A synthesis of research addressing children's, young people's and parents' views of walking and cycling for transport

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CONFLICTS OF INTEREST

None

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CONTRIBUTIONS

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LIST OF ABBREVIATIONS

DfES	Department for Education and Skills
DfT	Department for Transport
NICE	National Institute for Clinical Excellence
NSSD	Non-statistically significant difference
RCT	Randomised controlled trial
SES	Socio-economic status
SNR	Significance not reported
Sustrans	Sustainable transport charity
UK	United Kingdom

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EXECUTIVE SUMMARY

This report presents the findings from a systematic review of the research evidence relating to the public's views of walking and cycling, in particular the views of children, young people and parents. The need for such a review was recognised in light of an effectiveness review of interventions promoting a shift away from car travel towards more active modes of transport, the 'modal shift' review (Ogilvie *et* al., 2004). This found equivocal evidence of effectiveness for population-level interventions that promote walking and cycling as alternatives to car use. Where effectiveness findings are unclear, if they are synthesised with a review of studies addressing how people offered the interventions view them, their aims and circumstances, they can offer an explanation and possible ways forward (Oliver *et al.*, 2004). Synthesising views studies and effectiveness studies together can lead to more specific recommendations for developing interventions, choosing which to evaluate rigorously, as well as which to implement as policy.

To maximise the utility of the findings, an Advisory Group of stakeholders was convened to guide the focus of this review of views studies. Findings from these were then used to interrogate the reviewed effectiveness data in order to suggest why and how interventions work, or not.

The review of views studies concludes that children's, young people's and parents' views about what helps and hinders their walking and cycling involves the strong culture of car use, the fear and dislike of local environments, children as responsible transport users, and parental responsibility for their children. 'Cultures of transport' vary by age, sex and location (urban, suburban or rural). Developing effective and appropriate interventions calls for further examination of these differences.

Synthesising these findings with the 'modal shift' review's effectiveness findings identified some interventions that are appropriate and effective; and some that may be promising either because they appear effective in some studies, but not others, or because they complement people's views, but have not been rigorously evaluated for their effects. Effective interventions to be adapted for wider use include social marketing, with and without the development of cycle networks. *Choosing Health* (Department of Health, 2004b) sets out the importance of using a social marketing approach to encourage positive health behaviour. These interventions may show more benefit if implemented together. Interventions which may be effective include traffic calming and raised crossing places but these require further evaluation.

Studies of people's views have several implications for intervention. The most important is the need to reduce the convenience of car travel and *simultaneously* increase the safety of pedestrians and cyclists in residential areas and around schools. According to the research evidence, this would encourage children, young people and parents to walk and cycle, and to use public spaces more, which would strengthen overall community environments. Furthermore, this could lead to more opportunities to nurture children's and young people's independence in a safer environment.

Other barriers on which to focus intervention development are preferences for cars and the cultural attitudes which make car ownership a status issue; the promotion of walking and cycling as 'cool'; parental concerns about children's safety from both accidents and personal attack; and the factors which influence transport choice within families, particularly expectations about parenting.

Background

There is currently widespread policy concern about the decreasing rates of physical activity and the increasing incidence of obesity and chronic disease in the UK. The promotion of walking and cycling as a part of everyday activity is a promising way in which to increase physical activity across wide sectors of the population. Walking and cycling provides the opportunity to build physical activity into daily lives. This could contribute to meeting the Chief Medical Officer's recommendations for children to partake in at least 60 minutes of moderate physical activity each day (Department of Health, 2004b). In addition, these public health goals are consistent with cross-sectoral interest in the wider social and environmental benefits of a shift away from car travel to non-motorised forms of transport.

Research questions

This review seeks to answer two questions:

What research has been undertaken about the public's views of walking and cycling as modes of transport?

How do children's, young people's and parents' views of the barriers to, and facilitators of, walking and cycling match interventions evaluated for their effects on walking and cycling?

The review was conducted in three parts. First, we searched for and mapped the existing research literature on the general public's views of walking and cycling. Second, we conducted an in-depth review of a subset of this literature, the scope of which was selected by our Advisory Group, focusing on the views of children, young people and parents. Third, we synthesised the findings relating to these 'views studies' together with the research on interventions carried out by Ogilvie *et al.* (2004). The overall conclusions of the review are thus based both on international evaluations of specific interventions, and from findings of recent 'qualitative' research conducted in the United Kingdom (UK) examining the views and experiences of children, young people and parents.

Mapping the research

We found 97 studies of the public's views which were included in the first (mapping) stage of the review. This research used a variety of different methods, ranging from closed questions in surveys to more in-depth qualitative research using interviews or focus groups. The research was conducted in locations across

the UK, although more studies focused on urban than on rural populations. More studies were about cycling than walking, and about one-third concerned choice about mode of transport in general. Some studies concentrated on specific types of journey: one- third concerned commuting and slightly fewer focused on the school run.

As with all systematic reviews, although comprehensive methods were used to search for studies, it is possible that some relevant research has been missed. We invite readers to contact us if they know of relevant published or unpublished studies that have not been included in the review.

The research in-depth

Of the 97 studies identified in the map, 34 examined children's, young people's or parents' views. Of those, 18 were excluded on quality grounds, leaving a total of 16 studies. The remaining studies used a number of different methodologies. More of these studies concerned walking than cycling. The populations represented a fairly even spread of age ranges, from very young children to young adults and parents. Most collected data in schools.

Analysis of this research revealed four recurrent themes drawn from the views of children, young people and parents: a culture of car use; fear and dislike of local environments; children as responsible transport users; and parental responsibility and behaviour.

Views reflected a culture of car use which reinforced perceptions of the benefits of travel by car and discouraged the use of alternative modes. In addition, both children and parents expressed fear and dislike of local environments, including concerns about safety, traffic, and inadequate facilities for cyclists and pedestrians. However, children had their own views about transport and perceived themselves to be responsible transport users in their own right. Finally, parents' perceptions of their own roles and responsibilities, and children's views of these, influenced transport choice at the level of the family. All these themes differed in importance and content according to factors such as children's age, sex, and location.

When examining the systematic review of intervention effectiveness to see whether interventions appeared to address these views, it became apparent that some effective interventions have targeted the second of these themes – the public's fear and dislike of their local environments. Social marketing strategies, which provided tailored information about the benefits of walking and cycling, are interventions which are both appropriate and effective. Social marketing strategies provided in combination with cycle networks are also effective. Further, it appears necessary to target interventions specific to the ages, sex, location and socio-economic status of participants.

Specific recommendations include the following:

- thoughtful adoption and adaptation of effective social marketing interventions

- encouraging walking and cycling as activities which promote both physical and psychosocial health, to parents as well as to children

- close inspection of cycle networks in Delft and elsewhere in order to identify the active elements of effective design and rigorously evaluate new networks

- close inspection of the impact of traffic calming studies on active transport, in order to identify promising interventions for rigorous evaluation

- rigorous evaluation of traffic restraint and related measures for their effects on walking and cycling.

- marketing of walking and cycling to children as environmentally friendly, within rigorous evaluations

- rigorous evaluations of interventions addressing cycle crime

- rigorous evaluations of interventions that encourage children to discuss with their parents the ways and reasons to reduce car use in favour of more active forms of transport

- designing interventions tailored to the target audience's age, sex, socio-economic status (SES) and location

- consideration of the views of children, young people and parents in order to develop interventions to address concerns about personal safety

- interventions combining improved pedestrian facilities, traffic restraint and publicity campaigns be attempted first within a rigorously evaluated intervention to determine whether they are specifically effective in improving active transport

- marketing walking and cycling as 'cool' to appeal to children, within rigorous evaluations

- close inspection of studies addressing concerns about accidents in order to identify the likely active elements of effective interventions

- careful development and evaluation of interventions to promote children's walking and cycling to parents, by balancing messages about safety and risk to future health through inactivity with those encouraging children's independent mobility

- rigorous evaluations of interventions that promote the idea that being a 'good' parent means demonstrating appropriate walking and cycling behaviour, and allowing children to walk and cycle in order to encourage independence safely, while simultaneously caring for the environment

Interventions to address the culture of car use, the recognition of children as responsible transport users, or parent's responsibilities and their behaviour toward heir children in terms of active transport have been less frequently addressed by interventions. Several interventions which changed the infrastructure (e.g. traffic

calming, cycle lanes, road-user charges) may be appropriate for children, young people and parents, but require further evaluation with these specific groups.

The contribution of this review to policy

The key message from this systematic review is that interventions will not work unless public views about the value, safety, benefits and costs of walking and cycling are taken into account. This information will thus be of interest to parents and children, government policy-makers at the national and local level, schools, and research funding bodies.

Policy-makers need to understand that perceived safety is a key influence on walking and cycling, but that environmental improvements and facilities can encourage a shift away from car culture. The studies examined indicated that influential factors operated not just at an individual level but often at a family, community and environmental level. This indicates that interventions need to be tailored to fit more carefully with people's preferences and priorities, rather than start from technical or professional assumptions about what is best for people.

The in-depth review revealed that any interventions designed to increase walking and cycling need to be carefully matched to age, sex and location. Children and young people value the social aspects of physical activity. Younger children in particular want to walk and cycle, and are not as susceptible as older children to the notion of cars as 'cool'. Interventions aimed at improving environments for younger children would be likely to be most productive but must be combined with messages to parents that encourage walking and cycling as part of 'good parenting' and restrictions to make car use less attractive. The review also raises the question of whether targeting higher socio-economic groups might be a more productive strategy.

It seems that there is little evidence of effectiveness in the population-level intervention studies designed to increase walking and cycling. Since a great deal of resource is spent on interventions, the conclusions of our review inevitably raise questions about whether this money is well spent. Given the emphasis in much of the transport literature on rigorous quantitative methods, it was surprising that a number of the intervention studies did not have control groups or did not use standardised measures to assess changes in behaviour or the effectiveness of environmental or engineering changes. Assumptions are thus still being made that interventions will be valuable in increasing walking and cycling, even if they are not grounded in rigorous research methods and do not incorporate an understanding of people's priorities and choices.

Our work highlights two effective, promising and appropriate interventions: (1) the extension and improvement of cycle networks, and (2) the creation of tailored marketing messages for subsets of children, young people and parents – specifically geared to appeal to different ages, socio-economic classes, sexes and locations. The latter issue is crucial for policy-makers and planners: the review found evidence that cycling and walking schemes did not work, and this is likely to be because either inappropriate messages were given or because the intervention did not gather (and thus address) the expressed needs of the target group. Our review noted that none of the intervention studies had tried to change people's views about car culture or parenting, dealt with concerns about safety or

used positive messages that children have expressed in the views studies about the convenience or social advantages of walking and cycling.

Finally, the review gives some clear pointers about further research that is needed: into the family's influence on walking and cycling, issues of personal safety, convenience and the social value of these means of transport for children. Sub-group analysis is essential to capture views and understand how motivations vary across different age groups and sex, locations and socio-economic class.

1. BACKGROUND

1.1 Walking and cycling in the UK

Physical activity as part of a daily routine has been in decline in the United Kingdom (UK) over the past twenty years, while rates of obesity are at an all-time high (Department of Health, 2004b). Obesity and a lack of physical activity can lead to multiple health problems, including heart disease, diabetes, stroke, cancer and osteoporosis (Department of Health, 2004b). Being more physically active is one way to lower the risk of these potential health problems (Department of Health, 2000; 2005).

Incorporating more active forms or 'modes' of transport, such as walking and cycling, into people's daily routine is one way to boost physical activity. There is considerable interest in encouraging such activity. For example, national organisations such as the civil engineering charity, Sustrans, have been advocating changes to neighbourhoods and communities in order to encourage walking and cycling for many years (Sustrans, 2005). Other national organisations echo this by encouraging walking and cycling within the context of sporting activity and urban design, as a way of developing and maintaining fitness, reducing inequalities and building communities (Sport England, 1999; 2005). While walking and cycling are the most common modes of active transport, there are other forms, such as skateboarding or rollerblading. Modes of transport and people's attitudes and potential for change are likely to vary according to their personal characteristics (age, gender, disability), socio-economic status, the journeys they make (their purpose, length and location), and facilities to support those journeys.

1.2 Policy context

The UK government has shown considerable cross-sectoral interest in the benefits of more active forms of transport. The Department of Health for England (Department of Health, 2004a) presented the evidence on the relationship between physical activity and health. In this report, the Chief Medical Officer recommended a total of at least 60 minutes a day of at least moderate intensity physical activity, each day, for the promotion of general health in children and young people. At least twice a week, this should include activities to improve bone health (e.g. activities that produce high physical stresses on the bones), muscles strength and flexibility. An increase in walking and cycling could contribute to achieving this, and government plans laid out in *Choosing Activity: A Physical Activity Action Plan* (Department of Health, 2005) supported a variety of incentives to promote this. These range from child cycle and pedestrian training schemes to measures for delivering well-targeted and attractive facilities for walking and cycling. In 2003, the Department for Transport (DfT) and Department for Education and Skills (DfES) jointly launched *Travelling to School: An Action Plan* (Department for Education and Skills, 2004), which will help schools promote safe and healthy travel to school. The successive School Transport Bill is designed to enable a number of local authorities to develop innovative school travel schemes. The aim is for all schools in England to have active travel plans by 2010. The DfT unveiled an action plan specifically aimed at persuading people

to choose to walk and cycle more often. It is investing £10 million in a sustainable travel towns (STT) initiative, which will fund town-level 'models' for the promotion of sustainable travel. These will showcase best practice for encouraging walking and cycling, primarily through providing improved infrastructure as well as major programmes of personalised travel planning. Similarly, through the Cycling Demonstration Towns project, Cycling England is funding and working with six local highway authorities to develop an exemplary physical environment for cycling, supported by a comprehensive range of 'soft' measures to encourage more people to cycle. The aim of this work is to deliver a significant change in cycling levels, in towns which start from a low or moderate cycling mode share (Department for Transport, 2004b). At the local level, Primary Care Trusts have been suggested as potential leaders for Local Strategic Partnerships (with sport, transport and leisure providers) to develop and deliver evidence-based regional physical activity plans (Department of Health, 2004b). Similar reports from the Scottish Executive and recent guidelines from the National Institute for Clinical Excellence (NICE) outline a need for cross-sectoral initiatives to encourage people, particularly children and young people, to be more active (Physical Activity Task Force, 2003; Killoran *et al.*, 2006).

Thus there is significant interest across several government departments in obtaining a substantial increase in physical activity levels. However, understanding which strategies work, as well as for whom, why they work and in what context, is necessary to inform policy decisions about increasing walking and cycling.

1.3 Existing systematic reviews

Existing systematic reviews have collated evidence of the effects of encouraging car users to adopt more active forms of transport, and the influences of children and young people's physical activity more generally.

Researchers at the MRC Social and Public Health Sciences Unit in Glasgow undertook a rigorous and relevant review (Ogilvie *et al.*, 2004) which addressed the question: which population-level interventions work to promote a 'modal shift' (i.e. from passive forms of transport (e.g. cars) to active forms, such as walking and cycling)? Population-level interventions were defined as those applied to an identifiable urban population or area, measuring outcomes in a group of people. The review also examined health and adverse effects when such data were available. Overall, they found equivocal evidence of effectiveness for population-level interventions that promote walking and cycling as alternatives to car use. Targeted behaviour change with motivated subgroups appeared to have a positive effect. Some alternative services and financial measures showed promising results. However, Ogilvie *et al.* concluded that there was no evidence that publicity campaigns providing health information to the general public and engineering measures had an effect on encouraging a shift from cars to walking or cycling. Outcomes were most often measured in these studies on the basis of households or adults; few measured outcomes for children. The results of the review were equivocal: while some rigorously conducted primary studies showed positive effects, other less rigorous studies showed no effect or even a potentially negative effect. The review was based only on interventions studies, and did not take account of research on the different strategies for increasing physical activity.

The results from this current and key piece of review literature indicate a need to understand more about why no clear evidence of effectiveness has been found.

Other systematic reviews conducted by the EPPI-Centre have resolved the challenge of limited effective, or even rigorously evaluated, interventions by comparing evidence of effectiveness with a synthesis of the views of the target population. This cross-study type synthesis has led to recommendations for developing and evaluating interventions, as well as for implementing effective interventions. Previous syntheses of views have focused on promoting children's and young people's physical activity more generally (Brunton *et al.*, 2003; Rees *et al.*, 2001).

A previous systematic review conducted by the EPPI-Centre examined the influences on and strategies to promote young people's physical activity (Rees *et al.*, 2001). Authors noted that appropriate facilities are a major influence on young people's physical activity, but no soundly evaluated interventions address this. 'Whole school' approaches involving all members of the school community can promote increased physical activity. School-based peer-led initiatives, especially those in which peers lobby for environmental changes throughout the school, can be beneficial. Young people also called for the provision of community and school facilities for safe bicycling. Further evaluation of these interventions is required, as is exploration of the parental constraints on participation in physical activity.

A systematic review examining the same topic in children found that effective interventions are those which match children's needs, engaging parents in supporting and encouraging their children's physical activity, and providing opportunities for family participation (Brunton *et al.*, 2003). A need for future intervention development exists for strategies that emphasise the aspects of participating in physical activity that children value, such as the opportunity to socialise with their friends; provide free or low-cost transportation; and provide a safer local environment in which children can actively travel and play.

An EPPI-Centre study of children's modes of transport to school described the research activity, but did not rigorously appraise the methods for an in-depth review of the findings (Gough *et al.*, 2001).

These existing systematic reviews left a gap in our knowledge about people's views of walking and cycling as forms of transport. This knowledge was required in order to recommend how interventions should be developed or adapted, considering the disappointing evidence of effective interventions for encouraging car users to adopt more active forms of transport.

1.4 The role of research evidence

1.4.1 Review scope

The high quality systematic review by Ogilvie *et al.* (2004) focused on bringing together the effect sizes from outcome studies evaluating interventions aimed at encouraging people to relinquish car travel for more active forms of transport. However, looking at effectiveness alone is limited. Other study designs, especially studies of people's views, are valuable sources of data to inform public health

interventions. Understanding barriers to, and facilitators of, walking and cycling requires addressing different 'cultures of transport' according to dimensions such as geography (e.g. rural and urban) and inequalities (e.g. socio-economic group). It also raises the question of why people use their cars rather than more active forms of transport. The scope of the review reported here is a systematic review of views studies, synthesised with the findings of the review of effectiveness studies.

1.4.2 Types of studies relevant to the review

'Qualitative' research is often capable of opening up the so-called 'black box' of quantitative trials and epidemiological work on risk factors, to expose why interventions work or do not work. It can particularly help to identify more promising interventions for developing and testing in the future (Bonell, 2003; Strange *et al.*, 2001). Such research can help us to identify and understand the factors people consider to be important influences in their lives (Popay *et al.*, 1998). It includes studies that (i) examine people's attitudes, opinions, beliefs, feelings, understanding or experiences, rather than their health status, their stated behaviour or factual knowledge about, in this instance, walking and cycling; and (ii) privilege people's views by presenting them directly as data that is valuable and interesting in itself, rather than as a route to generating variables to be tested in a predictive or causal model. The research designs employed by views studies range from large-scale surveys to qualitative studies which use in-depth interviews or focus groups. Some studies directly present people's own descriptions and analytical observations of their lives.

1.5 Aims

The objectives of the review described in this report were to assemble the evidence in order to examine the following research areas:

(a) People's views provide explanations for whether promoting walking and/or cycling as modes of transport:

- is broadly acceptable;

- reduces car use;

- increases physical activity (walking or cycling);

- changes behaviour, in a sustainable way;

- improves physical and psychosocial health;

- reduces accidents;

- strengthens communities;

- improves the environment;

- offers other benefits;

- presents some problems.

(b) The views above may be independent of, or influenced by:

- people's age, gender, ethnicity, disability, socio-economic status or family structure or situation;

- whether journeys are long or short; to school, to work or to leisure activities;

- whether journeys are originally made by car or public transport;

- whether journeys are within or between rural or urban areas;

- geographical location around the UK;

- costs;

- convenience, complexity or speed of journeys;

- perceived safety;

- length of time and time of day;

- neighbourhood socio-economic status;

- availability of public transport;

- existing facilities for cars and/or bicycles; and

- other factors.

To ensure relevance to UK policy needs, this review is both UK-specific and time-limited (1995–2005).

We followed a two-stage process: ***a mapping exercise***, followed by ***an in-depth review*** of a subset of studies, chosen according to policy and practice needs. The mapping exercise identifies and describes the research activity that has been undertaken in terms of its substantive (e.g. area of population perspective, country of study) and methodological characteristics (e.g. data-collection methods). The in-depth review assesses the quality of studies and synthesises their findings, then combines those results with the results from the systematic review of interventions conducted by Ogilvie *et al.* (2004) in ***a cross-study type synthesis***. The review was undertaken from May 2005 to May 2006.

This report presents both a map of the relevant research, and a synthesis of a subset of studies. Chapter 1 describes the issues involved in walking and cycling as forms of active transport. Chapter 2 describes the research methods used in the review. Chapter 3 presents the results of the research map. Chapter 4 discusses the results of the in-depth review. Chapter 5 provides details on the cross study synthesis. Chapter 6 discusses the strengths and limitations of the review. Chapter 7 draws conclusions and outlines recommendations for policy, practice and future research.

CHAPTER 2. METHODS

2.1 User involvement

2.1.1 Approach and rationale

For systematic reviews to be relevant to policy and practice, potential users of the review must be involved in key stages of the review process (Oliver, 1997; Peersman *et al.*, 1999). In this review, user involvement was sought through an advisory group, comprising a mixture of policy specialists, practitioners and researchers, representing a number of organisations.

2.1.2 Methods used

The Advisory Group met twice, in early January and early April 2006. The Group's remit was to advise the research team on the scope of the in-depth review and to refine the research question, including the relevant populations and the particular aspect of encouraging walking and cycling which was to be explored. Group members were also asked to help identify potentially relevant research and to comment on draft documents. At the second meeting, Advisory Group members were asked to comment on findings and to help to produce relevant recommendations for policy and practice. Both meetings were chaired by one of the investigators (SO) and run in a manner to encourage everyone's participation, in order that all views could be expressed, discussed openly and recorded to guide the review process.

2.2 Mapping of research activity

2.2.1 Inclusion and exclusion criteria

Inclusion and exclusion criteria for studies to be included in the map were applied to titles and abstracts. Full reports were obtained for those studies that appeared to meet the criteria or where there was insufficient information to be sure.

'Views studies' were included if they:

- were conducted in the UK;

- were published from 1995 to 2005; *and*

- accessed the views of *children, young people or parents* on any of the following: their ideas about, and experiences of, walking and cycling (or other forms of active transport) initiatives; what influences whether they walk or cycle; and their ideas about what could be done to promote walking and cycling.

It was decided only to assess UK-based studies because such studies would allow us to judge the extent to which interventions evaluated in other countries might be transferable to a UK context.

2.2.2 Identification of studies

To locate relevant research, two separate searches were undertaken: the first was to locate systematic reviews on walking and cycling; and the second was to locate primary research on people's views. The results of the first search for reviews formed the development of the search strategy for finding primary studies on people's views.

Reviews of effectiveness were sought from several sources:

- Database of Abstracts of Reviews of Effectiveness (DARE)
  http://www.york.ac.uk/inst/crd/crddatabases.htm#DARE

- Database of Promoting Health Effectiveness Reviews (DoPHER)
  http://eppi.ioe.ac.uk/EPPIWeb/home.aspx?Control=Search&SearchDB=rore&page=/hp/

- Web sites of relevant organisations, including:

  – Department for Transport
    (http://www.dft.gov.uk/stellent/groups/dft_control/documents/homepage/dft_home_page.hcsp)
  – Scottish Executive (http://www.scotland.gov.uk/Home)
  – Transport Research Library
    (http://www.ovid.com/site/catalog/DataBase/157.jsp?top=2&mid=3&bottom=7&subsection=10)
  – Centre for Transport Studies (http://www.cts.ucl.ac.uk)
  – Sustrans (http://www.sustrans.org.uk)

In order to be considered a systematic review, reports had to describe both their search strategy and inclusion criteria. Full reports were retrieved for all systematic reviews as well as for those references where titles and abstracts did not provide enough information to determine if a review was systematic.

Locating primary research on the public's views required a slightly different approach. We wished to locate all the research relevant to this question, regardless of design or quality, as these limits may have compromised the value of evidence synthesis (Ogilvie *et al.*, 2005). A search specifically for qualitative research would exclude potentially useful quantitative surveys. Further, traditional methods of conducting systematic reviews of effectiveness advocate searching a wide variety of sources (Mulrow and Cook, 1998). This includes an emphasis on searching several large biomedical bibliographic databases, such as MEDLINE. But biomedical databases do not index studies of public health or the public's views well, if at all. The yield of relevant studies is less from these sources than from personal contacts, citation searches and key websites (Kavanagh *et al.*, 2002) For this reason, views research was searched for in non-biomedical sources without limits on study design, although we did search one biomedical database (PubMed). The choice of electronic sources was based on a comparison of each database's scope, depth and overlap with other databases.

Full search strategies are reported in Appendix 1. Specific search terms are available from the authors upon request.

2.2.3 Classification of studies

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 type (e.g. survey, process evaluation), the focus of the study (e.g. physical activity, health promotion), and the study population (e.g. sex, age group).

These codes were supplemented with codes which were developed specifically for the topic focus of the review. These covered the broad topic area (walking, cycling, transport mode choice in general), the type of views sought (e.g. attitudes, intentions, experiences), the type of journey under consideration (purpose, geography), the population whose views were sought (e.g. children and young people, parents, residents, commuters), and the methods used in the study.

Finally, the findings of the studies were coded according to the following research questions which were derived from background research and previously published systematic reviews.

(1) Do studies of people's views about walking and cycling, and factors influencing them at the level of the individual, community, or wider society, provide explanations for whether strategies:

- are widely acceptable;

- reduce car use;

- increase physical activity (walking or cycling);

- change behaviour, in a sustainable way;

- improve physical and psychosocial health;

- reduce accidents;

- strengthen communities;

- improve the environment; or

- result in other changes?

(2) Do studies indicate whether the views reported are independent of, or influenced by:

- travellers' age, gender, ethnicity, disability, socio-economic status or family structure/situation;

- whether journeys are long or short; to school to work or to leisure activities;

- whether journeys are originally made by car or public transport;

- whether journeys are within or between rural or urban areas;

- geographical location around the UK;

- costs;

- convenience, complexity or speed of journey;

- perceived safety;

- length of time and time of day;

- neighbourhood socio-economic status;

- availability of public transport;

- existing facilities for cars and/or bicycles; *and*

- other factors.

The final classification system was used to produce a descriptive map of all the different types of view studies found.

Pairs of reviewers applied inclusion and exclusion criteria, and keywording to a subset of views studies included in the mapping stage in order to reach agreement on ratings. Reviewers worked first independently and then compared their decisions. Once agreement was reached, reviewers continued independently to screen remaining studies for inclusion, and two reviewers keyworded all the studies included in the map.

2.3 From mapping to in-depth review

2.3.1 Inclusion and exclusion criteria

In consultation with the Advisory Group, and on the basis of the results of the mapping phase of the review, it was decided that the in-depth review would focus on the views of children, young people and parents. Thus studies were included in the in-depth review if they:

- were conducted in the UK;

- were published between 1995 and 2005; *and*

- accessed the views of *children, young people or parents* on any of the following: their ideas about, and experiences of, walking and cycling (or other forms of active transport); what influences whether they walk or cycle; and their ideas about what could be done to promote walking and cycling.

2.3.2 Identification of studies

For the second, in-depth stage of the review, studies included on the mapping stage of the review were rescreened to identify those studies which presented separate data on children, young people or parents.

Additional searching was undertaken at the in-depth stage: inspection of references, author citations and handsearching. References from a previous EPPI-Centre review on travel modes in children were scanned for potentially relevant studies (Gough *et al.*, 2001). Reference lists of all included studies were searched for potentially relevant studies. Science Citation Index and Social Science Citation Index were searched up until March 2006 for authors of included studies. Key experts were contacted once again for relevant primary studies. Two key journals identified by Advisory Group members as likely to be fruitful but not keyworded well on electronic indices – *Transport Policy* and *Transport Reviews* – were handsearched for the previous five years: from issue 1, 2000, to issue 1, 2006 inclusive. Handsearching journals is an important method to ensure that current citations not yet indexed on electronic databases are located (Harden, 2001). Time and resources determined the range of publication dates selected to hand search (Harden *et al.*, 1999). These additional sources were searched in order to ensure that all possible research was located specific to the in-depth review questions. Searching these sources at the mapping stage would have produced exponentially more references, of which few would have been relevant (that is, not answering the in-depth review questions).

2.4 In-depth review methods for views studies

2.4.1 Assessing the quality of studies and weight of evidence

The criteria used for assessing methodological quality built on those used in earlier EPPI-Centre reviews. After screening all studies according to the in-depth inclusion criteria, studies for in-depth review were assessed according to ten quality criteria. These criteria were informed by those proposed for assessing the quality of 'qualitative' research (Boulton and Fitzpatrick, 1996; Cobb and Hagemaster, 1987; Mays and Pope, 1995; Medical Sociology Group, 1996) and by principles of good practice for conducting social research (Hood *et al.*, 1999).

The ten criteria cover four main quality issues. The first two relate to the quality and reporting of the study's sampling methods. Each study was assessed according to whether:

1. there was an adequate description of the methods used to identify people to sample from, and the sampling frame; and

2. there was an adequate description of the methods used to select the sample from the sampling frame.

A further four criteria related to the quality of the description of the sample used in the study. Each study was assessed according to whether:

3. the total number of participants was specified;

4. the ages covered in the sample were specified;

5. the sex of the individuals in the sample was specified; and

6. the socio-economic status of the individuals in the sample was specified.

A further two criteria related to the sufficiency of *strategies* employed to establish the reliability and validity of data-collection tools, and hence the validity of the findings. Each study was assessed according to whether there had been 'some attempt', a 'good attempt', or 'no attempt' to establish the following:

7. the reliability of data-collection tools; and

8. the validity of data-collection tools.

The final two criteria related to the assessment of the appropriateness of the study methods for ensuring that findings were rooted in people's own perspectives and to the usefulness of the study for the purposes of the review. Reviewers judged studies according to whether these:

9. used appropriate data-collection methods for helping people to express their views; and

10. would contribute towards answering the review question.

These 10 criteria provided a measure of the extent to which we can be confident that a particular study's findings make a valuable contribution to the review. Each study scored 0, 0.5 or 1 point on each criterion; studies with a total of 7 points or more contributed to the findings of the in-depth review.

2.4.2 Data extraction

Two reviewers independently used a standardised tool to extract data from the included studies. In addition to the quality assessment questions described above, more detailed data from studies were extracted on the following:

- aims and rationale of the study

- design

- sampling strategy

- recruitment and consent

- description of the sample

- data collection methods

- data-analysis methods

- methods of the study and their appropriateness for eliciting the views of children, young people and parents

2.4.3 Synthesis of evidence

Our synthesis of evidence began with the reading of background material and team discussions to identify questions to ask of the data in order to undertake a framework analysis of the views studies (Bonell, 1999; Lofland and Lofland, 1995). The background documents raised ideas about particular topics, namely those aspects of health and daily life that might be related to walking and cycling. The topics were developed as research hypotheses and all studies were coded according to which of these hypotheses they addressed. In addition, new topics were developed and incorporated as they emerged from the data.

Topics derived from the map of research activity varied along two main dimensions: *type* of influence and *level* of influence relating to factors promoting or limiting walking and cycling as modes of transport.

Topics were also characterised according to four different levels of influence identified in advance (Dahlgren and Whitehead, 1992; Oliver *et al.*, 2005): individual, family, community and the wider society/environmental level.

Barriers and facilitators with respect to walking or cycling which were identified in each study were then listed, together with the level at which they were operating. Barriers and facilitators were summed across studies to determine which occurred most frequently.

Each barrier and facilitator was examined to explore any differences according to children's versus parent's views; children's age, sex or the socio-economic status of the area; urban, suburban or rural location; and whether the view expressed was about walking or cycling. Specific views were also extracted about each barrier (e.g. what it was participants said about traffic in relation to walking and cycling). Overarching themes were derived from the analysis of these barriers and facilitators across all levels. Implications for interventions were then developed from the themes.

For example, it became clear from reading background documents that one barrier to cycling was the possible theft of bicycles. A number of studies were located which reported views about theft and these were coded using this topic. At the in-depth stage of the review, all studies with specific textual and numeric data about theft were coded as community level influences. Theft was found to be one of the most frequently cited barriers. Data specific to theft were analysed across all studies to determine whether any systematic differences emerged according to children's versus parents' views; walking versus cycling; age, sex, socio-economic status, or location. This analysis of theft as an influence was examined together with other barriers and facilitators to walking and cycling across levels to determine overarching themes (one of which was a fear and dislike of local environments, of which the issue of theft was a part).

2.5 In-depth review methods for cross-study synthesis

2.5.1 Description of method

The findings of our views synthesis and of the synthesis of outcome evaluations in the review by Ogilvie *et al.* (2004) were then compared. Data from outcome evaluations attached to included process evaluations was not integrated into this synthesis due to time constraints. Five questions guided this cross-study synthesis:

- In what ways are the influences on walking and cycling identified in the views synthesis similar to, or different from, those addressed in outcome evaluations?

- Do those interventions which address influences identified in the views synthesis show larger effect sizes than those which are not so matched?

- To what extent do people's views on walking and cycling diverge from their walking and cycling behaviour, and how does this impact on intervention effectiveness?

- Are some interventions more effective than others, and if so, do the more effective interventions incorporate the findings of the views studies?

- Which recommendations for intervention development derived from the views studies have yet to be addressed by interventions evaluated in the outcome studies?

The findings from the views synthesis and outcome evaluations were put into a four-column matrix. An example of this matrix is illustrated below in Table 2.1.

Table 2.1: Example of synthesis matrix

Theme 1: Culture of car use			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004)**
Preference for cars	Influence groups inclined to prefer cars (e.g. older children, those from car owning families)	Study A: Brief description of intervention and effect	Study B: Brief description of intervention and effect

The influences on walking and cycling identified from the views synthesis were listed in the first column of the matrix. Implications for interventions derived from these studies were listed in the second column. They were compared with interventions evaluated by the outcome studies in Ogilvie *et al.*'s systematic review. Rigorously evaluated interventions (i.e. those using a control/comparison group), which addressed the implications derived from the views studies, were

described in the third column. Where no matches with rigorously evaluated interventions were found, matching interventions were sought from a pool of other outcome evaluations of a lower methodological quality (that is, with no control/comparison group) and placed in the fourth column. The matrix is shown in Appendix 8. Combining the findings from the systematic review of interventions with the findings from this systematic review of the public's views allowed us to understand whether and (if so) why the interventions under study were potentially appropriate for children, young people and parents.

2.6 Quality-assurance process

In all stages of the synthesis, pairs of reviewers worked independently to code and analyse the data, and develop themes and implications for interventions. They then met to compare their analyses in order to come to a consensus.

3. RESULTS: MAP

3.1 Identification of studies

Our searches identified a total of 6,674 records. Figure 3.1 describes how these records were sifted to identify those studies relevant to the research questions. After removing 190 duplicate references, 6,484 records were screened on the basis of title and abstract (where abstracts were available). Most of these (N=6,316, 97%) did not meet the inclusion criteria and so were excluded from the map.

The remaining 377 records were then sought, except for 11 records later identified as non-UK dissertations and 12 records (either conference proceedings or private consultancy reports) which were prohibitively expensive.

Of the 354 records remaining, 17 (5%) could not be retrieved in time for inclusion in this report and 22 (6%) could not be located at all. This left a total of 315 retrieved reports (89%), which were screened for inclusion again on the basis of the full report. A further 209 were excluded.

The highest proportion of records were excluded because the main focus of the record was not walking or cycling in the context of active transport (N=5,250, 83.1%). For example, some records described the health benefits of physical activity with walking as only one of a variety of possible activities. A further 877 records (13.9%) were not research about the public's views (e.g. they were editorials or research about health behaviour). Only 181 records (2.9%) were excluded because they were non-UK. Finally, eight records (0.1%) were excluded because they were published in or earlier than 1994.

The remaining 106 reports which described 97 studies were included in the research map. Slightly lower numbers of studies were found because some studies were published in more than one report. Studies were examined for topic focus, journey context, population and main findings. The results are described below. In most of the following analyses, figures add up to more than 100% since more than one concept may apply in any one study.

3.2 Systematic reviews

In addition to the review by Ogilvie *et al.* which prompted this work, we found six other systematic reviews tangentially related to our topic.

Killoran *et al.* (2006) examined all review-level evidence for the effectiveness of interventions to promote safe walking and cycling. Several systematic reviews of both observational studies and interventions were identified. None of the reviews of observational studies focused specifically on UK studies, and none of the reviews of interventions measured walking, cycling or modal shift as a specific outcome. The results suggest that characteristics of the urban environment may influence levels of walking and cycling, and that there is substantial evidence for the effectiveness of safety interventions.

An appraisal of reviews undertaken by Morrison and colleagues (2003) examined the effectiveness of ways to improve population health through transport intervention, but did not locate any studies which examined walking and cycling in children, young people and parents. Health promotion campaigns related to safety measures, traffic calming, and specific legislations against drunk driving were found to be effective. A lack of rigorous evidence on the effectiveness of engineering measures and environmental alterations restricted the authors' ability to draw conclusions about these measures.

A systematic review of the health effects of new roads concluded that such interventions decreased injuries on main roads or around towns, and reduced disturbances and community severance in towns, but increased them elsewhere (Egan *et al.*, 2004). Authors recommended that future research needed to measure the effects on physical activity.

Previous EPPI-Centre systematic reviews examining the barriers and facilitators to physical activity in children and young people have noted that, among other influences, they valued the social aspects of physical activity, and had clear ideas about the practical and material resources that are needed in order to be physically active (Brunton *et al.*, 2003; Rees *et al.*, 2001). Children also described the importance of family life and parental support in order to be physical active (Brunton *et al.*, 2003).

3.3 Studies of people's views

3.3.1 Publication date

Fifty-three studies were published in the past five years (2000-2005), compared with 44 in the six previous years (1995-2000). Figure 3.2 illustrates the range of publication dates.

Figure 3.1: Flow of literature through the map

**Searching for views studies:
Databases, websites, stakeholder
contact**

Total reports identified
N = 6,674

Duplicate reports removed
N = 190

Total reports screened on title and abstract
N = 6,484

Reports
excluded on
abstract
N = 6,107

Reports
excluded on
full report
N = 209

Criterion 1
N = 5,250
83.1%

Criterion 2
N = 877
13.9%

Criterion 3
N = 181
2.9%

Criterion 4
N = 8
0.1%
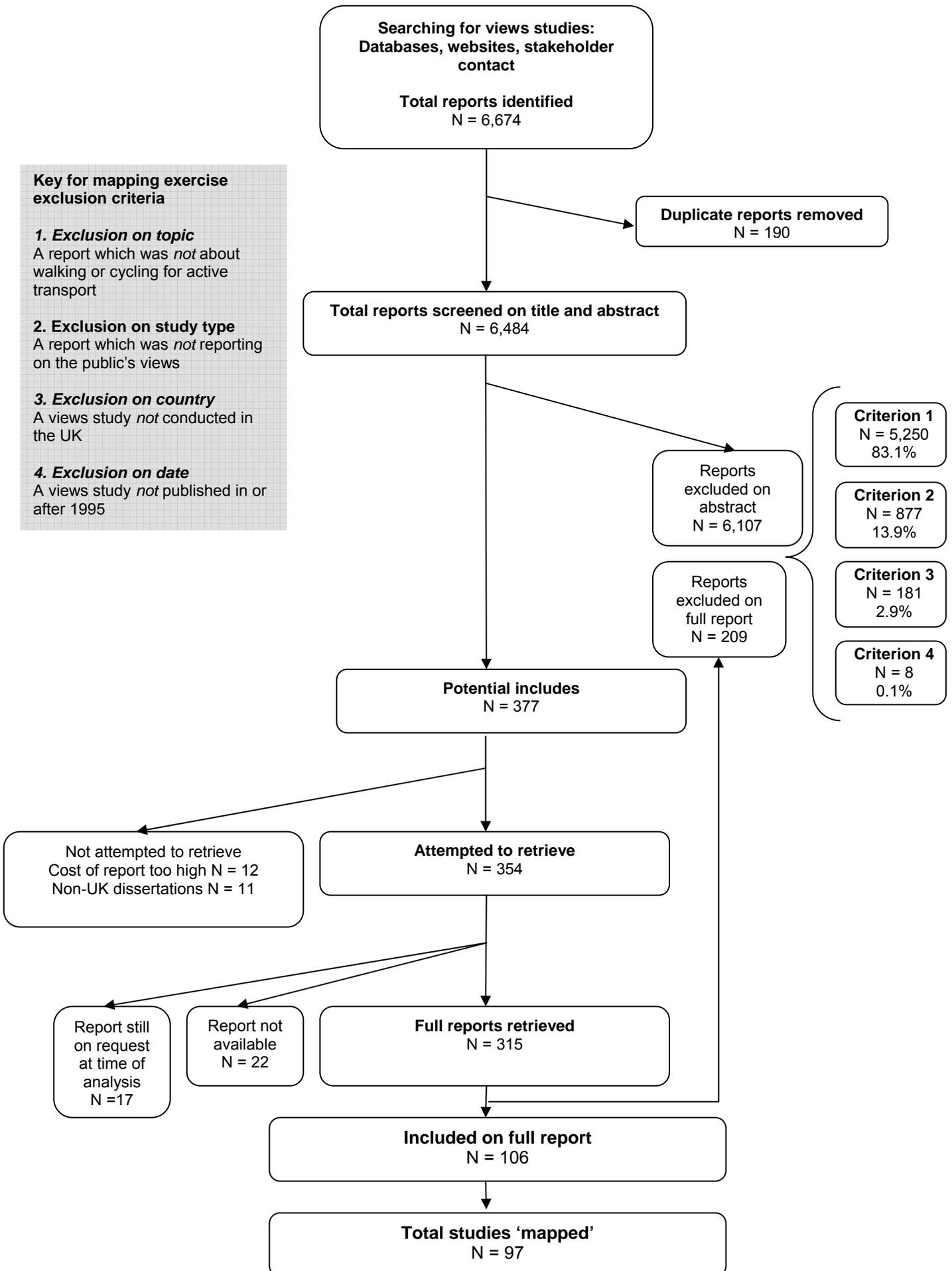
**Key for mapping exercise
exclusion criteria**

1. Exclusion on topic
A report which was *not* about
walking or cycling for active
transport

2. Exclusion on study type
A report which was *not* reporting
on the public's views

3. Exclusion on country
A views study *not* conducted in
the UK

4. Exclusion on date
A views study *not* published in or
after 1995

Potential includes
N = 377

Not attempted to retrieve
Cost of report too high N = 12
Non-UK dissertations N = 11

Attempted to retrieve
N = 354

Report still
on request
at time of
analysis
N =17

Report not
available
N = 22

Full reports retrieved
N = 315

Included on full report
N = 106

Total studies 'mapped'
N = 97

Figure 3.2: Publication date of the views studies (N = 97)
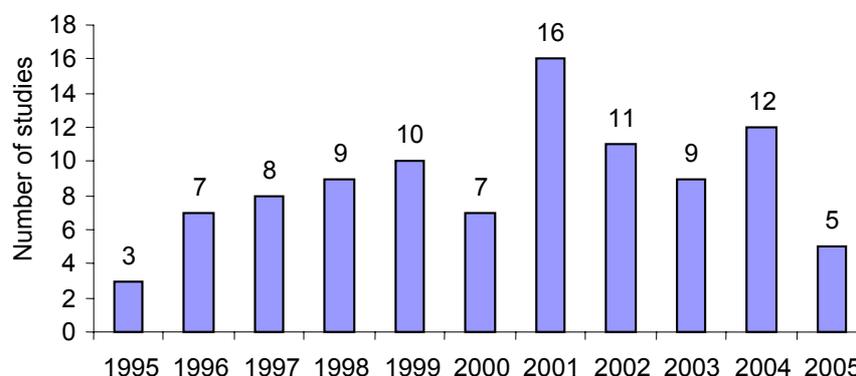
3.3.2 Topic focus

As Figure 3.3 shows, studies most often concerned the public's views on cycling (N=47). Somewhat fewer were about walking (N=32). Most studies examined people's views about their choice of transport mode, of which walking and/or cycling was a part (N=36). Thirteen studies concerned other issues, in addition to walking and cycling, such as traffic calming, road safety, and lifestyle issues.

Figure 3.3: Topic focus of the views studies (N = 97, not mutually exclusive)
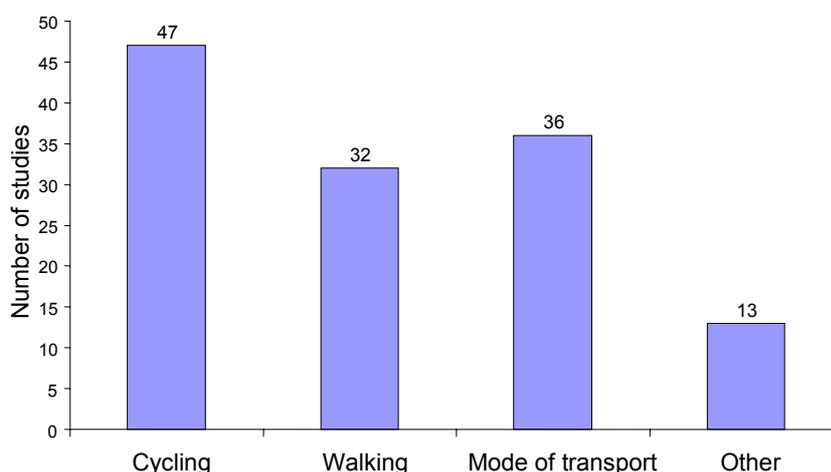
3.3.3 Type of view

Research participants expressed their views in different ways. We categorised seven types of views: attitudes and opinions (e.g. people's beliefs, likes or dislikes about a situation or experience); stated behaviour (i.e. what people say they do);

perceptions (e.g. people's descriptions of a situation or experience); intentions (e.g. what people say they plan on doing in the future, or may do); experiences (specific episodes that people say happen to them); knowledge (i.e. what people say they know about a situation, what information they have), and expectations of their travel experience. Figure 3.4 displays the frequency with which each type of view was studied.

Figure 3.4: Type of view in the views studies (N = 97, not mutually exclusive)
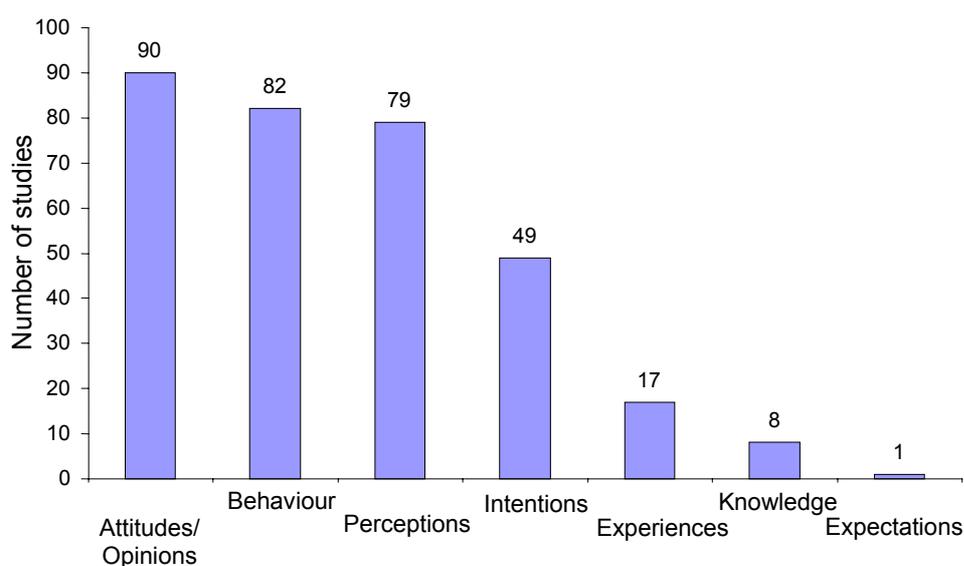
Studies of people's views most often addressed attitudes and opinions (N=90, 93%), followed by stated behaviour (N=82) and perceptions (N=79). They described people's intentions less often (N=49). Experiences and knowledge were covered in much smaller numbers (N=17 and N=8, respectively). One study examined people's expectations of different modes of travel.

3.3.4 Journey purpose

Only 68 of the 97 studies noted the purpose of people's journeys, and these are summarised in Figure 3.5.

Figure 3.5: Journey purpose in the views studies (N = 97, not mutually exclusive)
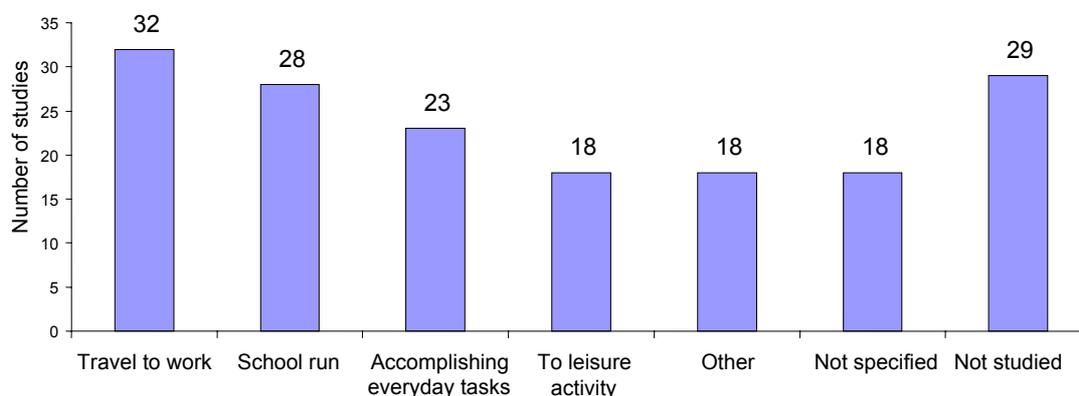
More studies (N=32) examined travelling to work than other purposes for journeying. The school run was described in 28 studies. Nearly as many (N=23) took place in the context of carrying out everyday tasks, such as shopping. Fewer studies (N=18) concerned journeys to leisure activity. Another 18 studies described other journeys such as business trips or visiting friends. Although claiming to examine specific types of journey, a further 18 studies did not clearly describe the journey purpose and were coded as 'not specified'. The remaining 29 did not study journey purpose.

3.3.5 Modal shift

In all, 57 of the 97 included studies examined modal shift from 'passive' forms of transport (e.g. cars) to 'active' forms (e.g. walking and cycling). Of these (shown in Figure 3.6), improvements to walking and cycling were most often studied (N=34).

Figure 3.6: Journey shift in the views studies (N = 97, not mutually exclusive)
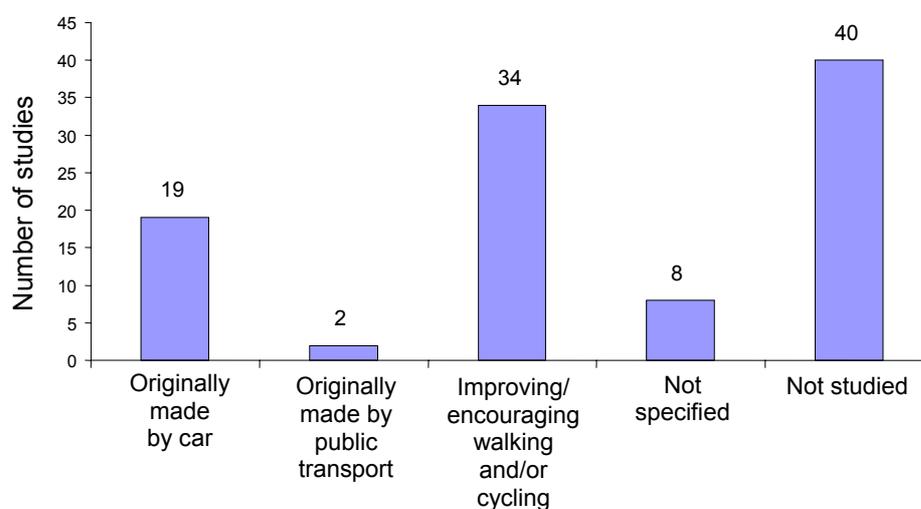
Only 19 studies looked at journeys made originally by car. Two studies elicited views of people making journeys originally by public transport. Another eight views studies did not say what type of shift was under study.

3.3.6 Journey geography

The background research indicated that there may be differences between trips made in urban and rural locations, and studies were coded according to these characteristics. This split is shown in Figure 3.7.

Figure 3.7: Journey geography in the views studies (N = 97, not mutually exclusive)
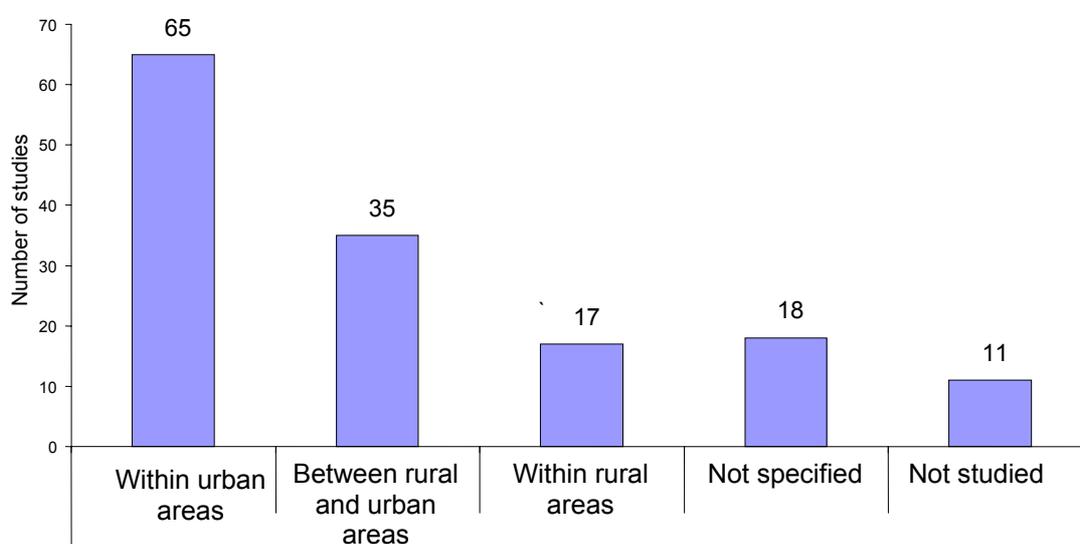
Eleven of the 97 studies did not study journey geography. Of the 86 studies which did, 65 studied walking and cycling in urban situations. Only 17 studied corresponding rural journeys. A further 35 studies addressed journeys between urban and rural locations. Eighteen studies did not clarify whether they studied urban or rural journeys.

3.3.7 Location of research

Only seven studies sampled the public's views UK-wide. Nine studies sampled across Scotland, while two studies looked at views across England, four studied people's views in Wales, and three studied views in Northern Ireland. The remainder of the studies focused on regions within these countries (see Figure 3.8). South East England (excluding London), the Midlands and North West England were most frequently studied (N=27, N=22 and N=21, respectively).

Figure 3.8: Geographical location in the views studies (N = 97, not mutually exclusive)
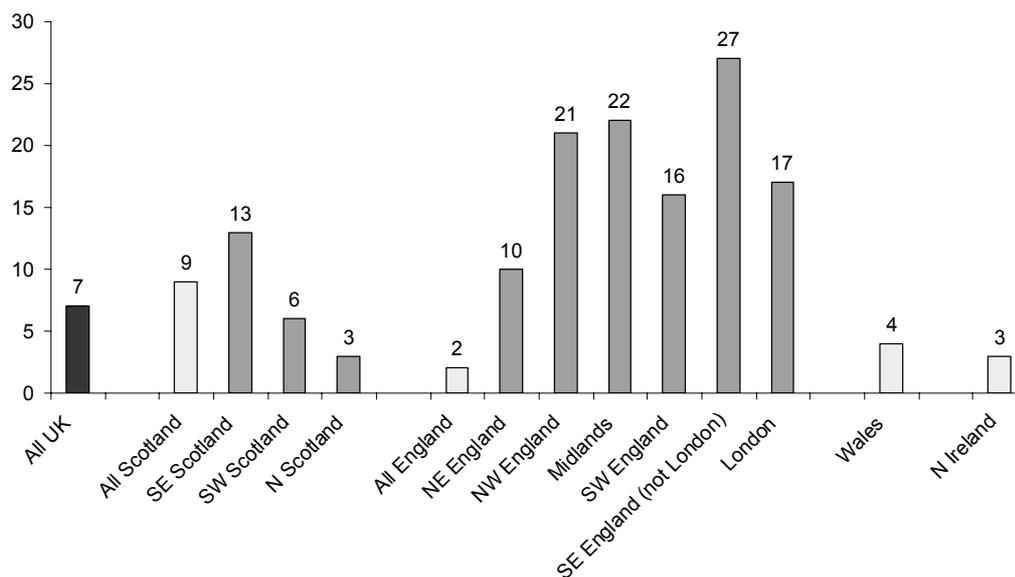
3.3.8 Population

There was considerable variation in whose views were elicited by the different studies, shown in Figure 3.9.

Figure 3.9: Study population of the views studies (N = 97, not mutually exclusive)
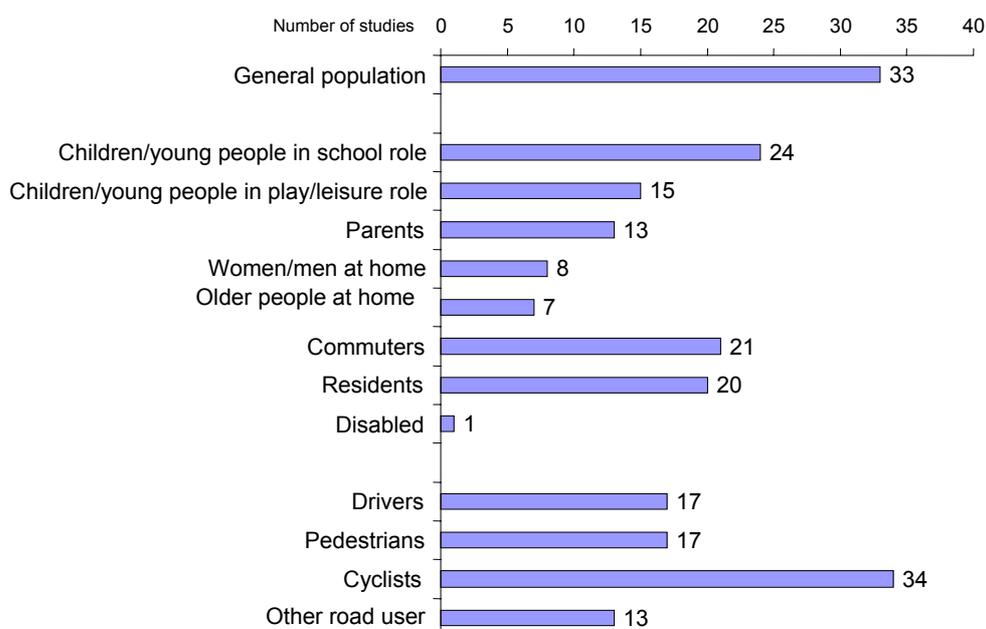
Approximately one-third of the studies accessed the views of the general population (N=33). Families (parents, children and/or young people) were most often the focus of research (34 studies). A total of 24 studies were interested in children or young people in a school role; 15 studies looked at this age group in a leisure role; and parents' views were studied in 13 reports. Commuters' views were described in 21 studies, and 20 studies examined the views of 'local residents'. Fewer studies had a focus on groups at risk of social exclusion. Only eight studies were conducted with women or men at home. A further seven studies dealt with older people, and one with the disabled.

Some studies identified particular types of road user. Cyclists were most often studied (N=34). Pedestrians and drivers were the next most frequently studied road users (17 studies about each). Thirteen studies gathered the views of other road users, such as public transport passengers, car passengers or motorcyclists.

3.3.9 Data-collection methods

Figure 3.10: Data-collection methods of the views studies (N = 97, not mutually exclusive)
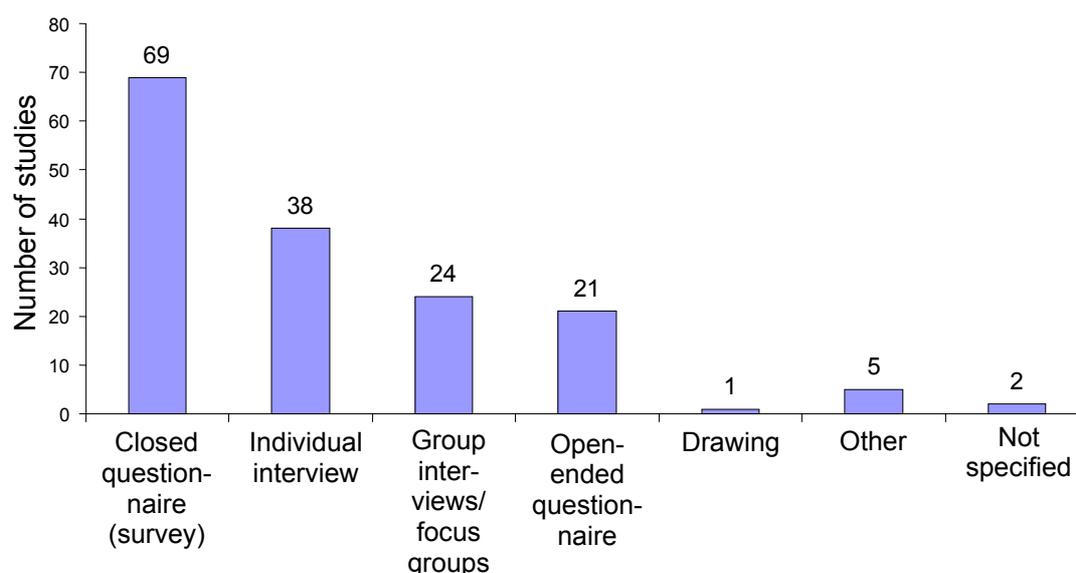
Most studies used questionnaire survey methods with 'closed' questions (N=69) (**Figure 3.10**). Considerably fewer questionnaire surveys used open-ended questions (N=21). Five studies used travel diaries, most likely to record types of journeys, and were coded as 'other'. One study also used drawing as a way of eliciting people's views. Where interviews were used, these were most often individual (N=38), rather than group (N=24) interviews. Two studies did not specify their methods of data collection.

3.3.10 General findings

We identified 23 hypotheses about the expected focus of people's views about walking and cycling (see section 2.2.3). Each study was examined for concepts relevant to these hypotheses. Figure 3.11 shows the number of studies that addressed these concepts.

Figure 3.11: Views studies addressing concepts integral to the review hypotheses (N = 97, not mutually exclusive)
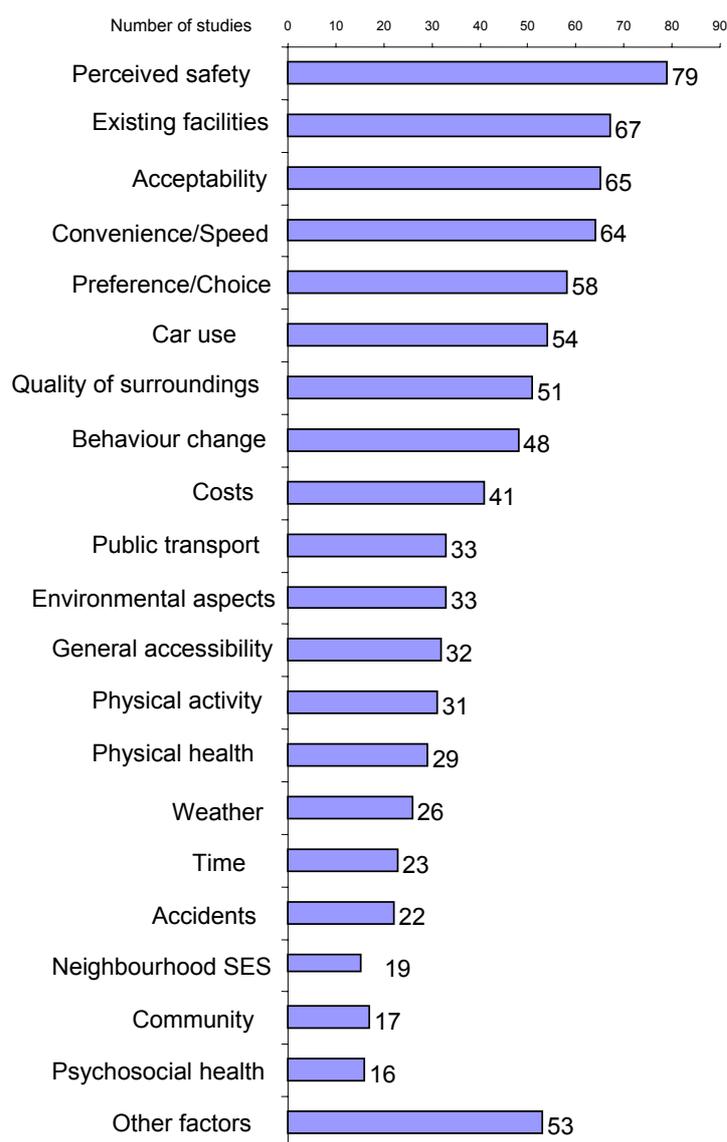
Perceived safety was mentioned in most studies (79 of the 97) as an influence on walking and cycling. Existing facilities (that is, for bicycles, cars or for pedestrians) were mentioned in 67 studies, followed closely by acceptability of walking or

cycling (N=65) and the convenience, complexity or speed of the journey (N=64). Fewer studies elicited views on preference or choice relating to the mode of travel (N=58), car use (N=54), or the quality of people's surroundings (N=51). Fewer than half the studies provided findings about the impact of cost on mode of travel (N=41).

3.3.11 Other findings

Some studies reported views about other issues (Figure 3.12). The most common 'other' issue addressed was traffic (N=13); several studies dealt with enjoyment or fun, comfort, theft and vandalism, and hills (N=5 each). We grouped these other issues according to whether they examined individual, family, community or societal and environmental factors.

Using the same grouping for all the views (Table 3.1), it is clear that most of the research in this area focuses on the individual factors (N=94 studies). Examples are car use and physical health, and enjoyment or fun, comfort, effort, independence/autonomy, and personal responsibility for the environment.

Only three family factors were identified: adult behaviour towards children, walking and cycling as a way to be with family, and cycling with children.

Sixteen different community factors were described: these included views such as peer pressure, encouragement from schools, the impact of walking and cycling on the ability to attract partners, and the difficulty in maintaining social relationships.

Almost as many studies highlighted societal or environmental factors which influenced walking and cycling (N=88). These included factors such as existing facilities for bicycles, cars or pedestrians, and the influence of traffic. Findings about the benefits of walking and cycling routes near people's homes in terms of property prices and increased revenue through tourism also featured.

Figure 3.12: Other issues reported in studies (N = 53, not mutually exclusive)
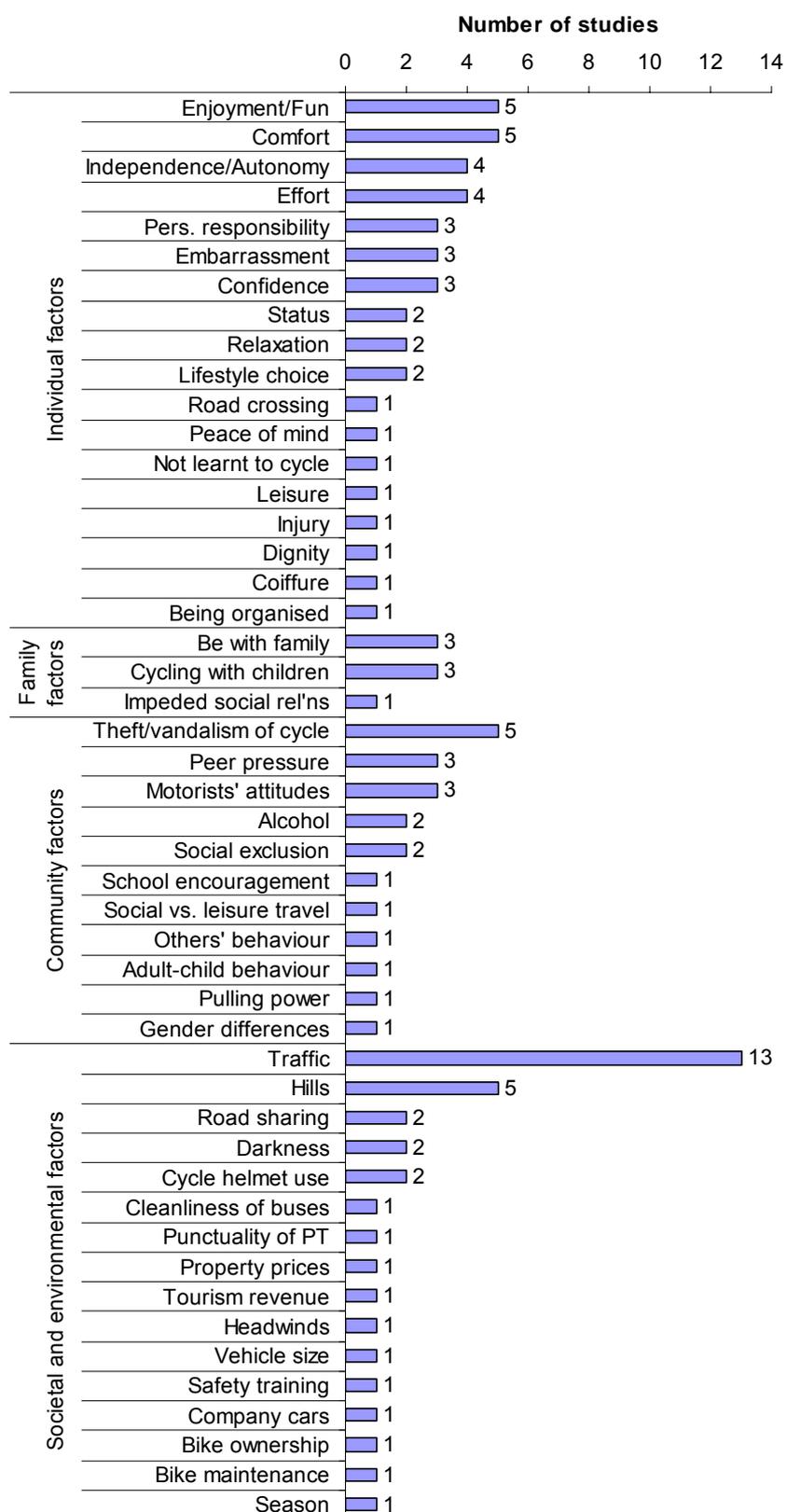
Number of studies

Table 3.1: Views (N=67, number of studies=97) considered at four different levels of influence

Level of influence	Views	
Individual Number of views: 28 Number of studies: 94	Acceptability Preference or choice of mode of travel Car use Behaviour change Physical activity Physical health Psychosocial health Alcohol Enjoyment or fun Comfort Effort Independence or autonomy Confidence issues Embarrassment	Lifestyle choice Relaxation Status (financial or social) Leisure Dignity Peace of mind Being organised Injury Never learned to cycle Road crossing behaviour Coiffure Cycle helmet use Bicycle ownership Bicycle management or maintenance
Family Number of views: 3 Number of studies: 4	Adult behaviour toward children Way to be with family Cycling with children	
Community Number of views: 17 Number of studies: 85	Perceived safety Quality of people's surroundings Length of time or time of day of journey Accidents Neighbourhood socio-economic status (SES) Community factors Theft/vandalism Impeded social relationships Motorists' attitudes Responsibility for environment and others	Social exclusion School encouragement Social versus leisure travel Perceptions of others' behaviour Pulling power Gender differences Peer pressure
Societal and environmental Number of views: 20 Number of studies: 88	Existing facilities for bicycles, pedestrians, cars Convenience, complexity or speed of journey Availability of public transport Environmental aspects General accessibility Darkness Punctuality of public transport Increased revenue through tourism Vehicle size Company cars	Costs Traffic Weather Hills Road sharing Cleanliness of buses Property prices Headwinds Safety training Season

3.4 Advisory group consultation

The final decisions about which studies to include in the in-depth review were made in consultation with the Advisory Group on the basis of the findings in the research map. The list of topics brought to the Advisory Group which might be relevant to policy and practice included socio-economic status, individual behavioural change, environmental and structural factors.

At a meeting in January 2006, which brought together key stakeholders from community organisations, government health and transport departments and transport researchers, a consensus emerged that what was needed was an examination of what works for children, young people and parents. A large proportion of the located studies focused on these populations, as was shown in Figure 3.9. The Group felt that this was a politically strategic population to research in that it was the most topical or promising policy issue to address. It was clear at the time of the meeting that there were not many intervention studies relevant to children and young people with which the findings of the views studies could be synthesised. Group members suggested that the research team should examine several different areas, including socio-economic status, individual behaviour change, environmental and structural factors, and (where views were available) the mismatch between attitudes and behaviour. As a result of this input, several in-depth review questions were developed which guided the second stage of the review.

Broad question

Do children's, young people's and parents' views illuminate the findings about the effectiveness of interventions to promote children's, young people's and families' walking and cycling?

Sub-questions

What are the views of children, young people and parents about *individual level* influences on their walking and cycling behaviour?

What do children, young people and parents say about the influences of the *family* on their walking and cycling behaviour?

What do children, young people and parents say about the influences of the *community* on their walking and cycling behaviour?

What do children, young people and parents say about the *wider social or environmental* influences on their walking and cycling behaviour?

Do socially excluded groups present different views about walking and cycling?

Do the views of children, young people and parents about walking and cycling explain their actual behaviour, or is there a mismatch between what they say and what they do? Can the data explain why this is the case?

4. RESULTS: IN-DEPTH REVIEW

4.1 Overview of views studies

The focus of the in-depth review is the perspectives, attitudes and experiences of children, young people and parents about walking and cycling as a means of transport.

A total of 21 relevant studies had already been identified in the first research map; a further 13 studies within this scope were found by searching and screening additional sources. There were therefore 34 studies for in-depth examination.

4.1.1 Methodological quality of studies

Studies used a variety of methods to collect the views of children, young people and parents. These included interviews, focus groups, and self-completion questionnaires with fixed and open response options. All 34 studies were assessed according to ten quality assessment criteria. The results are shown in Figure 4.1.

Figure 4.1: Proportion of studies reporting each quality criterion
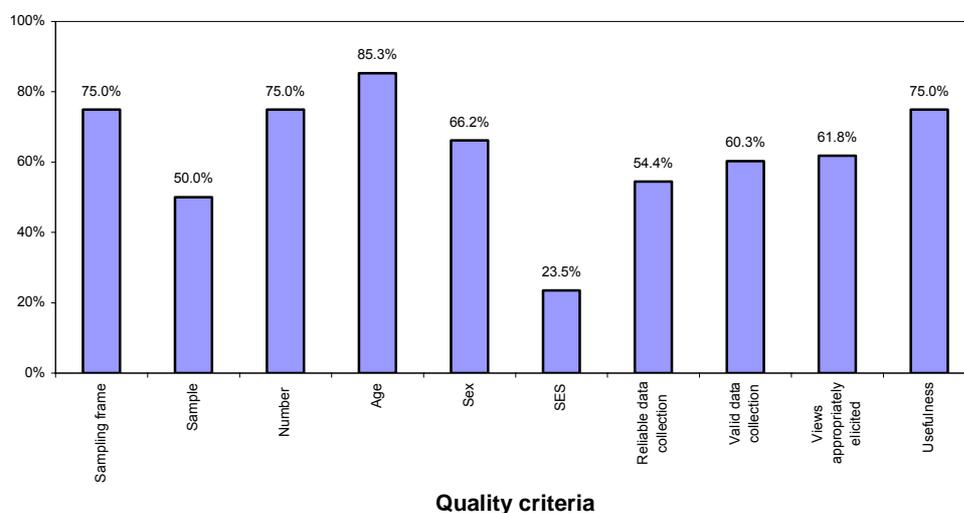
Although three-quarters of the studies were judged to be useful for answering the review question, there were many shortcomings in how they did this.

Information was lacking about whom they had recruited and how. Although three-quarters of the studies described their sampling frame and the number of people included, sampling methods were poorly described in half the studies. Most studies reported the age (85.3%) and sex (66.2%) of their participants, but over three-quarters of the studies failed to describe the socio-economic status of individual participants.

Information was also lacking about data collection and analysis. Only just over half the studies reported any steps to ensure the reliability of their data-collection tools (such as tape-recording interviews), and only two-thirds of the studies reported the validity of data-collection tools (such as pre-testing questions with a sample of the target population). Less than two-thirds of the studies reported methods for appropriately eliciting participants' views.

The 18 studies below an overall quality rating of 7.0 were omitted from the analysis and recommendation stages of the review. This decision was guided by the lack of consensus about whether some quality criteria are more important than others when judging the rigour of qualitative research; we therefore gave the individual criteria equal weight. The cut-off point of 7.0 was suggested as the most natural based on the distribution of the ratings (see Appendix 2). Given that the studies below this point may nonetheless provide useful insights into future research, the aims, populations and quality assessment of the 18 lower quality studies were recorded (Appendix 3). The 18 studies related more often to cycling than walking.

The 16 higher quality studies included an adequate description of the sample, except for the socio-economic status of participants which was reported in very few studies. Description of the sample was also not always exhaustive: for example, some studies did not provide precise details of numbers of participants, or explicitly state the sex of participants. All described their sampling strategy to some extent. Most made an effort to describe some assurance of the reliability and validity of data-collection methods, although this was generally poorly reported. Methodological characteristics of the 16 included higher quality studies are shown in Appendix 4.

4.1.2 Characteristics of higher quality studies

Most of the studies (N=11) were published between 2000 and 2005. Six studied walking in particular, and one cycling. The remaining nine studies elicited views on transport in general, from which issues relevant to walking and cycling emerged. Studies examined differing topic areas, ranging from general surveys concerned with transport behaviour to highly specific studies of risk or accessibility in particular populations. Three studies were process evaluations of UK-based interventions designed to increase walking and/or cycling.

In total, studies included at least 8,776 respondents living in England and Scotland. Some studies did not give exact numbers: four reported data-collection methods, such as focus groups, discussion groups, chat rooms and workshops, which had an undisclosed number of participants. The most commonly used means of data collection was by questionnaire, employed in 12 of the studies. Other methods used were discussion and focus groups (N=9 studies), analyses of children's writing, drawing and artwork (N=4), interviews (N=5), and workshops (n=1). Most studies were carried out using data collected in schools.

Between them studies included children, young people and parents from rural, suburban and urban areas. The individual socio-economic status (SES) of participants was only specifically described in four studies. Seven studies described the SES of the areas from which participants were selected; five studies did not provide any information on SES. Children and young people ranged in age from four to 18 years. Samples of participants varied from small

age ranges (e.g. 5- to 6-year-olds) to wide age ranges (e.g. 4- to 18-year-olds). Parents' views were elicited in five studies. Children's views were described more frequently and in greater depth than parents' views. Of the eight studies which elicited the views of younger children (under the age of 12), three did so exclusively, while the remainder also asked older children. Five studies concentrated exclusively on the age range 10–18 years.

Characteristics of the included higher quality studies are provided in Appendix 5.

4.1.3 Recurrent barriers and/or facilitators across studies

The distributions of positive and negative influences, and consequences for each level of influence are summarised in Tables 4.1 to 4.4.

Table 4.1: Wider society / Environment level

Barriers and problems	Number of studies	Facilitators and benefits	Number of studies
Dangerous traffic	12	Needed facilities	12
Weather	10	Environmental aspects	10
Convenience	9	Convenience of walking/cycling	8
Existing facilities	8	Traffic jams	8
Distance	7	Costs	7
Length of time / speed	5	Length of time / speed	5
Cost	4	Weather	3
Timing / time of day	4	Road sharing	2
Hills	3	Availability of public transport	1
Complexity of journey	2	Complexity of journey	1
Time of year	2		
Comfort	2		
Availability of public transport	1		
Neighbourhood SES	1		
Accessibility	1		

Table 4.2: Community level

Barriers and problems	Number of studies	Facilitators and benefits	Number of studies
Fear related to safety / accidents	10	Opportunity for sociability	10
Lack of sociability	8	Improved safety / reduced accidents	7
Cultural factors	7	Accompanied travel	5
Crime	7	School / local authority influence	4
Time pressure	6	Time pressure	3
Quality of surroundings	6	Training	3
Gender differences	5	Quality of surroundings	3
Peer pressure	5	Gender differences	2
Travelling alone	4	Peer pressure / status	2
School influence	3	Time of day of journey	1
Time of day of journey	1	Crime	1
Neighbourhood SES	1	Information provision	1
Responsibility	1	Journey type	1
Status	1	Cultural factors	1
Training	1	Responsibility for environment / others	1
Journey type	1	Social exclusion	1
Information	1		

Table 4.3: Family level

Barriers and problems	Number of studies	Facilitators and benefits	Number of studies
Needing parental permission	9	Having parental permission	5
Car use for protection	4	Parental approval	2
Parental responsibility	3	Encouragement / enthusiasm	1
Parental disapproval	2	Car use	1
Parental perception of children's abilities	2	Way to be with family	1
Car use for convenience	1	Parental role model	1
Gender differences	1	Schemes	1
Parental expectations of children	1	Parental responsibility	1
Reliance on extended family	1	Behaviour change	1
		Delegated authority	1

Table 4.4: Individual level

Barriers and problems	Number of studies	Facilitators and benefits	Number of studies
Preferences and choices	11	Prefer to walk or cycle	12
Limited independence	7	Improved physical health / physical activity	9
Impact on physical health / effort / fatigue	6	Psychosocial health	6
Psychosocial health	5	Enjoyment / fun	6
Car use	4	Car use	5
Acceptability	3	Independence / autonomy	4
Comfort	3	Gender differences	4
Road behaviour	2	Road behaviour	3
Age	2	Journey type	2
Enjoyment / fun	2	Acceptability	1
Embarrassment	2	Bicycle ownership	1
Journey type	2	Behaviour change	1
Lifestyle choice	1	Relaxation	1
Cycle helmet use	1	Confidence	1
Status	1		
Bicycle maintenance	1		

A number of different positive and negative influences on walking and cycling were described. Within each level of influence, a wider variety of barriers were identified and were often cited in more studies than were facilitators. We analysed the top barriers and facilitators for each level.

Wider society/environment-level barriers to walking and cycling

Barriers to walking and cycling at the level of wider society and the environment included dangerous traffic (N=12 studies), weather (N=10), convenience (N=9) and existing facilities (N=8).

(i) Dangerous traffic (N = 12)

A total of ten high-quality studies discussed traffic as a barrier to walking, while three studies talked about traffic as a barrier to cycling. Across these studies, views were expressed by people similar in terms of their ages, sex, and socio-economic status (SES). One study rated inner-city traffic as worse than traffic in rural areas (Jones *et al.*, 2000), although no other studies commented on this difference. Children and parents indicated that traffic restricted their walking and cycling (Martin *et al.*, 2004; Tyrrell, 2000), in some cases despite their desire to do so (Martin *et al.*, 2004). Traffic was described as busy and too fast (Bostock, 2001; Davis, 2001; Gray *et al.*, 1998), with a lack of gaps (Jones *et al.*, 2000) and resulting in difficulties in crossing (Davis, 2001; Jones *et al.*, 2000) and delays (Martin *et al.*, 2004). Safety issues connected with fast and busy traffic were concerns for children, young people and parents (Davis, 2001; Hine, 1996; Jones

et al., 2000; System Three, 1999). In one study, these concerns were shown to be more prevalent among non-cyclists than cyclists (Gray *et al.*, 1998). Driver behaviour was noted as being dangerous, with examples of cars around schools driving on the pavement and pulling up on corners (Cahill, 1996), and a general lack of respect towards other road users (Davis, 2001; Gray *et al.*, 1998; Jones *et al.*, 2000).

(ii) Weather (N = 10)

Weather was cited as a barrier in relation to walking (eight studies) and cycling (two studies). It was mentioned by children of all ages and both sexes, from a wide range of socio-economic backgrounds, and in urban, suburban and rural locations. The proportion of participants bothered by weather varied, from 7% to 60% (Bickerstaff and Shaw, 2000; System Three, 1999). Children and parents stated that poor weather caused them to use their cars instead (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Lupton and Bayley, 2002), that it added to the stress of walking (Bostock, 2001), and that they did not like getting cold and wet (Davison *et al.*, 2003; Martin *et al.*, 2004).

(iii) Convenience (N = 9)

Convenience was determined to be an influence at the wider society level because it is inextricable from the fast pace of life and long distances travelled in the course of daily lives.

Participants noted convenience as a barrier to both walking (eight studies) and cycling (one study). These views did not appear to be influenced by the SES of the area respondents lived in, or by their urban, suburban or rural location. In all the studies but one, the convenience of car use was emphasised. Participants described car use as easier (Bickerstaff and Shaw, 2000; Martin *et al.*, 2004), fitting in with other tasks (Bickerstaff and Shaw, 2000; Lupton and Bayley, 2002), and a necessity in rural locations (Davison *et al.*, 2003). Cars were perceived generally to be quick, easy and part of an adult way of life (Davis, 2001; Davison *et al.*, 2003; Martin *et al.*, 2004; Tyrrell, 2000). In contrast, respondents in one study noted the lack of convenience of crossing facilities as a barrier to walking (Hine, 1996).

(iv) Existing facilities (N = 8)

Children, young people and parents from all ages, SES levels and locations described the lack of facilities as a barrier to walking in five studies and cycling in three studies. The lack of structural facilities – such as appropriately spaced, secure, and ample bicycle stands (Davison *et al.*, 2003; Gray *et al.*, 1998) and 'lollipop' crossing attendants – were viewed as important (Davison *et al.*, 2003), as was a more material need indicated by the lack of a way to carry books and shopping easily (Bostock, 2001; Davison *et al.*, 2003; Gray *et al.*, 1998). Keeping the pavement in good repair was also cited (Davison *et al.*, 2003). Children and parents noted a lack of crossings and lights convenient to children's journey paths, and a need for more safe and well-lit cycle paths and footpaths (Hine, 1996; McKee, 2004).

Wider society/environment-level facilitators to walking and cycling

In terms of wider society level facilitators, studies most frequently mentioned the need for facilities (N=12), environmental aspects (N=10), convenience of walking/cycling (N=8), and traffic jams (N=8).

(i) Needed facilities (N = 12)

Children, young people and parents described facilities that might or did help them to walk or cycle more. These facilities were mentioned in nine studies relating to walking and six studies relating to cycling. Children's views were represented in five studies, and parents' views in three. (The remainder were researchers' views without direct quotes from either children or parents.) A range of ages and both sexes were represented. Participants' views from areas with a variety of SES levels and locations were included. Specific facilitators were described. These included safer places to cross and crossing facilities (Hine, 1996; Jones *et al.*, 2000; Lupton and Bayley, 2002; McKee, 2004; Sharples and Fletcher, 2000), and clean walking paths/pedestrian areas (Jones *et al.*, 2000; Martin *et al.*, 2004; McKee, 2004; System Three, 1999). Several studies cited slower car speeds / speed bumps (Bickerstaff and Shaw, 2000; Cahill, 1996; Jones *et al.*, 2000), cycle lanes, especially on main roads (Gray *et al.*, 1998; Jones *et al.*, 2000; Martin *et al.*, 2004), and locked/secure cycle sheds, cycle stands, and cycle parking (Gray *et al.*, 1998; System Three, 1999; Tyrrell, 2000). 'Safer Routes to School' schemes (Bickerstaff and Shaw, 2000; System Three, 1999) and more 'lollipop' crossing attendants (Lupton and Bayley, 2002; McKee, 2004) were the next most frequently cited facilitators to walking or cycling. Several studies noted other positive influences on walking and cycling, such as poor parking facilities for cars (Davison *et al.*, 2003), carrying capacity on bicycles (Davison *et al.*, 2003), cycle permits (Gray *et al.*, 1998), stopping school bus services (Sharples and Fletcher, 2000), organised escorts for children (System Three, 1999), using routes outside of school hours, a shop to hire bicycles, and cycle proficiency training (Tyrrell, 2000).

(ii) Environmental aspects (N = 10)

The importance of environmental aspects as facilitators of walking and cycling was noted by children, young people and parents in ten studies: four studies reported views in relation to walking and three in relation to cycling, with the remainder of the views referring to transport in general. While views from both sexes were equally represented, they were derived from samples with higher SES levels, and in more rural and suburban locations. Younger children, in particular, cited the environmental benefits of walking and cycling. The advantages or walking and cycling as ways of reducing car use and thus pollution were often cited by participants, and the idea of being out in fresh air, away from fumes while walking was also noted (McKee, 2004).

(iii) Convenience of walking/cycling (N = 8)

Walking and cycling were described as the most convenient modes of travel in four and three studies, respectively. While some children noted that walking is more convenient (Martin *et al.*, 2004; System Three, 1999), others thought cycling was more convenient (Gray *et al.*, 1998; Jones, 1998; Tyrrell, 2000). Although this appears to be contradictory, the children who cited walking as more convenient appear to have been sampled from more urban and suburban locations, and

those describing cycling as convenient came from more rural and suburban locations. Only one study of lower-income participants noted the convenience of walking and cycling as an issue (Gray *et al.*, 1998). In general, children and young people perceived walking and cycling as more convenient than parents did (Gray *et al.*, 1998; Hine, 1996; Martin *et al.*, 2004; System Three, 1999; Tyrrell, 2000). Studies reporting parents' views about convenience were confined to the walking bus scheme implemented in their area (Bickerstaff and Shaw, 2000).

(iv)Traffic (N = 8)

Traffic-related facilitators of walking were described in four studies and of cycling in two studies. Views were consistent across ages, sex, SES and locations. Participants in two studies noted that slower traffic would encourage walking or cycling (Gray *et al.*, 1998; McKee, 2004). Children in two studies described disliking being in a car during heavy traffic, which might also facilitate walking or cycling (Davison *et al.*, 2003; Martin *et al.*, 2004). Parents in one study thought that a walking bus scheme would both reduce the amount of traffic during the 'school run', thereby encouraging further walking, and also teach children about road safety (Bickerstaff and Shaw, 2000). Participants in one study noted that traffic could be controlled by speed bumps (Cahill, 1996), while in another they suggested controlling traffic by keeping it away from the school entrance (McKee, 2004). Children also said that stationary traffic allowed them to cross more easily (Hine, 1996). In another study children described travelling out of rush hour, presumably to benefit from lighter traffic (Tyrrell, 2000), although this is not an option for travelling to school.

Community-level barriers to walking and cycling

Barriers at the community level included fears relating to safety/accidents (N=10 studies), lack of socialising (N=8), cultural factors (N=7 studies) and crime (N=7).

(i) Fear related to safety/accidents (N = 10)

The issue of perceived safety was highlighted as a barrier to walking and cycling in ten studies. The majority of studies focused on safety in relation to either traffic (Black *et al.*, 2001; Bostock, 2001; Cahill, 1996; Davis, 2001; Gray *et al.*, 1998; Martin *et al.*, 2004; System Three, 1999; Tyrrell, 2000) or strangers (Black *et al.*, 2001; Davis, 2001; Gray *et al.*, 1998; Jones, 1998; Jones *et al.*, 2000; Martin *et al.*, 2004), including muggers and gangs of older children (Lupton and Bayley, 2002). While participants came from a range of socio-economic areas, concerns about safety were more frequently expressed in studies which included urban areas. Jones *et al.* (2000) noted that children in their urban sample were more concerned about safety than those in their suburban and rural samples. Differences by age and sex were also apparent. Younger children of both sexes appeared to be more concerned with traffic danger (Davis, 2001), while older girls were more concerned with stranger danger (Davis, 2001; Jones, 1998). Asian girls were less likely to report stranger danger than non-Asian girls; however, most travelled in the company of their families (Jones, 1998). Children's safety was the primary concern voiced by parents at this level and this appeared to act as a barrier to young people and children's walking and cycling (Bickerstaff and Shaw, 2000; Black *et al.*, 2001; Bostock, 2001; Cahill, 1996; Jones, 1998; Jones *et al.*, 2000)

(ii) Lack of sociability (N=8)

The desire for sociability could be a barrier to walking and cycling where the two were not perceived to be compatible. This view emerged in eight studies, across all age groups and all socio-economic strata. In four studies, children and parents thought that walking schemes, or the fact that their friends did not walk, could limit the amount they could be sociable with others (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Gray *et al.*, 1998; McKee, 2004). In one study, the lack of opportunity to be sociable was seen as a reason not to cycle (Gray *et al.*, 1998). In another study, children described cycling alone as 'boring' (Davis, 2001). As a barrier, the need for sociability was noted in fewer rural than urban and suburban locations.

(iii) Cultural factors (N = 7)

Seven studies listed cultural factors as barriers to walking. This was the case for studies of higher socio-economic samples. Differences by sex and age were noted: in one study, older girls (i.e. 13- to 14-year-olds) noted that unwanted stereotyping limited their active transport (Davis, 2001); while, in another study, older children tended to view car use as more 'normal' than younger children (Davison *et al.*, 2003). Specific cultural factors that were most often described included the perception of walking or cycling as not 'cool' (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Tyrrell, 2000), and the use of the car as a status symbol (Bickerstaff and Shaw, 2000; Tyrrell, 2000). Participants raised issues about perceived expectations of what makes a good parent (Bickerstaff and Shaw, 2000), and the conflict between the cultural expectation to walk more and the dangers of doing so (Tyrrell, 2000). The societal norm that children are used to everything being instant was also discussed, with the resulting perception that all modes of travel other than the car take too long (Martin *et al.*, 2004).

(iv) Crime (N = 7)

The issue of theft and vandalism as a barrier to walking or cycling was raised in seven studies. Most of these, understandably, focused on cycling: many children reported concerns about bicycle security (Davis, 2001; Davison *et al.*, 2003; Gray *et al.*, 1998; Jones *et al.*, 2000; Lupton and Bayley, 2002; Tyrrell, 2000). No views from parents on this issue were elicited. While all age ranges and levels of SES reported concern about theft, Lupton and Bayley (2002) found that more suburban children were concerned about bicycle theft, and more children in socially deprived areas (presumably urban) were concerned with street crime. In one study, it was noted that boys are more concerned with bicycle security than girls (Davison *et al.*, 2003), although it is possible that this is due to a greater proportion of boys cycling, compared with girls. Two studies described concerns about bicycle vandalism (Davison *et al.*, 2003; Gray *et al.*, 1998) and one noted concerns about mugging and harassment (Jones *et al.*, 2000).

Community-level facilitators to walking and cycling

Community level facilitators described the opportunity for sociability (N=10 studies), improved safety / reduced accidents (N=7 studies), and accompanied travel (N=5).

(i) Opportunity for sociability (N = 10)

Children and parents in several studies tended to see cycling, or walking in particular, as a good opportunity to socialise (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Gray *et al.*, 1998; Jones *et al.*, 2000; Martin *et al.*, 2004; McKee, 2004; Sharples and Fletcher, 2000; System Three, 1999; Tyrrell, 2000). Children from all ages, socio-economic strata and locations described this view. Views differed by sex in one study: boys tended to cite boredom as a reason to walk with friends, while girls indicated that they walked with friends in order to socialise (Jones *et al.*, 2000). Children and parents both enjoyed the social aspects of a walking bus scheme in one study (Bickerstaff and Shaw, 2000), while, in another, car travel was seen as antisocial (Martin *et al.*, 2004). Participants also thought that if more children began walking or cycling, a possible 'snowball effect' might occur, whereby increased or novel active transport behaviour among children would precipitate higher levels of walking and cycling throughout the group (Gray *et al.*, 1998).

(ii) Improved safety / reduced accidents (N = 7)

Studies described various examples of ways that children and young people could feel safer when walking or cycling. While views from all ages were elicited, one study noted that girls in particular described feeling safer if accompanied when walking in urban areas (Jones *et al.*, 2000). No views about what would make walking and cycling safer were found where participants came from lower SES areas. In general, participants noted that, if they felt more personally safe, they would walk or cycle (McKee, 2004), or would support any method that would allow their children to get to school safely (Tyrrell, 2000). Some strategies promoted walking and cycling; parents felt that a walking bus scheme implemented in their area (in which two parents 'pick up' and accompany a group of children to school) improved children's safety and reduced bullying (Bickerstaff and Shaw, 2000). Bicycle paths were thought by children to improve safety (Tyrrell, 2000), as were speed bumps (Cahill, 1996) and accompanied walking (Jones *et al.*, 2000). Car travel was seen to be unsafe as it had the potential for accidents in one study (Martin *et al.*, 2004). Cycling was noted as a fast method of escape from potentially dangerous situations (Lupton and Bayley, 2002).

(iii) Accompanied travel (N=5)

Children and parents in five studies noted that accompanied travel was a facilitator of walking, although this tended to be in relation to girls rather than boys, and urban girls in particular (Jones *et al.*, 2000). Parents emphasised that they would be more inclined to allow children to walk if they were accompanied (Cahill, 1996; Tyrrell, 2000). If children were accompanied by an adult they were more likely to cross roads (Hine, 1996). One researcher noted children's descriptions of the dynamics of being perceived as independent, being allowed to go with friends, requiring accompaniment, and being a loner, in relation to walking (Davison *et al.*, 2003).

Family-level barriers to walking and cycling

Considerably less data is found at the family level. Three barriers emerged: needing parental permission (N=9 studies), car use (N=4) and parental responsibility (N=3).

(i) Needing parental permission (N=9)

Four studies noted parental permission as a barrier specifically to walking (Hine, 1996; Lupton and Bayley, 2002; McKee, 2004; Sharples and Fletcher, 2000), although parents were noted to deny permission to cycle as well (Davis, 2001; Davison *et al.*, 2003; Jones *et al.*, 2000; Tyrrell, 2000). In general, girls described lack of permission as more of a barrier (Davis, 2001; Jones, 1998), although both sexes stated they would walk if their parents allowed it (Lupton and Bayley, 2002; McKee, 2004). No difference was noted in views on parental permission according to the children's ages, SES or where they lived. Children reported that they were restricted in how far from home they were allowed to walk or cycle (Davis, 2001; Jones, 1998; Lupton and Bayley, 2002).

(ii) Car use (N = 4)

Four studies described the use of a car to transport children (Jones *et al.*, 2000; Lupton and Bayley, 2002; McKee, 2004; Sharples and Fletcher, 2000). Parents used their cars for protection, for girls (Jones, 1998; Lupton and Bayley, 2002), and Asian girls in particular (Jones, 1998). While views from children of varied SES and all locations were reported, one study noted that secondary school children were more often reported as being driven (Sharples and Fletcher, 2000). Reasons parents cited for using cars to transport children included safety (Jones, 1998) and traffic (Lupton and Bayley, 2002).

(iii) Parental responsibility (N = 3)

In three studies, parental responsibility was highlighted as a barrier to children's walking and cycling. The views were consistent across ages, sex and SES, although more views were reported from studies conducted in suburban and urban locations. Views were expressed by parents about the perceived expectation that they should take their children to school themselves, and that they might be considered 'bad parents' if they did not (Bickerstaff and Shaw, 2000). Parents also described the challenges of having to manage children's behaviour (Bickerstaff and Shaw, 2000; Bostock, 2001) while getting other tasks done (Bostock, 2001). One study noted the challenges of recognising the need to allow children greater independence while still maintaining their safety (Cahill, 1996).

Family-level facilitators to walking and cycling

Few family level facilitators were found: having parental permission (N=5 studies), and parental approval (N=2) were noted.

(i) Having parental permission (N = 5)

Once facilities were made available or improved, or safety was perceived to have improved, parents either granted children permission to walk and cycle, or said they intended to do so (Bickerstaff and Shaw, 2000; Cahill, 1996; Lupton and Bayley, 2002). Further, parents seemed to allow, or were perceived by children to allow, children to walk in summer more than at other times of the year (Lupton and Bayley, 2002; McKee, 2004). These views were consistent across children's ages, sex, and their SES and location.

(ii) Parental approval (N = 2)

Two studies described views relating to parental approval as facilitators of walking. One study noted that parental approval of the walking bus would make it more likely that it would be used (Bickerstaff and Shaw, 2000). Sharples and Fletcher (2000) found that parental approval of walking as a safe activity made children think they would be allowed to walk. Children also noted that parents were in favour of walking as it was good exercise (Bickerstaff and Shaw, 2000).

Individual-level barriers to walking and cycling

At the individual level, several barriers to walking and cycling were noted: preferences and choices (N=11 studies), independence (N=7), and the impact on physical health / effort / fatigue (N=6).

(i) Preferences and choices (N=11)

The most frequently cited views about barriers to walking and cycling at this level are in relation to children and young people preferring to go by car (Black *et al.*, 2001; Bostock, 2001; Cahill, 1996; Davis, 2001; Davison *et al.*, 2003; Martin *et al.*, 2004; McKee, 2004; Tyrrell, 2000). This view varies considerably among different groups. More young people want to drive (Cahill, 1996; Martin *et al.*, 2004; Tyrrell, 2000); boys, in particular (Cahill, 1996; Davis, 2001). Although older children generally prefer to go by car rather than by more active forms of transport, boys are less interested in simply *travelling* by car than girls (Martin *et al.*, 2004) – in one study, 25% more boys than girls in Year 5 expressed a desire to *own* a car, although this gap reduced by Year 7 (Cahill, 1996). In one study, children from families who did not own a car were four times more likely to say they did not want a car (Cahill, 1996). In another study, children in rural areas preferred travelling by bus (Martin *et al.*, 2004). Children noted in one study that they chose to rearrange their journeys to avoid times of heavy traffic (Hine, 1996). In two studies, parents and young people noted that they had no choice about walking – they were obliged to walk to places they needed to get to, but would prefer to travel by car (Bostock, 2001; Tyrrell, 2000).

(ii) Limited independence (N = 7)

The issue of limited independence as a barrier to walking and cycling came up in seven studies. Views were consistent across socio-economic areas and locations. However, some differences by age and sex were found. Girls in one study noted they were driven to more places, while boys were allowed to walk (Lupton and Bayley, 2002). In general, studies with older children tended to report limited independence, and one study noted that older children did not like taking part in the walking bus because they were not free to explore (Bickerstaff and Shaw, 2000). Desire for independence also took the shape of increasing demand for driving licences, which could be construed as a barrier to walking and cycling (Martin *et al.*, 2004; Tyrrell, 2000).

(iii) Impact on physical health / effort / fatigue (N = 6)

Physical health, activity and fitness were all described by children of both sexes, and from a variety of socio-economic areas and locations as a barrier to walking and cycling. Studies of younger children tended to describe physical health as a barrier to walking and cycling. The view that walking is tiring was found in three

studies (Davison *et al.*, 2003; Martin *et al.*, 2004; Tyrrell, 2000). Participants in one study thought cycling was tiring (Tyrrell, 2000). As a barrier, a small proportion of parents described missing the chance to exercise themselves if the children took part in the walking bus scheme (Bickerstaff and Shaw, 2000). Prior to implementation, participants in this study also thought the walking bus might make children more tired, although post-implementation parents thought that the scheme reduced fatigue. Bostock (2001) noted that walking causes fatigue in children and parents, particularly those in deprived areas with no transport choices.

Individual-level facilitators to walking and cycling

The following individual level facilitators of walking and cycling were identified: preference to walk or cycle (N=12 studies), improved physical health / physical activity (N=9), psychosocial health (N=6), and fun (N=6).

(i) Prefer to walk or cycle (N=12)

Children across studies stated that they desired or preferred walking (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Jones *et al.*, 2000; Lupton and Bayley, 2002; McKee, 2004; System Three, 1999; Tyrrell, 2000) and cycling (Davison *et al.*, 2003; Jones *et al.*, 2000; Martin *et al.*, 2004; McKee, 2004; Tyrrell, 2000) over other forms of transport. In three studies, children said they wanted to cycle but did not or could not (Davis, 2001; Martin *et al.*, 2004; Tyrrell, 2000). However, the picture of who prefers to walk or cycle is complex. In one study, younger children in the sample (11- to 12 year-olds) preferred to walk (Martin *et al.*, 2004), while, in two other studies, older children in the samples (up to 17 and 13-14 years old respectively) preferred walking over cycling (Davison *et al.*, 2003; Jones *et al.*, 2000). However, younger children from another study (5- to 6-year-olds) chose cycling as the preferred mode of transport (Tyrrell, 2000). These age discrepancies are linked to the age ranges in individual studies, combined with the urban, suburban or rural contexts of different studies. More boys than girls preferred cycling in three studies (Davison *et al.*, 2003; Jones *et al.*, 2000; Martin *et al.*, 2004); girls were more interested in walking than boys in two studies (Jones *et al.*, 2000; Martin *et al.*, 2004), and less interested in car ownership at all ages (Cahill, 1996). Children from more urban and suburban areas tend to want to cycle (Davis, 2001; Jones *et al.*, 2000), although one study noted that urban children preferred walking over taking the bus, which was preferred by rural children (Martin *et al.*, 2004). Parents in one study preferred the walking bus as a mode of transport for their children (Bickerstaff and Shaw, 2000). Children also described the desire to travel by other methods, such as scooters, skateboards and roller skates (Lupton and Bayley, 2002).

(ii) Improved physical health / physical activity (N = 9)

More positive views about physical activity and health were expressed in nine studies. In several studies, both children and parents recognised the health benefits of walking and cycling (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; Gray *et al.*, 1998; Jones, 1998; Martin *et al.*, 2004; McKee, 2004; System Three, 1999; Tyrrell, 2000). In relation to car use, it was recognised by children that adults who used their cars were being 'lazy' (Davis, 2001; Martin *et al.*, 2004), and that children who walk are healthier than those using cars (Davison *et al.*, 2003; Martin *et al.*, 2004; McKee, 2004).

(iii) Psychosocial health (N = 6)

A total of six studies, mostly focusing on samples with younger children, noted the benefits of walking and cycling in improving psychosocial health. No difference in views was noted in relation to sex, socio-economic status or location. In particular, views were expressed that mental alertness improves with walking (Bickerstaff and Shaw, 2000; Davison *et al.*, 2003; McKee, 2004); that, if children are more relaxed (e.g. after school), they walk (Hine, 1996; Lupton and Bayley, 2002); and that children's sleep patterns, quality of work, relaxation, self-concept, energy, and personal accomplishment improve due to walking (Bickerstaff and Shaw, 2000).

(iv) Enjoyment/fun (N = 6)

Finally, fun and enjoyment were expressed as facilitators of walking and cycling in six studies. This view was particularly expressed by younger aged children, who thought that travel by car was 'boring' and that cycling was 'fun' (Davison *et al.*, 2003). All the studies noted the view that walking and cycling was enjoyable. Parents also expressed a belief that children's enjoyment of exercise would increase as a result of using the walking bus scheme (Bickerstaff and Shaw, 2000). Children equated happiness and healthiness (McKee, 2004).

4.2 Major themes arising from barriers and facilitators

Five explanations of transport choices were derived from the themes identified through framework analysis.

The first explanation combined two themes that emerged from views expressed by children and families. The overriding culture of car use, and fear and dislike of local environments seem to inhibit children's walking and cycling. Within the ***culture of car use***, the preference for cars, the perception of cars being more convenient than walking and cycling, the status of car ownership and the perception of cars as 'cool' work against the likelihood of more active forms of travel. Both children and parents expressed ***fear and dislike of local environments*** through concerns about children's safety, traffic concerns, the need for appropriate facilities and concerns about theft and other crimes.

The third explanation was derived from a theme emerging particularly from views expressed about ***children as responsible transport users*** in their own right. This was demonstrated by children's definite views of walking and cycling as preferred and convenient; their views about the impact of cars and walking and cycling on the environment; and their views on the benefits of walking and cycling in terms of safe accompanied travel, sociability and health and fitness.

A fourth explanation was derived from a theme emerging particularly from views about ***parental responsibility and behaviour***. This was demonstrated by views (most often from children) about their parents' car use, the ways in which they limited children's independence, and from parents about their perception of expectations about being a 'good parent' in relation to getting their children to school safely.

Notably, the fifth explanation was derived from the observation that views differed across studies, depending on the children's age, sex and location. These differences suggest that any interventions designed to increase walking and cycling may have to be tailored to children of different ages, sex, and rural, suburban or urban location. For that reason, this fifth explanation is incorporated into each of the preceding themes in order to target appropriately the implications for interventions.

4.3 Implications for interventions

Table 4.5 summarises key implications for the development and testing of interventions designed to promote walking and cycling derived from the analysis of 'views' research. In many cases, children's, young people's and parents' views differed according to factors such as their age, sex, and location (urban or rural). Interventions should take account of these differences. Where appropriate, we have attempted to identify those groups for whom particular interventions would be appropriate, based on the views they voiced as being particularly important.

Table 4.5

Theme 1: Culture of car use	
Preference for cars	• Address children's preference for travelling by car. • Influence groups inclined to prefer cars (e.g. older children, those from car owning families). • Encourage interventions which will maintain preferences for walking and cycling among younger children. • Tailor interventions for urban and suburban areas. In rural areas, factors such as convenience may be a more important barrier to walking and cycling than preference.
Perception of cars as more convenient than walking and cycling	• Aim to change attitudes by demonstrating that walking and cycling are as convenient as driving for short journeys. • Target messages about the convenience of active transport towards children and parents. • Promote walking as convenient, especially in urban areas, cycling in rural areas. • Target safety concerns about walking and cycling in comparison with driving. • Make travelling by car less convenient with greater parking restrictions, and speed limits. • Make 'park and walk' more convenient, with free parking permits issued through schools and available for use in car parks at school opening and closing times, several minutes' walk away from schools.
Status of car ownership	• Design interventions to influence wider social attitudes toward a shift away from car use.

	• Target educational interventions to change these attitudes especially in younger children.
Perceptions of cars as 'cool'	• Promote walking and cycling to children and young people as 'cool'.

Theme 2. Fear and dislike of local environments

Concerns about children's safety from personal attack	• Where possible, promote perceptions of local environments as safe. • Implement interventions which increase personal safety from attack (abduction, mugging, harassment), such as personal alarms. • Target messages about safety from attack to older girls and urban locations. • Promote interventions to reduce bullying / fighting among children. • Introduce accompanied walking / walking schemes to promote safety. • Encourage shared walking / cycling paths to increase visibility.
Concerns about safety from accidents	• Implement effective interventions to reduce accident risk for pedestrians, cyclists: for example, 20 mph zones, cycle lanes, accompanied walking schemes, parking restrictions near schools. • Target messages about safety from accidents toward younger children. • Aim to balance messages about safety and danger. If safety issues are over-emphasised in promoting walking and cycling, disproportionate perceptions of walking and cycling as dangerous activities will be reinforced.
Concerns about traffic	• Reduce or restrict traffic, enforce road rules with drivers (especially near schools), restrict access/ speed around school opening and closing times. • Reduce traffic speeds (20 mph zones) • Ensure that crossing points are safe, accessible, respected by drivers. • Ensure that traffic is spaced sufficiently to permit road crossing.
Need for appropriate facilities	• Install bicycle stands / sheds. • Improve conditions of pavements, paths, roads. • Locate crossings at convenient points for children's journeys. • Introduce more 'lollipop' crossing attendants / crossing patrols. • Create more frequent crossing places and enforce laws requiring cars to give way to

	pedestrians.
	• Construct raised (kerb high) crossing places to make it easier for pedestrians, buggies, wheeled shopping bags to cross.
Concerns about theft	• Create secure cycle parking, especially at schools.
	• Promote bicycle security measures, particularly at boys.
Theme 3: Children as responsible transport users	
Children's views of walking and cycling as preferred and convenient	• Design interventions to build on children's views of walking and cycling as preferred and convenient.
	• Ensure that interventions adapted from those involving adults are appropriate for children and young people.
	• Measure intervention impact on children as well as parents.
Children's views about environmental impact	• Target interventions emphasising environmental messages, especially at children.
	• Create syllabuses for environmental education, including positive messages about walking and cycling, as well as the negative effects of car use.
	• Target children in suburban and rural locations, and possibly from higher SES groups.
Children's views of benefits of walking and cycling: sociability	• Promote walking and cycling (particularly walking) to children and young people as sociable ('cool') activities, giving the opportunity for contact with friends and family.
	• Target this message toward girls, particularly in urban and suburban locations.
Children's views of benefits of walking and cycling: health and fitness	• Encourage walking and cycling activities promoting both physical and psychosocial health, to parents as well as to children.
Theme 4: Parental responsibility and behaviour	
Children's views about parents' car use	• Encourage children to think critically and ask about car use in their own families, and advocate walking and cycling.
	• Encourage parents to consider their own role in modelling transport behaviour for children.

Limitations on children's independence	• Promote walking and cycling to parents as means of increasing children's independence, particularly parents of girls and families of Asian ethnicity. • Balance messages about walking and cycling so as to address parents' concerns about safety, traffic, etc., and to encourage them to foster children's independent mobility.
Expectations about parenting	• Provide parents with information on behaviour management and role modelling when walking with younger children. • Promote the idea that allowing children to walk and cycle is a way of being a 'good' parent. • Promote walking and cycling as a way to encourage safe independence which simultaneously cares for the environment.

4.4 Summary of recent systematic reviews on interventions to shift travel mode

The systematic review by Ogilvie *et al.* (2004) examined the effectiveness of high quality population-wide strategies designed to impact on modal shift between cars and active modes of transport. Some of these studies measured walking and/or cycling. Of the interventions described in this review, some may have been relevant to children, young people and parents, and measured walking and/or cycling as part of the outcome. The review included evidence from any type of study design, while giving more weight to evidence from more rigorous study designs. It was decided to examine only those studies from the review which employed a control group, as this would limit the amount of bias influencing the studies' results. To ensure that no promising lower-quality interventions were missed, the first author of the Ogilvie *et al.* (2004) review was contacted to obtain a summary of lower quality studies excluded from the 2004 publication. These studies were included in the cross-study synthesis, albeit as studies needing further evaluation.

Examination of all the above interventions from the review by Ogilvie *et al.* (2004) revealed 15 reports of studies which may have been targeted towards children, young people and parents, or contained outcomes which could have been measured on this group. These studies are listed in Appendix 6. Interventions which could have potentially been aimed at this population included targeted behaviour change programmes, publicity campaigns and agents of change, engineering measures, financial incentives, and providing alternate services.

Three studies – in Perth (Australia), and Frome and Gloucester (England) – evaluated marketing strategies targeted to motivated subgroups. The TravelSmart programme included tailored leaflets, timetables, maps, free bus tickets, cycle discounts, cycle training, walking tours, branded gifts, and some infrastructure changes (Perth, Frome, Gloucester). Two areas in Adelaide, Australia, evaluated the use of tailored feedback on personal travel diaries, information on maps and timetables, and a new school curriculum (Adelaide). One study described the use

of a publicity campaign providing information to the general public on sustainable transport, including leaflets, advertising, displays in schools and shopping centres (Maidstone). One study described the use of an 'agent of change' intervention which employed the use of a school travel co-ordinator to advocate and plan for road safety improvement, building advocacy, travel plan funding application, walking buses, crossing facilities and parking restrictions (Camden and Islington) Engineering measures were evaluated in several ways.

Many studies evaluated the provision of cycle networks or lanes – Delft, (Netherlands), Detmold and Rosenheim (Germany), Stockton (England, bypass) – and studies under 'networks of routes' in Ogilvie *at al.* (2005); traffic speed reduction, calming or restraint measures (in England: 20 mph zones, bypass), and studies under 'traffic restraint' (Ogilvie *et al.*, 2005); road bypasses and other changes to the physical environment, such as dropped kerbs, pedestrian facilities, crossings (England – bypass). One study in Trondheim (Norway) introduced road user charges around the city centre. Another study examined the effect of providing alternate services by studying the construction of a new train station (Voorhout, Netherlands). Full publication details for these studies are provided in Appendix 7.

Ogilvie *et al.* (2005) concluded that there was some evidence that marketing behaviour-change programmes could affect behaviour in motivated sub-groups, and that a shift from car use to walking and cycling could occur at the population level. Individual studies, which examined subsidies and a new rail station, also showed a positive trend toward effectiveness. Ogilvie *et al.* noted that the balance of evidence about agents of change and publicity campaigns, engineering measures and charging road users has not shown them to be effective at the population level.

5. CROSS-STUDY SYNTHESIS

Having reviewed systematically the views of children, young people and parents about walking and cycling as a means of transport, we compared these views with evidence derived for the review by Ogilvie and colleagues (2004) of the effects of interventions promoting walking and cycling as a means of transport.

Implications for interventions highlighted by our views synthesis were entered into a matrix alongside the included and excluded evaluations of interventions from the review of intervention effectiveness by Ogilvie *et al.* (2004). This table is provided in Appendix 8. We then examined the matrix to determine whether interventions matched, contradicted or simply failed to address children's, young people's or parents' views.

Theme 1: Culture of car use

Few of the evaluated interventions addressed the theme of the culture of car use. No studies addressed the barrier of children's, young people's or parents' preference for cars. The Perth, Frome and Gloucester interventions showed a positive effect on walking and cycling, which may have been because they marketed measures which changed children's, young people's and parents' perceptions that cars are more convenient and combined this with infrastructure changes. No intervention evaluations from the systematic review reported a particular focus on changing perceptions of the status or 'coolness' of car ownership.

Theme 2: Fear and dislike of local environments

Some evaluated interventions addressed children's, young people's and parents' fear and dislike of local environments, albeit minimally. A few schools in one controlled study in Camden and Islington evaluated walking buses for some schools, which appeared to address children's views that accompanied walking was a facilitator to more active travel. However, this study showed no significant increase in walking and cycling.

Two types of interventions could have addressed concerns about safety from accidents and traffic: those trying to change actual accident rates and those changing perceptions of safety. Interventions trying to change actual accident rates by engineering work (i.e. by making changes to the physical environment) produced ambiguous results. Two English studies (England bypasses and England 20 mph zones) reported non-significant reductions, and a third (Stockton) reported a non-significant increase in accidents. Only one study directly measured perceptions about safety. The study of school travel plans in Camden and Islington assessed parental fears of traffic danger, abduction danger or bullying after one year. Rates were no lower in the intervention group than in the control group. However, adjustment for baseline and other covariates suggests there may

have been a non-significant reduction in these fears. None of these interventions resulted in a significant increase in walking or cycling.

The need for appropriate facilities for walking and cycling was addressed in a controlled evaluation in Delft, in the Netherlands, in which an improved and extended cycle network was installed. A positive, though non-significant, shift toward cycling was observed. In the controlled Camden and Islington study, a few schools implemented crossing patrols, parking restrictions, speed limits, and new pedestrian crossings with no increase in walking and cycling noted. Schemes evaluated in uncontrolled studies in England, and Detmold and Rosenheim in Germany, included changes to facilities such as cycle parking, cycle routes, new and raised crossing points, and traffic restraint strategies.

Finally, concerns about crime do not appear to have been addressed by any of the evaluated interventions.

Theme 3: Children as responsible transport users

Children's views of walking and cycling as preferred and convenient did not appear to be specifically addressed by any evaluated interventions.

One study addressed the views of children identified through our review concerning the environmental impact of different modes of travel. An uncontrolled study in Maidstone evaluated a publicity campaign emphasising the environmental benefits of walking and cycling implemented in schools, as well as wider community settings; however, within the schools, this message was not tailored specifically for children.

The benefits of walking and cycling, including giving children and young people opportunities to socialise, do not appear to have been addressed by any evaluated interventions.

Finally, children's views of the health and physical activity benefits of walking and cycling were addressed in the controlled studies in Perth, Frome and Gloucester, and in an uncontrolled study in Adelaide. These included marketing campaigns, incorporating some tailored health messages. In the controlled studies, a positive increase in walking and cycling was observed.

Theme 4: Parental responsibility and behaviour

This theme included aspects of children's views about parents' car use, limitations on children's independence, and expectations about parenting in relation to walking and cycling. Only one intervention in the systematic review addressed this theme. In a school-based intervention implemented in Adelaide, Australia, children were asked to 'relay the method and philosophy of choosing more active transport to the remainder of their household'. This could address the contradiction children see between messages to walk and cycle, and their parents' car use. However, the intervention was not evaluated with a control group.

Theme 5: Differences in views across ages, sex, SES and locations

This theme cuts across all the other themes. None of the evaluated interventions appeared to target particular social groups of children, young people or parents. Sometimes it was difficult to tell, due to the lack of information provided in either the systematic review or the primary studies.

Effective, appropriate and promising interventions

The cross-study synthesis helps to answer questions about how effective and appropriate interventions are best developed, implemented and evaluated.

1. In what ways are the influences on walking and cycling identified within the views synthesis similar to, or different from, those addressed in outcome evaluations?

The views studies suggest that two interventions shown to be effective in other studies would be acceptable and appropriate: tailored marketing measures that emphasise convenience and health messages; and the improvement and extension of cycle networks. The TravelSmart programme implemented and evaluated in Perth (Australia), and Frome and Gloucester (England) was all evaluated in controlled studies. Providing tailored leaflets, timetables, maps and free bus tickets, the programme emphasised the convenience and health benefits of non-car travel. Changes to cycling infrastructure were also implemented in some studies. All three examples of this programme found a positive shift toward walking and cycling. In Delft (the Netherlands), cycle networks were improved and extended through the construction of large bicycle underpasses and bridges, new or resurfaced segregated paths, and allowing cyclists two-way rights on one-way roads. A positive trend of unclear significance toward cycling was noted. This intervention fits well with the views expressed by children and young people in the research we looked at about needing facilities such as cycle paths.

Several other uncontrolled studies exhibited some degree of match with children's, young people's and parents' views concerning safety, traffic and existing facilities. These show mixed results, however; the interventions in these studies need to be evaluated more rigorously before conclusions about effectiveness can be made.

2. Do those interventions which address influences identified by the views synthesis show bigger effect sizes in their evaluations?

All the intervention studies included in the review by Ogilvie *et al.* (2004) had the potential to address the views of children, young people and parents, but evidence of the effects of intervention was only considered reliable if drawn from controlled studies. Four of the six controlled studies showed positive effects; one study found no change; and one showed a decrease in walking and cycling. The largest effect sizes were in the controlled studies offering tailored marketing with infrastructure changes and cycle networks. However, there was not enough detail in either the review or the primary studies to determine whether those studies with bigger effect sizes addressed views more directly.

3. To what extent do people's views on walking and cycling diverge from their willingness to walk and cycle, and how does this impact on intervention effectiveness?

People's views on walking and cycling appear to diverge from their willingness to walk and cycle in a number of studies. Interventions that addressed barriers or facilitators identified in the views studies were disappointing: two controlled studies evaluated interventions that showed either no effect or a possible negative effect.

One multi-faceted intervention implemented in Camden and Islington introduced a variety of strategies organised by a school travel co-ordinator, including walking buses, safety measures, traffic reduction and calming schemes, crossing patrols and new crossings, parking restrictions and speed limits; yet no change in walking or cycling was found. Strategies may not have been provided in a way that directly addresses people's views. For example, although the intervention involved publicising the strategies as 'safe' or 'convenient', it might have been more successful if walking buses had been promoted specifically for younger children and by emphasising the health benefits of walking.

Similarly, a publicity campaign in Maidstone emphasised the issue of sustainable transport in a bid to improve walking and cycling. Decreases in both walking and cycling trips were found (statistically significant only for cycling). Again, this potentially negative effect could have occurred because of the way in which the intervention was provided. A more positive effect may have resulted with the targeting of younger children, who are more receptive to the idea of the environmental benefits of walking and cycling, or if messages about sustainability were balanced with messages about safety for parents.

4. Do differences in the interventions highlighted by the findings of the views studies explain any heterogeneity of effectiveness between studies?

Some barriers and facilitators identified in the views studies were addressed by interventions that have been poorly evaluated. One such study in Adelaide, Australia, provided tailored feedback on personal travel diaries and information on maps and timetables. This could have addressed children's, young people's and parents' views about convenience. Studies evaluating interventions to construct, improve and extend cycle networks in Germany, England, and several other European countries appear to match views about the need to provide facilities. Similarly, several potentially innovative studies from England, Norway and elsewhere in Europe evaluate the provision of traffic-related facilities, including speed reduction, traffic bypasses and facilities for pedestrians and cyclists, and traffic restraint measures. These may address views expressed by children, young people and parents concerning traffic and their desire for better facilities to walk and cycle. Finally, one study evaluated the provision of a new train station in the Netherlands, which may also be addressing people's views about the need for convenient facilities. Interventions described in these studies are ready for more rigorous evaluation.

The lack of rigour in these studies, combined with the lack of detail concerning interventions, makes it difficult to draw conclusions about differences in effectiveness between studies.

5. Which recommendations for intervention development derived from the views and experiences of the public have yet to be addressed by interventions evaluated by outcome studies?

Several gaps existed between the views of children, young people and parents; these were uncovered in the research we looked at and the evaluated interventions included in the review by Ogilvie *et al.* (2004). None of the intervention studies addressed people's preference for cars, or tried to change overall perceptions of cars as status symbols, as more convenient or 'cool'. Further, few studies addressed concerns about children's safety from personal attack or children's views about the convenience of walking and cycling; and none promoted the benefits of being able to socialise with their friends. There were also no evaluated interventions that addressed parents' views about the need to put limitations on children's independence, their views about safety, or their perceptions about society's expectations of what it is to be a 'good' parent in relation to their children's walking and cycling choices.

CHAPTER 6. DISCUSSION

6.1 Substantive findings

6.1.1 Children's, young people's and parents' views

The synthesis of views studies revealed several barriers and facilitators at the levels of the individual, family, community and wider society. These barriers and facilitators correspond to those noted in previous research (Foster *et al.*, 2005; Killoran *et al.*, 2006), but we found that the factors interrelate a great deal more than is described in this research. For example, the review by Killoran *et al.* (2005) identified the public's concerns about traffic as a safety issue. Our review was able to add to this by showing that, while traffic is a safety concern, it is more of a concern to younger children. Young women and their parents are more concerned about personal safety in terms of abduction and rape. This impacts on whether young people walk or are driven or accompanied by adults. The interrelated nature of these findings points to a need for broad social policy interventions that cut across government departments, including those dealing with crime, health, education, transport and wider land-use patterns.

Currently, society and the structural environment favour the car and mitigate against children's and young people's independence: fast traffic and the lack of crossing facilities for walkers are a real threat to safety, and there are few facilities for cycling. As a result, there are fewer children and families on the streets, either as pedestrians or as cyclists. This is most likely a strategy on the part of parents to prevent accidents and maintain children's personal safety. Perhaps these parents feel obliged to protect children from danger rather than nurture their independence. Their perception may differ if community was valued above the convenience of cars. Children and young people have lost an independence and maturity that was enjoyed by earlier generations (Adams, 1993; Hillman, 1999).

In *Choosing Activity: A Physical Activity Action Plan* (2005), the Department of Health advocated fostering a 'culture shift' to support people in more active lifestyles. Our review found that a broad 'culture of transport' does exist. Key differences by age, sex and location (rural, suburban or urban) merit further research.

Most research on active transport has prioritised cycling and travel to work. The majority of studies on the public's views have used closed question surveys to elicit information, often in combination with some other form of data collection, such as focus groups or interviews. People's views about walking and cycling, tend to be about safety, existing facilities, the acceptability of walking and cycling and convenience. We found very little research on the influence of the family in relation to walking and cycling.

The cross-study synthesis of children's, young people's and parents' views about walking and cycling combined with the review of interventions by Ogilvie *et al.* (2004) suggested some appropriate interventions which may work and several which are promising but require further evaluation. A focus of our review was the health aspects of walking and cycling as means of transport. Studies measuring

physical activity alone would thus have been relevant – the review by Ogilvie *et al.* only included interventions studies that showed both a modal shift and measured walking and/or cycling outcomes. Thus, there may be some intervention studies measuring just walking and cycling that we have not considered. The results of the views studies indicate that many opportunities exist to develop new appropriate interventions.

6.1.2 Views and effects of interventions

Effective and appropriate interventions

Among the studies included in the review by Ogilvie *et al.* (2004), population-level interventions were considered to be effective if this was shown in a controlled trial and also appropriate if they addressed the views of children, young people and parents.

Interventions which combined tailored marketing campaigns promoting walking and cycling as more convenient with some infrastructure changes appeared to be appropriate, as did the improvement or extension of cycle networks. These approaches matched children's, young people's and parents' views about the convenience of walking and cycling, and the need for more dedicated facilities.

Children noted and appeared to appreciate the health benefits of walking and cycling. Interventions which included messages about the health benefits of active transport resulted in increased walking and cycling, thus indicating that this type of marketing could be both effective and appropriate among children.

The largest improvements resulting from interventions were found in motivated subgroups. For example, the marketing campaigns in Frome, Gloucester and Perth were deliberately targeted toward groups most likely to change. In the Delft study, which was the most successful of the cycle path interventions, much of the increase in cycling was found in those who were cyclists before the intervention. This is also a population more geared toward a culture of cycling. Questions remain about whether such interventions would be as effective for new cyclists, socially disadvantaged groups, or a less cycle-friendly culture, such as that in Britain. It is important to identify interventions which encourage groups who are not already favourably disposed to increase their use of active transport.

While people did express relatively clear views about what facilities and infrastructures would be needed to encourage active transport, it is impossible to say on the basis of existing research which facilities would be most likely to increase active transport.

Appropriate interventions that appear ineffective

Some of the controlled interventions (Maidstone, Camden and Islington, Perth) included infrastructure and publicity campaigns or marketing components addressing the views of children, young people or parents, but with mixed success. These apparently conflicting results may be due to differences in the 'dose' of intervention provided, or to differences in the balance of intervention components: for example, it is possible that marketing information about active travel was more heavily emphasised than marketing the infrastructure components. Differences in effects may also have been a result of differences in

marketing targeted toward children, young people and parents. This approach appears promising but needs to be examined in more detail.

Appropriate interventions that need further evaluation

Views about the need for better facilities for walking and cycling may have been addressed by several population-level interventions that have not yet been rigorously evaluated. These include infrastructure changes which may encourage walking and cycling while discouraging car use, such as traffic speed reduction/calming measures, cycle lanes, road user charges and even the construction of a new train station. Aspects of these interventions need to be considered in more detail. For example, where structural change consisted of the provision of new cycle routes, the provision of large-scale, integrated networks of routes (such as in Delft) is more likely to be effective than constructing single paths (as in Stockton). A broader approach to structural change, which attempted to improve the overall experience of transport for both pedestrians and cyclists, was implemented in one study (bypasses in England). This found no evidence of a modal shift but the study did not use a control group. The effect might have occurred because the principal component of the intervention was the construction of new roads, making car use potentially more attractive.

A combination of effective strategies could increase walking and cycling. Further, most of the uncontrolled studies evaluating infrastructure changes do not describe 'marketing' of the intervention or information schemes for users, which could have a positive impact on walking and cycling.

Views that do not appear to have been addressed by interventions

As noted earlier, very few of the intervention studies included in the review by Ogilvie *et al.* (2004) dealt with the theme of changing the culture of car use. No studies addressed concerns about children's safety from personal attack, or their views about the convenience of walking and cycling and the benefits of being able to socialise with their friends. Views about family level influences also do not feature in the interventions included in the review. Given that Ogilvie *et al.* were focusing on population-level interventions aimed at people of all ages, these gaps are perhaps understandable. They are important areas for future research.

6.2 Strengths and limitations of the review

A strength of our review is its focus on what matters to the public, using studies of their views and examining what they say about the kinds of interventions that have been tried to promote walking and cycling. For example, safety has been described as an important issue in active transport (Killoran *et al.*, 2006). Our review has been able to add to this by describing what in particular matters to children, young people and parents about safety (e.g. traffic for younger children, personal safety for older children and parents) and then setting this within the context of people's everyday lives. Next, our review draws on detailed themes in these views in order to comment on interventions evaluated for their effects as a basis for evidence-informed policy.

There are benefits and challenges in applying a research question about children and young people's travel to a completed systematic review that did not look

specifically at this age group. To the best of our knowledge, ours is the first attempt to integrate systematically the results of an already-existing systematic review of interventions with a systematic review of a specific subset of the public's views on the same topic. As such, it offers a method to combine efficiently the results of different kinds of research to enhance the relevance of both to policy and research.

It was deemed appropriate to use conventional methods of not looking closely at the effectiveness review's results until after the views analysis of children, young people and parents was complete, in order to reduce bias. However, this meant that the review found more gaps about appropriate interventions and was therefore less able to draw firm conclusions about population-level interventions appropriate to children, young people and parents. This creates a need for future research examining the effectiveness of individual-level interventions, specifically targeted toward this age group.

This was a first attempt to synthesise results from a systematic review of interventions not conducted by the EPPI-Centre. Relying on review authors' descriptions of the primary studies, and on primary study authors' descriptions of their interventions, meant that information could be incomplete. While this is a normal event in conducting systematic reviews, it is possible that the additional complexity involved in gathering data may have provided the potential for data misinterpretation.

The review of interventions by Ogilvie *et al.* (2004) concentrated on population-wide strategies. While our synthesis of the public's views has thrown light on whether population-wide interventions are appropriate for children, young people and parents, more may be learnt from other evaluations of interventions which have not been included in this analysis; in particular, those targeted to individual schools and groups of children, young people and parents. It is a common finding that analysis by subgroups rarely occurs in the primary studies included in health promotion and public health reviews (Jackson and Waters, 2005). Related to this, it proved difficult to get detail from review-level evidence about either specific populations under study or complete descriptions of interventions. However, this is not surprising, given the challenges of limited word space in publications and the quality of reporting of interventions in primary studies.

Making a decision to review only higher quality studies resulted in the loss of 18 studies. The lower quality studies differed from the higher quality studies in that most of them examined children's, young people's and parents' views in relation to cycling. There is thus a particular need for more rigorous research concerning the views of children, young people and parents about cycling.

Our review sought to test specific *a priori* hypotheses about the likely influences on walking and cycling based on previous research, but also allowed other influences to emerge from the data. This approach worked well, since twice as many new barriers or facilitators were identified from examination of the views studies.

We undertook three innovations to our review methods: searching for views studies, using the research question rather than using study design filters; increased use of manual searching of websites; and explicit use of levels of influence at the beginning of the analysis stage, rather than at the end. Each of these had mixed consequences.

As in previous EPPI-Centre reviews, we used the research question to develop concepts for locating research on the public's views. Others, including Popay (2005), have recommended using search filters that locate studies of qualitative design in order to comprehensively access this literature. However, a comparison of both types of search terms showed that using strictly qualitative design terms would have missed at least one primary study located for this review (Black *et al.*, 2001), which used more quantitative methods. This result indicates that using the research question to drive the search for relevant studies, rather than thinking of research as strictly 'qualitative' or 'quantitative', returns more relevant research on the public's views. This remains a methodological area to be tested in future research.

Ogilvie *et al.* (2005) discussed the limitations of using study design to determine the inclusion of studies to form a review of social interventions. Analysis of available evidence from included and excluded studies in their review of walking and cycling interventions suggested that examination of only higher quality studies (such as randomised controlled trials (RCTs)) would have missed additional promising interventions requiring more rigorous evaluation in future. Our review of the public's views synthesised only those results from studies meeting a higher number of 'markers' of quality. However, the lower quality studies were also examined and briefly described. The majority were about cycling and their results were similar to those found in the higher quality studies. When time and resources do not allow full examination of dozens, sometimes hundreds, of studies, determining a cut-off point for data extraction is a necessary step in systematic reviews of social interventions. However, less detailed information can still be provided to alert interested readers to potentially valuable interventions in need of more rigorous evaluation.

Ogilvie *et al.* (2004) encouraged the use of key resources recommended by experts when searching for transport-related studies. Our experience of this recommendation was that searching websites of key government and transport research recommended by the Advisory Group elicited many relevant publications, while handsearching key journals recommended by the same experts was much less fruitful (and more time-consuming).

As a final innovation, we chose to make explicit use of levels of influence (i.e. individual, family, community and the wider society/environment) at the beginning of the analysis stage, rather than at the end to determine if this facilitated the process. During the initial stages of the analysis, influences to walking and cycling fell fairly neatly into the levels. However, it became difficult to use once influences required synthesis into themes, because influences interacted across levels. For example, car use was an influential issue at all four levels: individuals identified their preference for cars, families described using cars for safety; traffic was seen as a community level barrier; and the convenience of car use was described as a wider society influence. This complexity necessitated going beyond levels in order to determine the overall themes emerging from the views. Future systematic review analyses could explore the use of these levels of influence further by focusing the review question onto a more specific topic or level, although this might miss the ways in which issues interrelate. Levels of influence could also be used explicitly at the thematic development stage, as a way of showing how any barrier or facilitator influences individuals, families, communities and wider society. Finally, a clearer comparison could be made in the cross-study synthesis between the levels of influence at which people's views are operating and the levels of influence at which interventions are targeted.

6.3 Methods of primary studies

6.3.1 Views studies

The reliability of the evidence considered in this review necessarily depends on the quality of the primary studies reviewed. There were some problems with the way in which primary studies were reported.

Views studies rarely described the socio-economic status (SES) of the study participants, although in many cases some indicators of SES were provided of the area under study. This made it difficult to draw out differences in views between affluent and less affluent areas.

Differences according to the age of the participants, their sex, and their location occurred across studies. However, individual studies varied enormously in their comparison groups. For example, age ranges within studies could vary from one year (Hine, 1996; Jones *et al.*, 2000; McKee, 2004) to 13 years (Davison *et al.*, 2003). Studies did not look at differences among participants by their location. Only two studies focused on differences between children, young people or parents from different locations within the same study (Jones *et al.*, 2000; Tyrrell, 2000). In other cases, important comparisons do not appear to have been made. For example, Bickerstaff and Shaw (1999) discussed views expressed by children and parents about their preference for children to walk but did not note that there was a difference between the two groups. Clearer comparisons of these factors among groups within individual studies are warranted.

The extent to which the public's views have been elicited consistently across studies is questionable. Researchers often research topics which they or the study funders set; the topics are not chosen by the participants. Only seven of the sixteen studies involved participants, even partially, in designing or conducting the study. In addition, the restriction of some studies to Likert scales and preset questions that were not informed by participants reduces the likelihood that children's young people's or parents' views are heard. Some topics reviewed appear to be somewhat one-dimensional in nature. It is not clear whether this is because they have been deemed to be truly important by the public or because they are convenient, practical or conceptually clear to study.

Very few views studies described the theory behind their methods of synthesis: only two studies (Bostock, 2001; McKee, 2004) clearly reported the theory or rationale behind their methods of synthesis. A further four views studies partially described their methods of synthesis or alluded to a rationale for the methods used (Bickerstaff & Shaw, 2000; Jones, 1998; Jones *et al.*, 2000; Lupton & Bayley, 2002). Ogilvie *et al.* did not describe whether outcome evaluations included in their review used theory in the development of interventions, either because it was not reported by primary study authors or was not extracted by review authors. This lack of clear description of the use of theory makes it difficult to compare the use of theory across different study types.

6.3.2 Intervention studies

Intervention studies can also have their shortcomings. Many of those reviewed by Ogilvie *et al.* (2004) lacked a control group, making their findings subject to bias.

This reduced the ability of many studies to draw reliable conclusions about the effectiveness of interventions.

The intervention studies were not consistent in the outcomes they measured. For example, there is a need to measure the effects on children as well as on parents, since the views of these two groups about appropriateness appear to differ with respect to walking and cycling. Some multifaceted interventions were not always recognised as such when effectiveness was being discussed. For example, in the Frome, Gloucester and Perth studies, strategies to change behaviour and publicity campaigns providing non-targeted information about interventions took place alongside infrastructural changes, but outcomes were reported as if they were attributed solely to publicity aspects of the intervention. It remains unclear whether and how infrastructure changes contributed to overall effects. Understanding which intervention components impact on outcomes, and whether all components contribute to a change in outcome, would allow clearer choices to be made concerning future intervention development.

The intervention studies included in the review by Ogilvie *et al.* (2004) showed that either people's knowledge and attitudes do not change as a result of alterations in their local environments, or changes in knowledge do not lead to different behaviour. For example, the control and intervention groups in the Maidstone study showed no differences in perception of alternative transport options after a publicity campaign on sustainable transport. The study of bypass construction and other infrastructure changes in England showed marked alterations in people's perceptions as a result of the intervention, but walking and cycling rates fell. Consistent measuring is needed of both mediating variables (such as knowledge and attitudes), and behavioural outcomes (such as walking and cycling).

6.4 Culture of walking and cycling

Where do these views of children, young people and parents fit into the 'culture of walking and cycling'? It is difficult to understand what the culture of walking and cycling is in the UK. Advocacy groups in the UK and local councils refer to 'cultures of cycling' or 'cultures of walking' (Cambridge Cycling Campaign, 1999; City of York Council, 2004; Leicester City Council, 2006; Suffolk County Council, 2006), but very little academic discussion of this topic could be found. Considerable literature in Europe, Australia and America was also located. Both non-UK academics and UK-based local councils and advocacy groups discuss a culture of walking or cycling, but usually within an urban environment and targeted primarily toward commuters and workplaces (Killingsworth *et al.,* 2003). In Leicester, where the need for safe routes to school is acknowledged as a priority to promote a culture of walking and cycling, no specific initiatives targeted towards children, young people or parents could be found listed on the council's website (Leicester City Council, 2006). In addition, discussions about the cultures of walking and cycling do not appear to address differences found between the views of children, young people and parents about walking and cycling, specifically in rural areas. We propose that a culture of walking and cycling does exist among children, young people and parents, and that it may vary according to children's, parents', and young people's sex, age, location and possibly socio-economic status.

The views elicited in these studies also indicate a conflict among parents about their role in relation to their children's transport – namely, a struggle between nurturing and protecting. Criticisms of UK policy and resultant changes to the built environment and community infrastructures emphasising safety over community values have noted this effect on parents (Adams, 1993). The views expressed by parents indicate a desire to be seen to be as a 'good parent' and to protect their children, while recognising that their choices for their children do limit their children's independence when there is a perception of danger. Current policy must help parents to achieve a better understanding of the risks involved in not allowing their children to walk or cycle to school. This means being careful not to add to parental conflict, by balancing messages about safety and risk to future health from inactivity, with those valuing walking and cycling as primary forms of transport. The breadth and complexity of the factors influencing walking and cycling indicates a need to examine these factors in more detail. Safety provides a good example. It has been the subject of much research on transport (Killoran *et al.*, 2006) but is not a one-dimensional topic. Safety is not intrinsic to one mode of transport, but should take into account its relationship to other factors. For example, studies of parental concerns about safety were cited as a reason to drive children from place to place, and particularly to school (Black *et al.*, 2001; Cahill, 1996; Jones, 1998). Parents may have been assuming that either (a) driving as such involves less risk of traffic accidents than walking or cycling or (b) being with their children throughout the journey to school enables them to minimise the risk of traffic accidents, abduction or attack. Focusing too narrowly on the first issue would miss the implication that many of the concerns parents express about safety might be addressed by accompanying their children to school on foot or by bicycle – or having another trusted adult accompany them – and do not necessarily imply that the car must be used. This example also suggests that parents' concerns about safety may reflect social pressures to be a 'good parent' by adopting cultural norms defined as 'safe', as much as an assessment of objectively present risk factors.

It is unclear whether parents' (and children's) concerns about safety would be alleviated by objectively measured improvements in safety. The most recent statistics (1994-1998 and 2004) on child deaths and serious injuries indicate that rates for both child pedestrians and cyclists fell by 44% and 49% respectively (Department for Transport, 2004a), but perceptions of safety do not appear to have improved in this period. Views about traffic as a danger did not improve in studies published between 1996 and 2004. Further, the total number of children killed or injured as car passengers, rather than as pedestrians in Britain was similar over this period (11,885 in 1994-1998 versus 12,234 in 2004; Department for Transport, 2004a). While a child is at slightly less risk of accidents as a car passenger than as a pedestrian, this difference in objective risk is inadequate to explain why perceptions of safety are so often cited as a barrier to active transport. The subjective sense that the car offers protection from a hostile environment may be equally important.

As with safety, other factors influencing transport choice involve a complex interplay between subjective and environmental factors, and the meaning attached to different forms of transport. Where walking and cycling are perceived as inconvenient, this could reflect time pressures and land-use patterns which make these modes of travel less practical. Alternately there may also be a perception that walking and cycling are activities linked with lower social status (Bickerstaff and Shaw, 2000).

Further, factors influencing transport choice, such as convenience and sociability, can be both barriers and facilitators, depending on whose view was being sought. For example, children and young women identified walking as a good way to be sociable with friends; young men thought cycling restricted being sociable. Understanding that these differences exist between children and young people and between walking and cycling as forms of transport is important. It will provide insight into why some interventions to promote walking and cycling are or are not effective, and may indicate how to target strategies more effectively.

6.5 The context of previous 'views' research

Previous EPPI-Centre systematic reviews examining the barriers and facilitators to physical activity in children and young people noted similar findings to ours: specifically, that children and young people value the social aspects of physical activity, and have clear ideas about the practical and material resources that are needed in order to be physically active (Brunton *et al.*, 2003; Rees *et al.*, 2001). Children also describe the importance of family life and parental support in order to be physically active (Brunton *et al.*, 2003; Rees *et al.*, 2001). Examination of these findings in relation to this review adds strength to the finding that a culture of walking and cycling exists in this group, and merits further research.

6.6 Policy context

Cross-government policies are aiming to encourage walking and cycling through changes to existing facilities; an emphasis on health messages increasingly delivered through social marketing and environmental aspects, such as sustainable town and city planning. The underlying philosophy is that if pleasant, safer environments existed, people would be more inclined to walk and cycle. The themes derived from the views studies examined in this review echo this. However, it is not clear whether the message is getting through to those groups who would most benefit from it. For example, children, young people and parents say they want more facilities to enable them to walk and cycle, and national policy reflects a commitment to provide these. However, there is little evidence of effectiveness in the various population-level intervention studies designed to increase walking and cycling. There may be a number of reasons for this. National standards may not be consistently met by local government initiatives. Implementation of national policy by local government may not reflect public needs closely enough, and/or may not be carried out at a high enough intensity or for long enough to have a significant effect. Finally, data-collection methods may not have been sensitive enough to detect the public's true motivations.

Current cross-government policy fails to address the themes derived from children young people and parents about the culture of car use; children as responsible transport users in their own right; and the differences in the needs of children and young people dependent on age, sex and the location in which they live. The Sustainable Communities movement is trying to encourage population-level changes with more emphasis placed on creating public spaces that prioritise pedestrian and cycle travel (Department for Communities and Local Government,

2005), but rigorous evaluation needs to be attached to these initiatives to ensure that claims about effectiveness (or a lack of effectiveness) are evidence-based.

The findings from this systematic review indicate clear and complex factors which influence children's, young people's walking and cycling. These factors influence each other and operate at the level of the individual, family, community and wider society. They are thus relevant to many policy-makers, practitioners and researchers who are interested in wider social policies relating to the environment, health and inequalities.

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

In this review, we looked at a range of qualitative research concerned with factors influencing walking and cycling among children, young people and parents. There were four themes which stood our clearly in this research: a strong culture of car use, fear and dislike of local environments, children as responsible transport users, and parental responsibility for children. The key implications for interventions that follow from these themes are (a) to reduce the convenience of car travel, and (b) simultaneously to increase the safety of pedestrians and cyclists in residential areas, and around schools and leisure facilities in order to (c) strengthen community interactions and (d) nurture children's and young people's independence in a safer environment.

The 'culture of walking and cycling' that exists in the UK among children, young people and their parents differs by age, sex, and location. This merits further examination to understand who is most likely to benefit from what intervention.

Our review of research complemented the only existing systematic review of intervention effectiveness in the area of walking and cycling. This review included intervention studies targeted at communities and all ages. While the review by Ogilvie *et al.* (2004) provides an excellent overall picture of what interventions may benefit the general population, combining it with findings from qualitative research in a cross-study synthesis leaves gaps in understanding about what would be most effective for children, young people and parents. We need more good quality research on interventions for particular social groups. Nonetheless, it is possible to derive a number of recommendations from the work described in this report. They are grouped into recommendations for developing future effective and appropriate interventions, systematic reviews, and views studies.

Recommendations for developing effective and appropriate interventions

Interventions shown to be effective and appropriate

Changing perceptions of cars as more convenient or as the only convenient mode of transport has been addressed effectively by targeted marketing measures in the UK and Australia. The synthesised views literature offers pointers for further developing this approach. **We recommend thoughtful adoption and adaptation of effective social marketing interventions.**

Children appreciated the health benefits of walking and cycling, and interventions which included messages about the benefits of walking and cycling showed an increase in this activity. **We recommend the adoption of social marketing interventions which emphasise the health benefits of walking and cycling to children.**

Promising interventions shown to be appropriate but requiring further evaluation

Many interventions addressing concerns about traffic have been evaluated, usually poorly. The one well evaluated intervention showed no effect on walking and cycling. **We recommend close inspection of the impact of traffic calming studies on active transport, in order to identify promising interventions for rigorous evaluation.**

The Delft new cycle network increased cycling. Other less rigorously evaluated cycling networks appeared ineffective. Understanding 'what worked' with these initiatives could reveal if similar strategies could be implemented in UK settings. **We recommend close inspection of cycle networks in Delft and elsewhere in order to identify the active elements of effective design and rigorously evaluate new networks.**

Interventions to make cars less convenient have not been rigorously evaluated for their effects. **We recommend that traffic restraint and related measures be rigorously evaluated for their effects on walking and cycling.**

Children appreciated the links between car use and damage to the environment. The only relevant intervention was not targeted at children. **We recommend marketing walking and cycling to children as environmentally friendly, within rigorous evaluations.**

We found no well-evaluated interventions addressing concerns about cycle crime. **We recommend rigorous evaluations of interventions addressing cycle crime.**

Children appreciated the health benefits of walking and cycling, and one rigorously evaluated intervention had positive effects. **We recommend encouraging walking and cycling as activities promoting both physical and psychosocial health, to parents as well as to children.**

Children and young people were aware of both the impact of car use and the example set by their parents with respect to car use. **We recommend rigorous evaluations of interventions that encourage children to discuss with their parents the ways and reasons to reduce car use in favour of more active forms of transport.**

Interventions requiring further development and evaluation to determine whether they are effective

Analysis across studies highlighted differences in children's, young people's and parents' views based on ages, sex, SES and locations. **We recommend designing interventions tailored to the target audience's age, sex, SES and location.**

Evaluations of interventions from the review by Ogilvie *et al.* (2004), which address concerns about accidents, have had mixed results. This may reflect variations in design between the interventions, or discrepancies between details of the interventions and the views of the target populations. **We recommend**

close inspection of studies addressing concerns about accidents in order to identify the likely active elements of effective interventions.

Concerns about children's safety from personal attack have been addressed by only one rigorous study of an intervention (a walking bus scheme). Disappointingly, there was no increase in walking and cycling. Personal safely was not addressed by any interventions suitable for older children or young people, such as: accurate messages about safety, personal alarms, anti-bullying interventions, and designing and modifying shared walking and cycling paths to allow increased visibility. **We recommend that the views of children, young people and parents be taken into account when developing interventions to address concerns about personal safety**.

Improved facilities for pedestrians combined with traffic restraint and a publicity campaign in Maidstone did not lead to more walking; however, this was not targeted specifically towards children and young people. **We recommend that similar interventions be attempted first within a rigorously evaluated intervention targeted toward children, young people and parents to determine whether they are specifically effective in improving active transport.**

Children appreciated the convenience, independence and sociability of walking and cycling, yet no interventions were found which addressed these issues. **We recommend marketing walking and cycling as 'cool' to appeal to children, within rigorous evaluations.**

No evaluated interventions addressed measures to relieve the restrictions parents place on children's independent travel. **We recommend careful development and evaluation of interventions to promote children's walking and cycling to parents, by balancing messages about safety and risk to future health through inactivity, with those encouraging children's independent mobility.**

Parents' perceptions of expectations about their abilities and behaviour influenced their children's experiences of walking and cycling. **We recommend rigorous evaluations of interventions that promote the idea that being a 'good' parent means demonstrating appropriate walking and cycling behaviour, and allowing children to walk and cycle in order to encourage independence safely, while simultaneously caring for the environment.**

Recommendations for future views studies

The findings of this review suggest that different factors influence walking and cycling, according to sex, age, and location. Children, young people and parents are not homogenous groups. These differences need exploration through separate studies and differential analyses. **We recommend that 'cultures of walking and cycling' need to be examined in more detailed research.**

Analysis of the studies in this review highlighted that very few described public consultation in research design, data-collection methods and analyses. **We recommend that researchers working with children, young people and parents ensure that their views are elicited by the use of careful, participant-influenced design, data collection and analysis.**

The views studies were limited in their descriptions of exactly who took part in a study, how many took part, and specifics about proportions of males, females, their socio-economic status and where they live. **We recommend that authors provide clear details about the characteristics of those whom they studied.**

Full descriptions of methods of selection, data collection and analysis were missing in the majority of studies. **We recommend that authors provide complete details of the methods of participant selection, data collection and analysis, and that journals permit them to do so.**

We found that views studies did not always differentiate their findings by age, sex, location or socio-economic status. **We recommend that researchers consistently conduct and report detailed analyses by age, sex, location and socio-economic status**.

Recommendations for future systematic reviews

Strong preferences for cars, and perceptions of cars as status symbols and 'cool' were not explicitly addressed by any of the evaluated interventions reviewed by Ogilvie *et al.*(2004). There may be opportunities to counter these preferences by portraying walking and cycling in a more positive light. Relevant information may be found in a wider body of literature not restricted to population-level interventions. **We recommend conducting a systematic review that aims to seek and appraise the effects of interventions addressing individuals rather than only populations.**

Inspection of studies obtained for this review indicates that at least one would not have been obtained using a design-driven search filter. **We recommend developing strategies to search for views studies which are driven by the review question, rather than by search terms that filter by qualitative study design.**

Searching the websites of key organisations yields many potentially relevant research reports, compared with handsearching key journals. Future research should test out the time and yield of both sources. **We recommend the consistent use of websites in searching for studies, and future testing of the time and yield of website searching versus hand searching of journals.**

We found early in the analysis of the research map that barriers to, and facilitators of, health could be grouped into four levels (individual, family, community, and the wider society/environmental aspects). **We recommend the continued use of levels of influence at the thematic development stage of analysis, matching these levels against similarly categorised levels of intervention.**

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Appendix 1: Search sources

1. Social sciences databases

- CSA (SA, ASSIA)
- IBSS

2. Medical database

- PubMed

3. Transport specific databases

- Geobase

- HMIC (Health Management Information Consortium)
- HELMIS (Health information management service database)
- Transport
  http://www.ovid.com/site/catalog/DataBase/157.jsp?top=2&mid=3&bottom=7&subsection=10

4. Dissertations

- Dissertation Abstracts

5. Grey literature

- British Library

6. Specialist or UK-based websites containing registers

- Google Scholar http://scholar.google.com
- Nottingham School of the Built Environment http://www.nottingham.ac.uk/sbe/
- Scottish Executive http://www.scotland.gov.uk/
- Sustrans http://www.sustrans.org.uk
- UK Transport Research Laboratory http://www.trl.co.uk
- Centre for Transport Studies at UCL http://www.cts.ucl.ac.uk/
- Centre for Transport Studies at Imperial College http://www.cts.cv.ic.ac.uk/
- links to UK academic research centres
  http://www.sd-research.org.uk/sdrguide/category.php?catid=15
- Centre for Transport Policy, Robert Gordon University www.abs.ac.uk/cftp
- Napier University www.tri.napier.ac.uk (Stradling' s work)
- Staffordshire University, CAST (The Centre for Alternative and Sustainable Transport Institute for Environment and Sustainability Research)
  www.staffs.ac.uk/schools/sciences/geography/cast
- University of Leeds, Institute for Transport Studies www.its.leeds.ac.uk/
- University of the West of England, Unit for Transport and Society (UTS)
  www.transport.uwe.ac.uk/research/projects/projects.htm
- University of Westminster, Transport Studies Group www.wmin.ac.uk/transport
- University of York, Stockholm Environment Institute (SEI)
  www.york.ac.uk/inst/sei/IS/overview.html

- Welsh Higher Education Academy, Centre for Education in the Built Environment http://www.cebe.heacademy.ac.uk/
- Commission for Integrated Transport http://cfit.gov.uk/research/ebp/key
- University of Ulster, School of the Built Environment, Transport Planning and Policy Group http://engj.ulst.ac.uk/SCOBE/TRAC/tppgintro.htm
- Transport and Society Network http://geocities.com/transport_and_society
- Transport and Society Research web resource http://geocities.com/transport_research
- Institution of Civil Engineers http://ice.org.uk
- JISCmail Universities Transport Study Group http://jiscmail.ac.uk/lists/utsg.html
- Transport for London, http://www.tfl.gov.uk/tfl/
- Dept for Transport, Mobility and Inclusion Unit http://mobility-unit.dft.gov.uk
- MVA Group (commercial research consultancy) http://www.mva-group.com
- School of Civil Engineering and Geosciences, University of Newcastle upon Tyne http://www.ncl.ac.uk/torg
- Reclaim The Streets http://www.reclaimthestreets.net
- TransportWeb – Information Service for the Transport Industry http://www.transportweb.com
- University of Southampton Transportation Research Group http://www.trg.soton.ac.uk
- Office of the Deputy Prime Minister – Urban Policy http://www.urban.odpm.gov.uk
- Open University Energy and Environment Research Unit http://www-tec.open.ac.uk/eeru

7. Conference proceedings

- European Transport Conference http://www.aetransport.co.uk/lc_cms/page_view.asp?id=673

- Velo-City conference http://www.ecf.com/138_1

8. Contacting key experts

Personal contact was made with key researchers and other systematic reviewers in the field of walking and cycling. Requests for further relevant studies were made to the authors of studies of people's views, and to members of the Advisory Group.

Appendix 2: Quality ratings of included studies (N = 34)
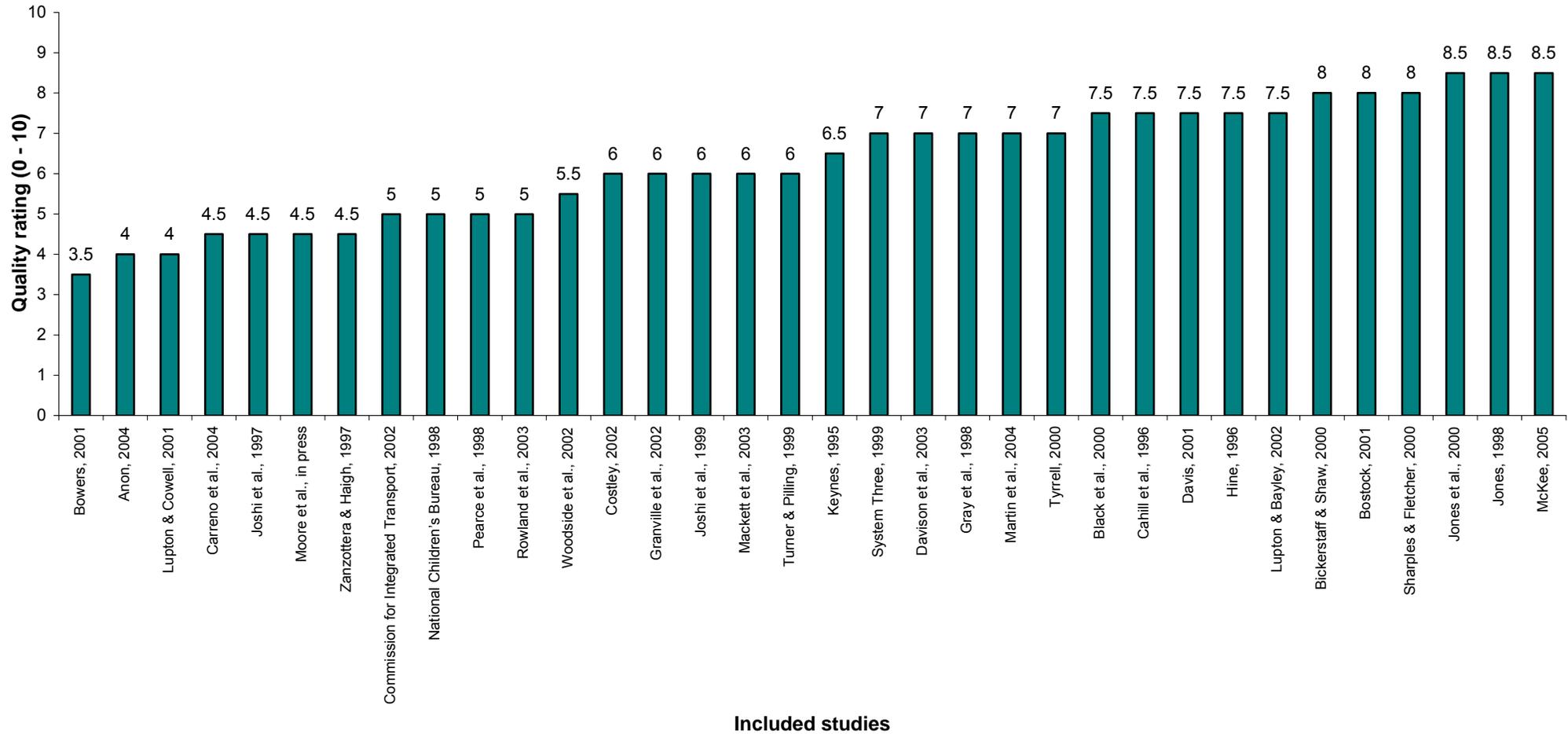
Appendix 3: Aims, methods, populations and quality ratings of lower quality studies (N = 18)

Study	Aims	Methods	Population	Quality rating
Barnardo's and Transport 2000 (2004)	To investigate children's views of road safety	Interviews	7- to14-year-old children and young people	Sampling frame 0.5 Sample selection 0 Sample numbers 1 Ages 1 Sex 0 Socio-economic status 0 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0.5 Usefulness of study 1 *Total 4*
Bowers (2001)	To evaluate views of an intervention to reduce traffic speeds near a school	Questionnaires	All school-age children and young people, parents, local residents	Sampling frame 1 Sample selection 0.5 Sample numbers 0 Ages 0.5 Sex 0 Socio-economic status 0 Reliable data collection 0 Valid data collection 0.5 Views appropriate data collection 0.5 Usefulness of study 0.5 *Total 3.5*

Study	Aims	Methods	Population	Quality rating
Carreno *et al.* (2004)	To evaluate perceptions of the urban environment and obstacles to walking among vulnerable groups	Questionnaires	Older adults, disabled people, parents of young children (under 5 years) and a control group of adults with no disability	Sampling frame 1 Sample selection 0 Sample numbers 0.5 Ages 0 Sex 0 Socio-economic status 0 Reliable data collection 0 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 4.5*
Commission for Integrated Transport (2002)	To investigate public attitudes to transport in England	Questionnaires	General population; includes subgroup analysis of parents	Sampling frame 0.5 Sample selection 1 Sample numbers 1 Ages 0 Sex 0.5 Socio-economic status 0.5 Reliable data collection 0.5 Valid data collection 0.5 Views appropriate data collection 0 Usefulness of study 0.5 *Total 5*

Study	Aims	Methods	Population	Quality rating
Costley (2002)	To provide up-to-date information on cycling use and attitudes towards cycling in Scotland	Questionnaires	Adult cyclists Data collected on child cyclists within households	Sampling frame 0.5 Sample selection 1 Sample numbers 0.5 Ages 0.5 Sex 1 Socio-economic status 0 Reliable data collection 1 Valid data collection 0.5 Views appropriate data collection 0 Usefulness of study 1 *Total 6*
Granville *et al.* (2002)	To investigate the reasons why parents drive their children to school	Focus groups	4- to 15-year-old children and young people, and parents	Sampling frame 0.5 Sample selection 1 Sample numbers 0 Ages 1 Sex 1 Socio-economic status 0.5 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 1 Usefulness of study 1 *Total 6*

Study	Aims	Methods	Population	Quality rating
Joshi *et al.* (1997)	To investigate parents' attitudes towards their children's journeys to school	Questionnaires	Parents of 7- to 11-year-old children	Sampling frame 0.5 Sample selection 0 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0 Usefulness of study 1 *Total 4.5*
Joshi *et al.* (1999)	To investigate the impact of travelling to school by car on children's cognitive and emotional development	Questionnaires, various psychological tests	7- to 11-year-old children	Sampling frame 0.5 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 1 Socio-economic status 0.5 Reliable data collection 0.5 Valid data collection 1 Views appropriate data collection 0.5 Usefulness of study 0 *Total 6*

Study	Aims	Methods	Population	Quality rating
Keynes (1995)	To investigate the potential for a shift away from cars to walking, cycling and public transport for the journey to school in Nottinghamshire	Questionnaires, interviews, focus groups	Children across all school age groups, parents, teachers, headteachers	Sampling frame 1 Sample selection 1 Sample numbers 0.5 Ages 1 Sex 0 Socio-economic status 0 Reliable data collection 0.5 Valid data collection 0.5 Views appropriate data collection 1 Usefulness of study 1 *Total 6.5*
Lupton and Colwell (2001)	To investigate children's perceptions of the road environment and risk, and their road crossing behaviour	Focus group and observations	8- to 14-year-old children and young people	Sampling frame 0.5 Sample selection 0 Sample numbers 0 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 0 Valid data collection 1 Views appropriate data collection 0.5 Usefulness of study 0.5 *Total 4*

Study	Aims	Methods	Population	Quality rating
Mackett *et al.* (2003)	To investigate the effectiveness of walking bus schemes and discuss methodological issues	Interviews	3- to 10-year-old children, parents, headteachers, walking bus co-ordinators	Sampling frame 1 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 0 Socio-economic status 0 Reliable data collection 1 Valid data collection 0 Views appropriate data collection 1 Usefulness of study 0.5 *Total 6*
Moore *et al* (in press)	To investigate correlations between cycling and age, sex, socio-economic status and ethnicity	Questionnaires	Cyclists	Sampling frame 0.5 Sample selection 1 Sample numbers 0.5 Ages 1 Sex 0.5 Socio-economic status 0.5 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0 Usefulness of study 0 *Total 4.5*

Study	Aims	Methods	Population	Quality rating
National Children's Bureau (1998)	To report on an activity day bringing together children from schools involved in various pilot projects to improve the local environment through transport measures	Unclear	9- to 13-year-old children	Sampling frame 1 Sample selection 0 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0.5 Usefulness of study 0.5 *Total 5*
Pearce *et al* (1998)	To investigate link between cycling and health and to identify particular groups who could benefit from cycling	Questionnaires and interviews	Adult commuters, 11- to 17-year-old young people	Sampling frame 0.5 Sample selection 0 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 0 Valid data collection 0.5 Views appropriate data collection 0 Usefulness of study 1 *Total 5*

Study	Aims	Methods	Population	Quality rating
Rowland *et al.* (2003)	To evaluate the effectiveness of school travel co-ordinators	Questionnaires	Primary school-age children and parents	Sampling frame 0.5 Sample selection 1 Sample numbers 1 Ages 0.5 Sex 1 Socio-economic status 0.5 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0 Usefulness of study 0.5 *Total 5*
Turner and Pilling (1999)	To investigate the transport experiences and choices of young people	Questionnaires and focus groups	12- to 23-year-old young people	Sampling frame 1 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 0 Valid data collection 0.5 Views appropriate data collection 1 Usefulness of study 1 *Total 6*

Study	Aims	Methods	Population	Quality rating
Woodside *et al.* (2002)	To investigate influences on use of the car for travel to school	Questionnaires	Secondary school-age young people	Sampling frame 1 Sample selection 1 Sample numbers 0.5 Ages 0.5 Sex 0.5 Socio-economic status 0.5 Reliable data collection 0 Valid data collection 1 Views appropriate data collection 0 Usefulness of study 0.5 *Total 5.5*
Zanzottera (1997)	To investigate barriers to cycling and ways of overcoming them	Questionnaires	Secondary school-age young people, adult commuters	Sampling frame 1 Sample selection 0 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 0 Valid data collection 0 Views appropriate data collection 0 Usefulness of study 0.5 *Total 4.5*

Appendix 4: Methodological characteristics of higher quality included studies (N = 16)

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Bickerstaff and Shaw (2000)	Process evaluation of walking bus scheme. Questionnaires and discussion groups with parents and children; analysis of children's drawings	**Sampling** Questionnaires distributed to all parents with children at this school. Unclear how discussion group participants were sampled. **Recruitment** Not stated **Consent** Not stated	Structured questionnaires and focus groups.	**Reliability** Questionnaire responses used as prompts for focus groups. Focus groups repeated with same participants before and after intervention. Groups moderated to be 'warm and non-judgemental'. **Validity** Methods based on tools used in previous studies.	Questionnaires and discussion groups: unclear Drawing: Content analysis of images	**Reliability** Not stated **Validity** Some limited comparisons between results of different methods.	Children were not involved in study design. Age-appropriate qualitative methods used. Rationale for methods stresses importance of views.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Black *et al.* (2001)	Survey of factors behind mode choice with parents of infant school-age children	**Sampling** Sampling frame consisted of 51 infant or infant/ primary schools. Sampling process unclear. **Recruitment** Not stated **Consent** Not stated	Closed self-completion questionnaires, including Likert-type questions on attitudes.	**Reliability** Extensive piloting of questionnaires **Validity** Construction of attitudinal questions and avoidance of bias based on previous research	Multilevel regression, including both factor analysis (using varimax rotation to assign questions to one of three factors) and question analysis (using questions directly as explanatory variables)	**Reliability** Combination of distinct methods to reduce the likelihood of spuriously significant results **Validity** Further analysis did not produce more consistent factors, showing that the factor analysis was internally valid.	Parents involved in piloting and design of tool. Explicit focus on importance of psychological factors. External validity of data analysis not addressed.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Bostock (2001)	Interviews with disadvantaged mothers	**Sampling** All mothers were on social security benefits. Purposeful sampling to reflect differences in ethnicity and household forms. **Recruitment** Unclear **Consent** Not stated	One-to-one semi-structured interviews with broad topic guides	**Reliability** Interviews taped and transcribed. **Validity** Five themes in topic guide; transport not included in these but emerged as a theme from analysis.	Exploration of convergent and divergent themes in responses to each question	**Reliability** Not stated **Validity** Not stated	No input from parents on design of study. Interview designed to capture complexity of experiences. Thematic analysis enabled emergence of unexpected themes.
Cahill *et al.* (1996)	Questionnaires with children; in-depth focus groups with selected children, parents and teachers	**Sampling** Questionnaires issued to all children in selected year groups in seven selected schools. Focus group participants randomly selected. **Recruitment** Parents contacted by letter **Consent** Parental consent for interviews	Questionnaires including open and closed questions. Semi-structured group interviews with topic guide.	**Reliability** Questionnaires administered with researchers and teacher present. Interviews followed main themes of questionnaires. **Validity** Questionnaires piloted in one school and discussed with headteachers.	Not stated	**Reliability** Not stated **Validity** Not stated	Children involved in piloting of tool. The authors stress the importance of views data. Age-appropriateness of methods discussed.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Davis (2001); Davis and Jones (1996)	Semi-structured questionnaires and focus group discussions with young people	**Sampling** Questionnaires distributed to all children in selected year groups in four selected schools. Focus group participants sampled purposively on the basis of analysis of questionnaires. **Recruitment** Not stated **Consent** Not stated	Semi-structured self-completion questionnaires and focus groups	**Reliability** Questionnaires completed in lesson time. Focus groups taperecorded. **Validity** Questionnaires piloted with small group and based on methods used in previous studies. Questionnaires used to identify themes for exploration in focus groups.	Not stated	**Reliability** Not stated **Validity** Not stated	Young people involved in piloting although not wider design. 'Naturalistic dialogue' and non-threatening engagement with children emphasised.
Davison *et al.* (2003)	Questionnaires and focus groups with children, young people and parents	**Sampling** Sampled schools were involved in Safe Routes to School or related projects. Sampling of individuals unclear. **Recruitment** Not stated **Consent** Not stated	Questionnaires on travel behaviour and attitudes; more detailed 'personal construct psychology' questionnaires in two schools. Drawing with younger children. Discussion groups.	**Reliability** Some surveys supervised by teachers **Validity** Extensive piloting of questionnaire. Similar structure of parent and child questionnaires to explore parental influence on behaviour.	Questionnaires: Unclear but some significance testing of results. Focus groups: not stated	**Reliability** Not stated **Validity** Not stated	Children involved with piloting but not design. Mixed age-appropriate methods used. Psychological theory emphasises importance and complexity of motivations.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Gray (1998)	Evaluation of Cycle Challenge scheme, using questionnaires and discussion groups with children and young people	**Sampling** Schools selected by local authorities. Sampling of individual respondents unclear. **Recruitment** Not stated **Consent** Not stated	Closed questionnaires and discussion groups	**Reliability**: Questionnaires supervised by teacher and research representative. Discussion groups led by trained school specialist and tape-recorded. **Validity**: Not stated	Not stated	**Reliability** Not stated **Validity** Not stated	Young people had no input into methods. Views data used as part of outcome evaluation but not valued in itself.
Hine (1996)	Individual interviews on travel patterns and video-based exercise on crossing behaviour and perceptions of safety	**Sampling** Sampled on basis of prior knowledge of study location. Pedestrians from sheltered and rented housing near study location; children from nearest primary school; young adults from pool of participants in earlier study. **Recruitment** Not stated **Consent** Not stated	Qualitative open-ended interview, using interview guide; 'threshold assessment exercise' using video; interview relating to video excerpts on road crossing and safety	**Reliability** Interview guide used. Interviews taped and transcribed. **Validity** The same questions were used in each part of the interview to facilitate comparison of results.	Thematic analysis of interviews to draw out key points	**Reliability** Not stated **Validity** Not stated	Children not involved in design. Inter-view guide allows children to respond in their own terms. Authors address limitations of children's views data.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Jones *et al.* (2000)	Questionnaires and focus groups with young people	**Sampling** Schools selected to provide range of environments (high-, medium- and low-density). All pupils in selected year groups in three selected schools participated. **Recruitment** Not stated **Consent** Not stated (although voluntary participation emphasised)	Semi-structured questionnaires covered: • travel patterns • out-of-school activities • ideas about health • views about local areas • ideas for change Focus group discussions based on questionnaire responses	**Reliability** Questionnaires completed in lesson time. Focus groups taped and transcribed. Focus groups conducted as 'naturalistic dialogues'. **Validity** Same questionnaires and discussion structure used for each group. Use of single-sex groups for part of study based on prior research.	Iterative thematic analysis	**Reliability** Researchers performed analysis separately **Validity** Themes discussed and revised with reference to overall structure of discussions.	Young people not involved in design or tools. Authors emphasise that focus groups enable young people to take control of the agenda. Friendship groups used to encourage open discussion.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Jones (1998)	Questionnaires and focus groups with British Asian and non-Asian teenage girls	**Sampling** Four classes from each of two selected year groups in one selected school **Recruitment** Not stated **Consent** Participant consent sought`	Questionnaires covered: • behaviour • attitudes to travel • access • gender differences • negotiations with parents. Focus group prompts drawn from questionnaire responses	**Reliability** Questionnaires administered by school staff. Focus groups recorded and transcribed. **Validity** Questionnaires piloted. Selected responses used to stimulate discussion in focus groups.	Analysed according to themes: • travel • access • safety • negotiations with parents and patterns relating to other variables: • age • cultural affiliation	**Reliability** None stated **Validity** None stated	Children not involved in design or tools. Authors stress 'ownership' of discussions by participants.
Lupton and Bayley (2002)	Group interviews with children and young people; observations of road crossing behaviour	**Sampling** Schools sampled on advice of Road Safety Officers and purposively to give wide range of street environments and socio-economic backgrounds. Sampling of individuals not stated. **Recruitment** Not stated **Consent** Not stated	Semi-structured group interviews; observation	**Reliability** Interview guide used. Interviews taped and transcribed. **Validity** Flexible interview structure to allow exploration of issues. Interviewer sought to create a non-judgmental environment.	Thematic content analysis using QSR NUDIST software	**Reliability** Analysis facilitates identification of views about particular themes **Validity** Not stated	Young people not involved in design. Some discussion of importance of flexible, non-judgmental interviews.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
McKee (2004)	Evaluation of intervention to increase walking to school	**Sampling** One school chosen according to supportiveness of headteacher. Pupils living <3 miles from school and currently driven were sampled. **Recruitment** By letter from headteacher **Consent** Parental consent sought	Questionnaires based on stage of change model; mapping exercise; 'draw and write' activity	**Reliability** Data collection supervised by researcher and teacher **Validity** Extensive piloting of tools; 'draw and write' adapted from previous research according to population.	Significance testing on pre-post questionnaire results; 'draw and write' analysed using flexible category analysis	**Reliability** Category analysis designed as open-ended tool to capture attitudes **Validity** Not stated	Children involved in tool design. Authors stress importance of views data within outcome evaluation. Multiple methods for flexibility.
Martin *et al.* (2004)	Multi-method cross-sectional study on themes of transport and social exclusion	**Sampling** Eight schools chosen to provide range of locations and settings. Two year groups sampled within each school. **Recruitment** Via teachers **Consent** Not stated	Questionnaires, travel diaries, focus groups (internet chat rooms), workshops	**Reliability** Data collection supervised by researchers; designed to allow children's expression of attitudes **Validity** Not stated	Unclear	**Reliability** Not stated **Validity** Not stated	Young people not involved in design. Authors stress importance of views data and explore methods in this light. Multiple data-collection methods designed to be interactive and engaging.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Sharples and Fletcher (2000)	On-street survey and survey in schools on attitudes to different types of road crossings	**Sampling** Participants in on-street survey approached randomly. Schools chosen 'partly on a random basis' after consultation with local authorities. Sampling of individuals in schools not stated. **Recruitment** Unclear **Consent** Headteachers' consent for school participation; not stated for individual participants	Questionnaires including open and closed questions; observations of crossing behaviour	**Reliability** Two interviewers used. Schools survey based on general survey. **Validity** Methods piloted and tested on children before study commenced. Questionnaires designed with input from psychologists and Advisory Group.	Not stated	**Reliability** Not stated **Validity** Not stated	Some consultation with children on tool, but not study design. Views data are valued within the closed context of the study.
System Three (1999)	Weighted population survey on walking patterns and attitudes to walking	**Sampling** Unclear. Samples taken from 79 sampling points throughout Scotland and results weighted to population average. **Recruitment** Not stated **Consent** Not stated	Closed questionnaires	**Reliability** Two waves of fieldwork to take account of seasonal variation **Validity** Unclear	Cross-tabulation of responses and demographic data	**Reliability** Not stated **Validity** Not stated	No consultation on tool or design. Closed questionnaire does not allow exploration of qualitative data.

Study	Study design	Sampling and recruitment	Data-collection methods	Reliability and validity of data-collection methods	Data analysis methods	Reliability and validity of data-analysis methods	Findings grounded in participants' perspectives
Tyrrell (2000)	Mixed-method cross-sectional study of children's and young people's attitudes to transport	**Sampling** Local councils sampled on the basis of their commitment to policy development in the area of young people and transport. Not stated how individuals were sampled. **Recruitment** Via schools or training schemes **Consent** Participant consent sought from older age group; parental consent for younger age groups.	Focus groups, quizzes, 'brainstorming', travel diaries, mapping exercise, drawing, a 'graffiti wall'.	**Reliability** Two sessions held with each group where possible. All sessions recorded. **Validity** Variety of methods used according to age group. Material derived from first sessions used to inform subsequent work.	Not stated	**Reliability** Not stated **Validity** Not stated	Children not involved in tools or design. Multiple age-appropriate methods used. Authors emphasise importance of listening to children's and young people's views for research and policy.

Appendix 5: Aims, methods, sample and quality rating of higher quality studies (N = 16)

Study	Aims and methods	Sample characteristics	Quality rating
Bickerstaff and Shaw (2000)	To assess a walking bus scheme in terms of number of pupils walking to school, reduction of traffic, and attitudes of pupils, parents and teachers to the scheme; to describe the implementation process of the scheme Study planned as prospective before-and-after design but most components are actually cross-sectional. Includes mapping exercise; traffic counts; survey of parents' attitudes; survey of children's attitudes; interviews with headteachers.	**Location** Stone, Staffordshire **Sample number** Unclear (≥23) **Sex** Both **Age range (children)** 4-9 years **Socio-economic status** Not stated **Ethnicity** Not stated	Sampling frame 1 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 8*
Black *et al.* (2001)	To investigate psychological and sociological (as well as economic and demographic) factors influencing mode choice in journey to school Self-completion questionnaires and subsequent multilevel regression.	**Location** Hampshire and north-west England **Sample number** 4,180 usable responses **Sex** Both (distribution not stated) **Age range (children)** Infant school (5-7) **Socio-economic status** • 15.4% of parents employed full-time, 45.3% part-time. • 13.8% have no car in household. • SES not directly stated. **Ethnicity** Not stated	Sampling frame 0.5 Sample selection 0 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 7.5*

Study	Aims and methods	Sample characteristics	Quality rating
Bostock (2001)	To explore mothers' experiences of caring for children in poverty, with particular reference to experiences of walking Semi-structured individual interviews	**Location** Midlands **Sample number** 30 **Sex** Female (parents) **Age range (children)** pre-school **Socio-economic status** • All on social security benefits • 85% in receipt of income support • 90% living in rented accommodation • 14% car owners **Ethnicity** 60% White; others Black, Pakistani, Indian, Gujarati Muslim	Sampling frame 0.5 Sample selection 0.5 Sample numbers 1 Ages 0 Sex 1 Socio-economic status 1 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 8*
Cahill *et al.* (1996)	To explore meanings of transport, mobility and access for school children Questionnaires and semi-structured group interviews with children, parents and teachers	**Location** Brighton and Lewes **Sample number** 724 (questionnaire); 21 children, 14 parents, 7 teachers (interviews) **Sex** Both (329 boys, 338 girls) **Age range (children)** Year 5 (9-10) and Year 7 (11-12) **Socio-economic status** Schools represented a range of catchment areas in terms of average SES, but details not stated. SES for sample not stated. **Ethnicity** Not stated	Sampling frame 0.5 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 0.5 Usefulness of study 1 *Total 7.5*

Study	Aims and methods	Sample characteristics	Quality rating
Davis (2001); Davis and Jones (1996)	To understand children's and young people's perceptions of risk and how this affects their decisions about transport mode Questionnaires and focus group discussions	**Location** Birmingham **Sample number** 492 (questionnaire); not stated (focus groups) **Sex** Both **Age range (children)** Year 5-6 (9-11 years), Year 9 (13-14 years) **Socio-economic status** Schools were in broadly working-class areas; SES of sample not stated. **Ethnicity** Not stated	Sampling frame 0.5 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 1 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 0.5 *Total 7.5*
Davison *et al.* (2003)	To explore children's and young people's attitudes to sustainable transport; to understand the influence of environmental education in schools on these attitudes. Questionnaires and focus groups with children, young people and parents	**Location** Stirling, Falkirk, Dumfries and Galloway, Edinburgh, Aberdeenshire, Highland, South Lanarkshire **Sample number** Not stated **Sex** Both (distribution not stated) **Age range (children)** 4-17 years **Socio-economic status** Areas covered included varying SES, but no details stated. SES of sample not stated. **Ethnicity** Not stated	Sampling frame 1 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 0.5 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 7*

Study	Aims and methods	Sample characteristics	Quality rating
Gray (1998)	To evaluate Cycle Challenge schemes in selected areas according to attitudes of participants and changes in travel behaviour, and assess the potential for wider application of the schemes Questionnaires and discussion groups with children and young people	**Location** Warwick, Waltham Forest **Sample number** 341 (questionnaires); 43 (discussion groups) **Sex** Both (distribution not stated) **Age range (children)** 11-16 years **Socio-economic status** Waltham Forest is a lower-income area, Warwick more affluent. SES of sample not stated. **Ethnicity** Not stated	Sampling frame 1 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 0 Views appropriate data collection 0.5 Usefulness of study 1 *Total 7*
Hine (1996)	To analyse the impact of traffic on pedestrian behaviour on high-density mixed-use streets in Edinburgh Interviews including use of video excerpts	**Location** Raeburn Place, Edinburgh **Sample number** 21 total, 7 children **Sex** Both (distribution not stated) **Age range (children)** 9-10 years **Socio-economic status** Not stated **Ethnicity** Not stated	Sampling frame 1 Sample selection 1 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 0.5 Usefulness of study 0.5 *Total 7.5*

Study	Aims and methods	Sample characteristics	Quality rating
Jones *et al.* (2000)	To explore young people's perceptions of travel risks and their handling of parental concerns, particularly with reference to differences between urban, suburban and rural environments Semi-structured questionnaires and discussion groups	**Location** Midlands (Birmingham, Northampton, Kettering) **Sample number** 349 (questionnaires); 100-120 (focus groups) **Sex** Both (approx. 54% male) **Age range (children)** 13-14 years **Socio-economic status** Birmingham – surrounding area: • above average unemployment • below average income • below average car ownership • >50% children entitled to free school meals Northampton – surrounding area: • mixed SES • 50%-83% car ownership Kettering – surrounding area: • mixed SES • 72%-91% car ownership SES of sample not stated. **Ethnicity** >50% Asian in Birmingham; not stated for other samples.	Sampling frame 0.5 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 8.5*

Study	Aims and methods	Sample characteristics	Quality rating
Jones (1998)	To understand teenage girls' perceptions and management of risk, and access to health-promoting environments, with reference to differences between Asian and non-Asian girls Cross-sectional study using structured questionnaires and focus groups to collect qualitative and quantitative data	**Location** Not stated (major UK city) **Sample number** 214 (questionnaires); 48 (focus groups) **Sex** Female **Age range (children)** Years 7, 9 (11-14 years) **Socio-economic status** Wide range of parents' employment type; a 'considerable' number unemployed **Ethnicity** 49.5% Asian	Sampling frame 1 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 0.5 *Total 8.5*
Lupton and Bayley (2002)	To explore children's interaction with the road environment, and restrictions on access, with particular emphasis on (a) road crossing behaviour and (b) leisure journeys, as opposed to the journey to school. Group interviews and observational study	**Location** Hertfordshire, North London (Barnet, Enfield, Haringey) **Sample number** 122 **Sex** Both (distribution not stated) **Age range (children)** 8-15 years **Socio-economic status** Schools covered range of SES, but details not stated. SES of sample not stated. **Ethnicity** Not stated	Sampling frame 1 Sample selection 0 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 7.5*

Study	Aims and methods	Sample characteristics	Quality rating
McKee (2004)	To design and deliver an intervention in one school designed to increase walking to school; measure the impact of the intervention (one-group pre-post design); establish children's motivations and barriers for walking to school Questionnaires, mapping, 'draw and write'	**Location** West Dunbartonshire **Sample number** 60 (31 intervention, 29 control) **Sex** Both (60% female) **Age range (children)** 9-10 years **Socio-economic status** Not stated **Ethnicity** Not stated	Sampling frame 1 Sample selection 1 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 0.5 *Total 8.5*
Martin *et al.* (2004)	To investigate the role of transport in the social exclusion of young people; to identify influences on young people's transport choices; to investigate the appropriateness of various consultation techniques Questionnaires, travel diaries, focus groups, workshops including drawing and hypothetical scenarios	**Location** Leeds, Congleton (Cheshire), Sherwood (Nottinghamshire), High Wycombe (Buckinghamshire), East Ham (London), Tenbury Wells (Worcestershire), Theale (Berkshire), and Chigwell (Essex) **Sample number** 178 (questionnaire); 84 (diaries); other methods unclear **Sex** Both (55% male for questionnaire sample; distribution not stated for other groups) **Age range (children)** Year 7 (11-12 years; 65%), Year 10 (14-15 years; 35%) **Socio-economic status** Schools ranged from 3%-55% eligible for free school meals; wards from 1.4%-5% unemployment and 33%-92% car ownership. SES of sample not stated. **Ethnicity** Schools (not actual samples) ranged from 0.9%-72.7% ethnic minority.	Sampling frame 1 Sample selection 0.5 Sample numbers 0.5 Ages 1 Sex 0.5 Socio-economic status 0.5 Reliable data collection 1 Valid data collection 0 Views appropriate data collection 1 Usefulness of study 1 *Total 7*

Study	Aims and methods	Sample characteristics	Quality rating
Sharples and Fletcher (2000)	To identify factors associated with different types of crossing facilities which may encourage or discourage walking in urban areas Cross-sectional study using surveys and observations	**Location** Aberdeen, Dumfries, Edinburgh, Galashiels, Glasgow, Inverness (general survey); Edinburgh, Glasgow (schools survey) **Sample number** 890 (general survey); not stated (schools survey) **Sex** Both (52% male, 48% female (general survey); 43% male, 57% female (schools survey) **Age range (children)** 10-16 years (schools survey) **Socio-economic status** Not stated **Ethnicity** Not stated	Sampling frame 1 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 1 Socio-economic status 0 Reliable data collection 1 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 0.5 *Total 8*
System Three (1999)	To investigate walking patterns, attitudes to walking and what would encourage people to walk more Closed questionnaire	**Location** All Scotland **Sample number** 2,144 in total; including families with 1,045 children **Sex** Both (parents); not stated (children) **Age range (children)** 4-18 years **Socio-economic status** 190 AB, 289 C1, 290 C2, 276 DE **Ethnicity** Not stated	Sampling frame 0.5 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 1 Reliable data collection 1 Valid data collection 0.5 Views appropriate data collection 0 Usefulness of study 1 *Total 7*

Study	Aims and methods	Sample characteristics	Quality rating
Tyrrell (2000)	To explore children's and young people's views on local transport systems and their impact on quality of life and social inclusion Cross-sectional study using multiple methods with different groups	**Location** Stirling, Renfrewshire, Moray **Sample number** 161 children and young people, 8 parents **Sex** Both (distribution not stated) **Age range (children)** 5-6, 12-14, 16-17 years **Socio-economic status** Not stated **Ethnicity** Not stated	Sampling frame 0.5 Sample selection 0.5 Sample numbers 1 Ages 1 Sex 0.5 Socio-economic status 0 Reliable data collection 0.5 Valid data collection 1 Views appropriate data collection 1 Usefulness of study 1 *Total 7*

Appendix 6: Summary of interventions relevant to children, young people and parents included in the review by Ogilvie et al. (2004)

Project location	Intervention description (taken from primary studies where available; studies marked with * taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)	Controlled/ Uncontrolled	Targeted to/ Outcome measured on	Effect (shift from cars toward walking/cycling, taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)
Perth, Australia	**Main component** TravelSmart 'individualised marketing' programme to interested households (tailored leaflets, timetables, maps, free bus tickets) to encourage public transport, walking and cycling more often **Co-intervention** Some infrastructure changes (e.g. strategic cycling group, large cycle networks development programme)	Controlled	Households	5.5% increase in absolute number of trips (statistically significant difference (SSD) reported by primary authors)
Frome, England	**Main component** TravelSmart 'individualised marketing' programme to interested households (tailored leaflets, timetables, maps, free bus tickets, cycle discounts) **Sub-components** Cycle training, guided walks; further information and 'branded gifts' to those already using eco-friendly modes of transport	Controlled	Households	3.6% absolute modal shift (significance not reported (SNR) by primary study authors or Ogilvie *et al.*)
Some information in this table adapted from Ogilvie *et al.* (2004) originally appearing in BMJ 2004 **329:** pages 763-767.				

Project location	Intervention description (taken from primary studies where available; studies marked with * taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)	Controlled/ Uncontrolled	Targeted to/ Outcome measured on	Effect (shift from cars toward walking/cycling, taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)
Gloucester, England	**Main component** TravelSmart 'individualised marketing' programme to interested households (tailored leaflets, timetables, maps, free bus tickets, cycle discounts) **Sub-components** Cycle training, walking tours; further information and 'branded gifts' to those already using eco-friendly modes of transport	Controlled	Households	4.4% absolute modal shift (SNR)
Adelaide, Australia (two areas)	**Main component** Travel Blending programme (tailored feedback on personal travel diaries, information on maps and timetables) **Sub-components** 'Living Neighbourhoods' initiative to improve the quality of life in particular neighbourhoods, including a new school curriculum in these areas	Uncontrolled	Households	Intervention group 1-1.0% increase in walking (SNR); 11% decrease in cycling (SNR); overall reduction in all trips 8% (SNR) Intervention group 2 - 2.0% decrease in walking (SNR); 20.9% increase in cycling (SNR); overall reduction in all trips 11% (SNR)
Camden and Islington, England	**Main component** One year of school travel co-ordinator services, focusing on road safety improvement, building advocacy, development and application for travel plan funding **Sub-components** A few schools implemented changes such as walking buses, crossing facilities, parking restrictions.	Controlled	Pupils in 10 primary schools	Odds ratio for non-car journeys 0.98, 95% CI 0.61-1.59 (non-statistically significant difference (NSSD))

Project location	Intervention description (taken from primary studies where available; studies marked with * taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)	Controlled/ Uncontrolled	Targeted to/ Outcome measured on	Effect (shift from cars toward walking/cycling, taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)
Maidstone, England	**Main component** Publicity campaign on sustainable transport (including leaflets, advertising, displays in schools and shopping centres) **Co-intervention** Infrastructure changes to local transport system (including Park-and-Ride services; use of bio-fuels by transport vehicles, improvements to bus priority and access to tow, new bicycle network; increased traffic management and regulation)	Controlled	Households	Intervention group – average weekly car journeys increased (12.74 to 12.82, NSSD), walking decreased (5.02 to 4.95, NSSD), cycling decreased (0.75 to 0.45, SSD) Control group – average weekly car journeys decreased (12.83 to 12.10, NSSD), walking increased (6.72 to 6.85, NSSD), cycling decreased (1.03 to 0.56, NSSD)
Delft, Netherlands	**Main component** Improving and extending cycle networks by construction of large bicycle underpasses, bridges, new segregated or resurfaced paths, extended paths to integrate the network, allowing cyclists two-way rights on one-way road **Sub-components** Separate cycle paths and cycle lanes on existing connections; improving road surface	Controlled	Households	3% mode share of all trips (SNR)
Detmold and Rosenheim, Germany	**Main component** Improving and extending cycle networks*	Uncontrolled	Households	5-7% shift to cars or no shift (SNR)
Stockton, England	**Main component** Construction of new cycle route*	Uncontrolled	Secondary school pupils	2% absolute negative modal shift (SNR)
England	**Main component** Traffic speed reduction in 20 mph zones*	Uncontrolled	Households	No change (SNR)

Project location	Intervention description (taken from primary studies where available; studies marked with * taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)	Controlled/ Uncontrolled	Targeted to/ Outcome measured on	Effect (shift from cars toward walking/cycling, taken from Ogilvie *et al.*, 2004; Ogilvie *et al.*, 2005)
England	**Main component** Traffic reduction via locally-decided combinations of strategies to towns which had town centre bypasses built (including traffic calming, pedestrian facilities, advanced stops for cyclists, cycle parking and cycle routes, dropped kerbs, seating, new crossings)	Uncontrolled	Households	3% absolute negative modal shift (SNR)
Trondheim, Norway	**Main component** Introduction of road user charges around city centre*	Uncontrolled	Households	2.6% absolute negative modal shift (SNR). 6.6% decrease in respondents reporting any walking (SSD) and 2.6% decrease in cycling (NSSD).
Voorhout, Netherlands	**Main component** Construction of new train station in town*	Uncontrolled	Households	5.0% increase in mode share of all trips (SSD)
Hungary/Norway/ Denmark/Italy/Unknown	**Main component** 'Networks of routes' not further described*	Uncontrolled	Unknown	Most studies showed no change (SNR)
UK/Germany/Sweden/ Netherlands/Unknown	**Main component** 'Traffic restraint' not further described*	Uncontrolled	Unknown	Most studies showed no change (SNR)

Appendix 7: Publication details for relevant intervention studies included in the review by Ogilvie *et al.* (2004)

* Publications retrieved by EPPI-Centre Review Team. The first publication in the list for each included study is the main report in each case.

Perth, Australia	Department for Planning and Infrastructure (2001) *South Perth Large Scale Evaluation Report*. Perth: Government of Western Australia.*
	Department for Planning and Infrastructure (2003) *Travel Behaviour Change Program for the City of South Perth under the TravelSmart Program: Technical appendix.* Perth: Government of Western Australia.*
	Ashton-Graham C, John G, James B, Brög W, Grey-Smith H (2002) Increasing cycling through 'soft' measures (TravelSmart) - Perth, Western Australia. In: McClintock H (ed) *Planning for Cycling: Principles, Practice and Solutions for Urban Planners*. Cambridge: Woodhead.
	James B, Brög W (2001) Increasing walking trips through TravelSmart® Individualised Marketing*. World Transport Policy and Practice* **7**: 61-66. *
	Department for Transport (2002) *A Review of the Effectiveness of Personalised Journey Planning Techniques*. London: Department for Transport.
	Socialdata Australia (1999) *Community Survey and Marketing Campaign for the South Perth TravelSmart Project: Report of the Second Evaluation*. Perth: Department for Planning and Infrastructure, Government of Western Australia.
	Socialdata Australia (2000) *Community Survey and Marketing Campaign for the South Perth TravelSmart Project: Third Evaluation Report*. Perth: Department for Planning and Infrastructure, Government of Western Australia.
Frome, England	Sustrans (2002a)*TravelSmart Frome Pilot Project*. Bristol: Sustrans. *
Gloucester, England	Sustrans (2002b) *TravelSmart Gloucester Pilot Project*. Bristol: Sustrans. *
Adelaide, Australia	Rose G, Ampt L (2001) Travel blending: an Australian travel awareness initiative*. Transportation Research Part D* **6**: 95-110. *
	Ampt L (1999) Grass routes: from travel blending to living neighbourhoods. *Traffic Engineering and Control* **40**: 475-478. *
	Perkins A, Giannakodakis G (2001) *The Greenhouse Abatement Potential of Travel Behaviour Change Initiatives*. Walkerville: Transport South Australia.
	Department for Transport (2002) *A Review of the Effectiveness of Personalised Journey Planning Techniques*. London: Department for Transport.

Camden and Islington, England	Rowland D, DiGuiseppi C, Gross M, Afolabi E, Roberts I (2003) Randomised controlled trial of site specific advice on school travel patterns. *Archives of Disease in Childhood* **88**: 8-11. *****
Maidstone, England	Hodgson F, May T, Tight M, Conner M (1998) Evaluation of the MIST travel awareness campaign: 2. The before-and-after study. *Traffic Engineering and Control* **39**: 103-112. *****
Delft, Netherlands	Wilmink A, Hartman J (1987) *Evaluation of the Delft Bicycle Network Plan: Final Summary Report.* The Hague: Ministry of Transport and Public Works. ***** Hartman J (1997) The Delft bicycle network revisited. In: Tolley R (ed) *The Greening of Urban Transport: Planning for Walking and Cycling in European Cities.* 2nd edition. Chichester: Wiley. ***** Anonymous (1986) *Evaluation of the Delft Bicycle Network: Summary Report of the Before Study.* The Hague: Ministry of Transport and Public Works. Bovy P, Veeke P (1987) *Intensiteitspatronen voor en na realisering van het Delftse fietsrouteplan.* In: Proceedings of Bijdragen Verkeerskundige Werkdagen. Bovy P (1988) Wijzigingen verkeersintensiteiten door Delfts fietsrouteplan (1). *Verkeerskunde* **39**: 54-58. Katteler H, Förg O, Brög W (1984) *Evaluatie fietsroutenetwerk Delft. Het verplaatsingsgedrag: vooronderzoek.* Nijmegen: Instituut voor Toegepaste Sociologie. Katteler H, Förg O, Brög W (1985) *Evaluatie fietsroutenetwerk Delft: marges voor het fietsgebruik.* Nijmegen: Instituut voor Toegepaste Sociologie. Louisse C, ten Grotenhuis D, van Vliet J (1994) Evaluatie fietsroutenetwerk Delft: lessen en leergeld voor integraal stedelijk verkeersbeleid. In: *Proceedings of Colloquium Vervoersplanologisch Speurwerk; 1994; Rotterdam.* Amsterdam: CVS.
Detmold and Rosenheim, Germany	Brög W, Erl E (1987) *Abschließender Bericht zum Modellvorhaben "Fahrradfreundliche Stadt". Teil A: Begleituntersuchung und übergreifende Aspekte.* Texte 18/87. Berlin: Umweltbundesamt. Dammann F, Hänel K, Richard J (1987) *Abschließender Bericht zum Modellvorhaben "Fahrradfreundliche Stadt". Teil B: Fahrradverkehrsplanung in der Modellstadt Detmold.* Berlin: Umweltbundesamt. Eichenauer M, Von Winning H, Streichert E (1987) *Abschließender Bericht zum Modellvorhaben "Fahrradfreundliche Stadt". Teil C: Fahrradverkehrsplanung in der Modellstadt Rosenheim.* Berlin: Umweltbundesamt.
Stockton, England	Dean D (1993) *The Stockton Cycle Route After Study.* Crowthorne: Transport Research Laboratory.
England (20 mph zones)	Babtie Group (2001) *Urban Street Activity in 20 mph Zones: Final Report.* London: Department for Transport, Local Government and the Regions.
England (bypasses)	Barrell J, Robson C (1995) The Bypass Demonstration Project: an overview. *Traffic Engineering and Control* **36**: 398-403. ***** Social Research Associates (1999) *Bypass Demonstration Project: Further*

	Research and Analysis in Relation to Attitudes to Walking. Leicester: Social Research Associates. *****
Trondheim, Norway	Meland S (1995) Generalised and advanced urban debiting innovations: the GAUDI Project. 3: The Trondheim toll ring. *Traffic Engineering and Control* **36**: 150-155. ***** Meland S (1994) Road Pricing in Urban Areas. *The Trondheim Toll Ring – Results from Panel Travel Surveys*. Trondheim: SINTEF Transport Engineering.*
Voorhout, Netherlands	Arentze T, Borgers A (2001) Assessing urban context-induced change in individual activity travel patterns: case study of new railway station. *Transport Research Record* **1752**: 47-52.
Excluded studies: 'networks of routes' and 'traffic restraint'	Ogilvie D, Egan M, Hamilton V, Petticrew M (2005) Systematic reviews of health effects of social interventions: 2. Best available evidence: how low should you go? *Journal of Epidemiology and Community Health* **59**: 886-892.

Appendix 8: Cross-study synthesis

Theme 1: Culture of car use			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al*. (2004)**	**Interventions needing further evaluation in Ogilvie *et al*. (2004, 2005)**
Preference for cars	Address children's preference for travelling by car	-	-
	Influence groups inclined to prefer cars (e.g. older children, those from car owning families). Encourage interventions which will maintain preferences for walking and cycling among younger children.	-	-
	Tailor interventions to influence preferences to urban and suburban areas, noting that in rural areas factors, such as convenience, may be a more important barrier to walking and cycling than preference.	-	-
Perception of cars as more convenient than walking and cycling	Aim to change attitudes by demonstrating that walking and cycling is as convenient as driving for short journeys.	Perth, Frome, Gloucester: Marketing measures with emphasis on convenience. Some increase in walking and cycling was observed.	Adelaide: Marketing measures with emphasis on convenience. No increase in walking and cycling was observed.
	Target messages about the convenience of active transport towards children and parents.	-	-
	Promote walking as convenient especially in urban areas, cycling in rural areas.	-	-
	Target safety concerns about walking and cycling in comparison with driving.	-	-

Theme 1: Culture of car use			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al*. (2004)**	**Interventions needing further evaluation in Ogilvie *et al*. (2004, 2005)**
	Make travelling by car less convenient with greater parking restrictions, and speed limits.	-	England (bypasses): Various measures including traffic calming, pedestrian facilities, cycle lanes. No increase in walking and cycling was observed. 14 studies under 'traffic restraint': various measures implemented; some effect on walking and cycling noted.
	Make 'park and walk' more convenient with free parking permits issued through schools and available for use in car parks at school opening and closing times, several minutes' walk away from schools.	-	14 studies under 'traffic restraint': various measures implemented; some effect on walking and cycling noted.
Status of car ownership	Design interventions to influence wider social attitudes toward a shift away from car use.	-	-
	Target educational interventions to change these attitudes especially in younger children.	-	-
Perceptions of cars as 'cool'	Promote walking and cycling to children and young people as 'cool'.	-	-

Theme 2: Fear and dislike of local environments			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004, 2005)**
Concerns about children's safety from personal attack	Implement evaluated effective interventions (e.g. personal alarms) which increase personal safety from attack (abduction, mugging, harassment).	-	-
	Promote perceptions of local environments as safe where appropriate.	-	-
	Target above messages about safety from attack to older girls and urban locations.	-	-
	Promote interventions to reduce bullying / fighting among children.	-	-
	Introduce accompanied walking / walking schemes to promote safety.	Camden and Islington: Walking buses implemented by some schools. No increase in walking and cycling was observed.	-
	Design and modify shared walking / cycling paths to allow increased visibility.	-	-
Concerns about safety from accidents	Implement interventions shown to reduce accident risk for pedestrians, cyclists (e.g. speed bumps, cycle lanes, accompanied walking schemes).	Delft: New cycle network installed. Significant shift to cycling was observed. Camden and Islington: Various safety measures implemented by some schools. No increase in walking and cycling was observed.	England (bypasses): Various measures including traffic calming, pedestrian facilities, cycle lanes. No increase in walking and cycling was observed. Detmold and Rosenheim (Germany) and Stockton (England): Cycle routes installed. No increase in walking and cycling was observed. 14 studies under 'traffic restraint': various measures implemented; some effect on walking and cycling noted.

Theme 2: Fear and dislike of local environments			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004, 2005)**
	Target messages about safety from accidents toward younger children.	-	-
	Aim to balance messages about safety and danger. If safety issues are over-emphasised in promoting walking and cycling, disproportionate perceptions of walking and cycling as dangerous activities may be reinforced.	-	-
	Reduce or restrict traffic; enforce road rules with drivers (especially near schools).	Camden and Islington: Traffic reduction measures implemented locally by some schools. No increase in walking and cycling was observed.	England (bypasses): Various traffic calming measures implemented. No increase in walking and cycling was observed 14 studies under 'traffic restraint': various measures implemented; some effect on walking and cycling noted.
Concerns about traffic	Reduce traffic speeds – speed bumps.	Camden and Islington: Traffic calming measures implemented locally by some schools. No increase in walking and cycling was observed.	England (bypasses): Various traffic calming measures implemented. No increase in walking and cycling was observed. 14 studies under 'traffic restraint': various measures implemented; some effect on walking and cycling noted.
	Ensure that crossing points are safe, accessible, respected by drivers.	-	England (bypasses): New crossing points created. No increase in walking and cycling was observed.
	Ensure that traffic is spaced sufficiently to permit road crossing (e.g. traffic light synchronisation).	-	-

Theme 2: Fear and dislike of local environments			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004, 2005)**
	Enforce parking restrictions near schools and leisure facilities.	Camden and Islington: Parking restrictions implemented by one school. No increase in walking and cycling was observed.	-
Need for appropriate facilities	Improve conditions of pavements, paths, roads.	Delft: New cycle network installed. Positive shift toward cycling was observed.	Detmold and Rosenheim, (Germany) and Stockton (England, bypasses): Cycle routes installed. No increase in walking and cycling was observed. Five studies under 'networks of routes for cyclists and pedestrians'. No evidence of increase in walking and cycling.
	Locate crossings at convenient points for children's journeys.	-	-
	Install bicycle stands / sheds.	-	England (bypasses): Some cycle parking introduced (probably not very much). No increase in walking and cycling was observed.
	Introduce more lollipop people / crossing patrols.	Camden and Islington: Crossing patrols implemented by some schools. No increase in walking and cycling was observed.	-
	Create more frequent crossing places and enforce laws requiring cars to give way to pedestrians.	Camden and Islington: New pedestrian crossings implemented by one school. No increase in walking and cycling was observed.	England (bypasses): New crossing points created. No increase in walking and cycling was observed.
	Construct raised (kerb high) crossing places to make crossing easier for pedestrians, especially with buggies, shopping trolleys.	-	England (bypasses). Raised crossing points created. No increase in walking and cycling was observed.

Theme 2: Fear and dislike of local environments			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004, 2005)**
Concerns about crime	Create secure cycle parking, especially at schools.	-	-
	Target cycle security measures, particularly towards boys.	-	-

Theme 3: Children as responsible transport users			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al.* (2004)**	**Interventions needing further evaluation in Ogilvie *et al.* (2004, 2005)**
Children's views of walking and cycling as preferred and convenient	Design interventions to take into account children's more positive views about walking and cycling.	-	-
	Ensure that interventions adapted from those involving adults are appropriate for children and young people.	-	-
Children's views about environmental impact	Target interventions emphasising environmental messages especially at children.	Maidstone: Publicity campaign emphasising environmental benefits of walking and cycling implemented in schools as well as wider community settings (but message not tailored to children specifically). No increase in walking and cycling was observed	-
	Create syllabuses for environmental education including positive messages about walking and cycling as well as the negative effects of car use.	-	-
	Target children in suburban and rural locations, and possibly from higher SES groups.	-	-
Children's views of benefits of walking and cycling: sociability	Promote walking and cycling (particularly walking) to children and young people as a sociable activity ('cool'), giving the opportunity for contact with friends and family.	-	-
	Target this message toward girls, particularly in urban and suburban locations.	-	-
Children's views of benefits of walking and cycling: health and fitness	Encourage walking and cycling as activities promoting both physical and psychosocial health, to parents as well as to children.	Perth, Frome, Gloucester: Marketing campaigns, including some health messages. Some increase in walking and cycling was observed.	Adelaide: Marketing campaigns, including some health messages. No increase in walking and cycling was observed.

Theme 4: Parental responsibility and behaviour			
View	**Implications for interventions**	**Rigorously evaluated interventions in Ogilvie *et al* (2004)**	**Interventions needing further evaluation in Ogilvie *et al* (2004, 2005)**
Children's views about parents' car use	Encourage children to think critically and ask about car use in their own families.	-	Adelaide: Part of intervention took place in school and children were asked to 'relay the method and philosophy to the remainder of their household'. No increase in walking and cycling was noted.
	Encourage parents to consider their own role in modelling appropriate transport behaviour for children.	-	-
Limitations on children's independence	Promote walking and cycling toward parents as a means to increase children's independence, particularly parents of girls and Asian families.	-	-
	Balance messages about walking and cycling in a way to both address parents' concerns about safety and traffic while encouraging them to foster children's independent mobility.	-	-
Expectations about parenting	Provide parents with information on behaviour management and role modelling when walking with younger children.	-	-
	Promote the idea that allowing children to walk and cycle is a way of being a 'good' parent.	-	-
	Promote walking and cycling as a way to encourage safe independence which simultaneously cares for the environment.	-	-

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