secondary/university or more (O'Loughlin et al. 1999) • Highest level attained by parent or guardian living with the child (Probst et al. 2005) • Parental educational attainment – less than high school/high school graduate/some college/college graduate (Santelli et al. 2004) • Parental education – less than high school/high school graduate/some college/college or more (Sarmiento et al. 2004) • Mother's educational background (Sellstrom et al. 2003) • Father's educational level – mean years of formal schooling (Shani et al. 2003) • Parental education – less than high school/high school/equal to or greater than some college (Shi and Stevens 2005)

<ul style="list-style-type: none"> • Parental education – graduate school/college graduate/some college/high school (Cokkinides et al. 2001) • Mother's educational level (Rickert et al. 1997) • Any parental college education (Garland et al. 2005) • Education – years in middle school/high school/university (Chen et al. 2005) • Education level – under high school/high school and above (Simbayi et al. 2004) • Parental education, no further detail – three studies (Neumark-Sztainer et al. 2002, Reading and Allen 1997, Szilagyi et al. 2003)
<p>Income (N=24)</p> <ul style="list-style-type: none"> • Weekly family income at 16 (Case 2005) • 'Insufficient income', which refers to the proportion of the population receiving a per capita household income lower than half the Brazilian minimum wage (Antunes et al. 2004) • Household income, taking into account number of family members (Haines et al. 2002) • Parental reports of overall 1994 household income were categorised into quintiles according to 1994 US Census data for household incomes (Goodman et al. 2003) • Income – low/middle/high (Irvine et al. 2002) • Mean family income measured at the neighbourhood level and then percentage considered to be poor (Lee and Cubbin 2002) • Median household income (Wood et al. 2005) • Perceived family wealth (Morgan et al. 2006) • Income measured at the family and neighbourhood level, using median family income (Oliver and Hayes 2005) • Low income – ≤60 per cent of the average (median) household income in that year (Palmer et al. 2005) • Mean income at a neighbourhood level (Schneiders et al. 2003) • Income greater than \$30,000 (Thomson et al. 1996) • Household income – above poverty level/not above poverty level, based on household size and the 1994 federal poverty threshold (Sarmiento et al. 2004) • Income sufficiency – insufficient/sufficient/high (O'Loughlin et al. 1999) • NHIS indicator for household income – above or below \$20,000 (Probst et al. 2005) • NHIS indicator for household income – less than \$20,000 per year/\$20,000 to \$34,999/\$35,000 to \$49,999/\$50,000 or more (Santelli et al. 2001) • Estimated county median household income level, using the 1990 Census of Population and Housing by the US Bureau of the Census (Slade 2003) • Family income by quartile (Garland et al. 2005) • Family income (Vicary et al. 2004) • Income, no further detail – five studies (Cokkinides et al. 2001, Leveque et al. 2004, Perez Contreras et al. 2004, Richards et al. 2004, Szilagyi et al. 2003)
<p>Occupational status (N=14)</p> <ul style="list-style-type: none"> • Social class based on occupation of head of household – six studies (Cooper et al. 1998, Haines et al. 2002, Harding et al. 1999, Morgan et al. 2006, Palmer et al. 2005, Shucksmith et al. 1997) • Mother's or father's occupation based on parental report, and collapsed

<p>into four categories (Friestad and Klepp 2006)</p> <ul style="list-style-type: none"> • Social class calculated on basis of father's occupation (Lamont et al. 1998) • Calculated at neighbourhood level as proportion of blue collar workers (Lee and Cubbin 2002) • Based on ISCO-88 classification 11 using most qualified individual's occupation (Leveque et al. 2004) • Highest occupation for any member of household (Schneiders et al. 2003) • Father's occupational status – unemployed /blue-collar/white collar (Shani et al. 2003) • Based upon the respondent's description of (a) mothers' and fathers' occupation and (b) what do your mother/father do at work? (Valle et al. 2005) • No further detail provided (Szilagyi et al. 2003)
<p>Poverty (N=10)</p> <ul style="list-style-type: none"> • Percentage of neighbourhood families living in poverty (Irwin 2004) • Neighbourhood-level poverty based on housing tenure and family financial resources (Jewell et al. 2000) • Individual level, income-to-need ratio, at neighbourhood level, percentage of families in poverty (Lee and Cubbin 2002) • Percentage of individuals from families living below the poverty line (Faelker et al. 2000) • Poverty and family composition – population living below 100% poverty/children under 18 living in poverty/families headed by single mothers/families headed by single mothers in poverty (Andrulis 2005) • Estimated county poverty rates using the 1990 Census of Population and Housing by the US Bureau of the Census (Slade 2003) • Poverty status measured by the ratio of family income to the federal poverty level (Beltran et al. 2005) • Family's federal poverty level status (USA) – three studies (Shi and Stevens 2005, Stevens et al. 2006, Witt et al. 2003)
<p>Housing (N=10)</p> <ul style="list-style-type: none"> • Housing tenure – two studies (Harding et al. 1999, Jewell et al. 2000) • Average dwelling value (Faelker et al. 2000) • Household composition, house type, tenure and persons per room (Lamont et al. 1998) • Neighbourhood-level, percentage of home owners and percentage of multi-unit housing (Lee and Cubbin 2002) • Housing characteristics (type of floor, presence of running water and drainage) (Perez Contreras et al. 2004) • Type of house (hut vs other) and degree of overcrowding (no detail provided) (Schatz and Dzvimbo 2001) • Mean age of residential buildings (Schneiders et al. 2003) • Type of housing – concrete/shed/hut/tent (Shani et al. 2003) • Living in rented apartment (Berg-Kelly et al. 1997)
<p>Employment status (N=8)</p> <ul style="list-style-type: none"> • Based on proportion of people unemployed at neighbourhood level (Oliver and Hayes 2005) • Numbers employed/unemployed (Simbayi et al. 2004) • Proportion of families headed by unemployed person (Reading and Allen 1997) • Employment status of parent (Neumark-Sztainer et al. 2002)

<ul style="list-style-type: none"> • Father employed – yes/no; mother employed – yes/no (O’Loughlin et al. 1999) • Mother/father in full-time employment; employment at neighbourhood level (Berg-Kelly et al. 1997) • Employment status of participants (Chen et al. 2005) • Unclear (Richards et al. 2004)
Receipt of/eligibility for benefits (N=6)
<ul style="list-style-type: none"> • Receipt of family credit or income support by the household (Cooper et al. 1998) • Family receipt of state benefits (Haines et al. 2002) • Percentage adults (>20 years) receiving welfare (Schneiders et al. 2003) • Family eligibility for public assistance (Neumark-Sztainer et al. 2002) • In receipt of welfare (Duncan and Rees 2005) • Those who received social allowance and those who did not (Sellstrom et al. 2003)
Free or reduced-cost lunch programme (N=4)
<ul style="list-style-type: none"> • Individual free school meal entitlement – three studies (Morgan et al. 2006, Neumark-Sztainer et al. 2002, Rickert et al. 1997) • Minimum of one-third of student body eligible for free or reduced-cost lunch programme (Vicary et al. 2004)
Food security (N=2)
<ul style="list-style-type: none"> • Household food security – always in deficit/sometimes in deficit/balance/surplus (Nath et al. 2004) • Household situation: not enough money for basic things/have food and clothes, short on many other things/most of important things apart from luxury goods/some money for extra things (Simbayi et al. 2004)
Educational aspirations (N=2)
<ul style="list-style-type: none"> • What do you think you will be doing after secondary school? (Friestad and Klepp 2006) • Future aspirations educationally (Valle et al. 2005)
Social mobility (N=2)
<ul style="list-style-type: none"> • Percentage of families living in a different location in 1985 (Irwin 2004) • Percentage of residents moving out of the neighbourhood in a one year period (Schneiders et al. 2003)
Health insurance (N=2)
<ul style="list-style-type: none"> • Insurance status (Stevens et al. 2006, Witt et al. 2003)
Illiteracy (N=1)
<ul style="list-style-type: none"> • Number of illiterate participants over 14 years of age (Antunes et al. 2004)
Deprivation (N=1)
<ul style="list-style-type: none"> • At neighbourhood level based on postcode and linked to small area statistics for 1981 Census (Shucksmith et al. 1997)
Access to car (N=1)
<ul style="list-style-type: none"> • Access to car (Harding et al. 1999)
School fee status (N=1)
<ul style="list-style-type: none"> • School type – high versus low fees (Schatz and Dzvimbo 2001)

First produced in 2008 by:

Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre)
Social Science Research Unit
Institute of Education, University of London
18 Woburn Square
London WC1H 0NR

Tel: +44 (0)20 7612 6367

<http://eppi.ioe.ac.uk/>

<http://www.ioe.ac.uk/ssru/>

ISBN: 978-0-9554810-3-1

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telephone: +44 (0)20 7947 9556 email: info@ioe.ac.uk