Protocol for Systematic Review

**Title:** The health and social impacts of opening new road

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**Commenced 1st August 2001**

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**Sources of support**
Two of the authors are funded by the UK Economic & Social Science Research Council as part of the Centre for Evidence Based Public Health Policy (a member of the Centre for Evidence Based Policy and Practice). Two authors are funded by the Chief Scientist Office of the Scottish Executive Health Department.
The health and social impacts of opening new roads

1. Background
Transport is an important determinant of health (Dora, 1999; WHO, 1999; Macintyre & Ellaway, 2000), but the World Health Organisation has recently expressed concern that the importance of a healthy transport policy has not been fully recognised. WHO specifically refers to the issue of road travel, stating that ‘reliance on motorised transport, in particular road transport, continues to increase, resulting in adverse environmental and health effects.’ (WHO, 1999 p. 3) These comments reflect a general emphasis within public health research on negative impacts associated with motorised road vehicles (Hillman, 1991; Pucher & Lefèvre, 1996; Maddison et al, 1996; Fletcher & McMichael ed., 1997; McCarthy, 1999; Künzli, 2000).

The Red Cross has predicted that by 2020, injuries related to traffic will be the world's third largest cause of death and disability (International Federation of Red Cross and Red Crescent Societies, 1998). Road construction and automobile-dependency have also been associated with community severance (i.e. reduced access to local amenities and disruption of social networks caused by a physical barrier running through the community), increased disturbance amongst residents, and social inequalities (Appleyard, Gerson, & Lintell, 1981; Davis, 1992; McCarthy, 1999; Bosselmann, Macdonald & Kronemeyer, 1999; Lucas, Grosvenor & Simpson, 2001).

In such circumstances, it is little wonder that the building of new roads is contentious. Yet roads fulfil a fundamental role within local and national infrastructures, whilst the motorised vehicles that use them can confer benefits of mobility and convenience on substantial sections of a population (Dunn, 1998). In his well-known study of residential streets in San Francisco, Donald Appleyard summed up the paradox implicit in the relationship between roads and the people who are affected by them: 'the street has always been the scene of…conflict, between living and access, between resident and traveller, between street life and the threat of death.' (Appleyard, Gerson, & Lintell, 1981).

The building of new roads is therefore a public health issue but the evidence base upon which the health impacts of new roads can be assessed is disparate and incomplete (Wentz, Roberts & Burns, 2001). In order to better understand the positive and negative impacts that new roads exert on human health and well-being, we will conduct a systematic review of the relevant literature pertaining to developed countries. The purpose of the review will be to identify, assess and synthesise primary studies in any language that included both a new road and some measurement of impacts on human health and well-being. As there has been no previous attempt to systematically review health impacts of new roads, this review will take a broad focus. It will include studies that consider any measure of health or wellbeing on the variety of different population types who might be affected by the opening of a new road: i.e. road-users (drivers, passengers, cyclists, pedestrians etc) and people who live or spend time in areas affected by new roads.

Experts within the transport field have suggested that it may not always be possible or appropriate for an evaluation of transport interventions to use matched controls, random sampling and prospective studies (Hedges & Morrissey, 1986; Elvik, 1988;
Haur, 1997; Elvik, 1997; Elvik, 2000). This review will therefore aim to include all relevant primary studies of an experimental or quasi-experimental nature (including “natural experiments”): for example before and after studies of accident data, and both prospective and retrospective surveys of affected populations. To maximise the utility of the review, we will also attempt to identify cost-benefits analyses of interventions.

2. Objectives of the Review

To summarise the best evidence on the positive and negative impacts of new road building on human health and wellbeing.

Secondary Objectives:
The following questions will also be considered:
- How do the health impacts of new roads differ according to local conditions (eg. comparing rural areas, urban areas)?
- Does the impact differ across different social groups?


Criteria for inclusion and exclusion of studies in the review

Studies included in the review must contain the following elements:

Inclusion Criteria - Intervention: The review is of health impacts of new roads once they are opened, rather than health impacts associated with road construction processes. Besides the opening of roads in places where none existed before, the definition of new roads will also include the conversion of gravel tracks into hard-surface roads, the addition of lanes to existing roads (through either road widening or converting hard shoulders into new lanes), new road bridges and tunnels. The roads must be intended for automobiles (although they may also be used by pedestrians and cyclists).

Inclusion Criteria - Time and place: We are interested in reviewing the impact of new roads in places where mass motorised private transport is in an advanced stage of development. The review will include studies conducted in developed countries, using OECD membership as a guide. Studies produced at any time will be included in the search.

Inclusion Criteria - Study Participants: road-users (drivers, passengers, cyclists, pedestrians etc) and people who live in areas affected by new roads. The analyses will distinguish between different population types.

Inclusion Criteria - Outcomes: included studies must contain some measurement of how the opening of one or more new roads impacted on the health or wellbeing of constituents. Examples of outcomes may include the following (note that this list is not necessarily exhaustive).

1) injuries associated with road accidents
2) health impacts of traffic pollution
3) improved access to health care
4) physical activity (willingness to walk/cycle)
5) transmission of disease
6) mental health/stress/disturbance
7) community severance (including considerations of pedestrian road-crossing behaviour, access to local amenities, and the formation/maintenance of social networks).

Inclusion Criteria - Study Design.
1) Before and after studies using controls
2) Before and after studies without controls
3) Retrospective studies using controls (including historical controls)
4) Retrospective studies without controls

Note: data may be quantitative or qualitative

Exclusion Criteria
- studies that do not attempt to measure health impacts on humans
- studies that examine the health impact of the road construction process itself, rather than the health impact of new roads once they have been opened.
- studies that do not involve the building of new roads
- general discussion papers not presenting data on impacts
- studies conducted in developing countries

Search Strategy
Academic research, local and central government studies and grey literature are all targeted. No language restrictions will be placed on this search.

Study identification will include both manual and electronic searching strategies. Electronic searches will involve the electronic databases and search terms listed below. The initial selection criteria will be broad to ensure that as many studies as possible are assessed as to their relevance to the review. Any articles that are obviously unsuitable can be excluded in the early stages or the search (for example, on the basis of abstracts and titles presented in electronic catalogues), whilst the decision to exclude or include other articles will only be made once the article has been ordered and read. The number of articles included and excluded at the various stages will be noted.

At the same time, we will be conducting follow-up searches on citations found in other studies and we will be seeking information from experts. Journals that seem particularly relevant will be hand-searched. Research centres dealing with subjects related to transport studies will be identified and individuals with specialist knowledge of the area contacted. We refer to these search strategies as ‘manual searches’, although we may utilise information technology to help us locate articles discovered in this way. ‘Work in progress’ conference papers will help make people with potentially useful information aware that the review is taking place, as will other forms of dissemination such as the internet, posters, personal contacts etc.

Expert Contacts: A panel of expert contacts will be formed from people with a specialist interest in public health and/or transport. These experts will be asked to provide information on ongoing research.
Electronic Search Strategy
The following electronic databases will be searched from start date to 2002: ABI Inform, Acompline/Urbaline, ASSIA, BOPCAS, British Humanities Index, Business Premier, Campbell Collaboration, Caredata Web, Catchword, Childdata, CINAHL, Cochrane Library, Dissertations Abstracts, Econlit, EI Compendex, Electronic Collections Online (ECO), EMBASE, GEOBASE, HMIC/HELMIS, IBSS (International Bibliography of the Social Sciences), Index to Theses, ingenta/uncover, INSPEC, International Civil Engineering Abstracts, MEDLINE, PAIS, PLANEX, ProceedingsFirst, PsycInfo, Regard, Road Construction Network, SIGLE, Social Science Citation Index (Web of Science), Social Services Abstracts, Sociological Abstracts, TRANSPORT (including TRIS), ZETOC. The British Library catalogue and the COPAC catalogue were also checked. Internet sources will be searched.

Search Terms for Electronic Databases.
The following terms (with wildcards when necessary) will be used when devising search strategies for electronic databases. The exact search terms and their results will be recorded as the search strategy is refined.

The basic search terms used will be:
(street* or thoroughfare* or freeway* or road* or highway* or motorway* or route* or lane* or bridge* or tunnel*) and (new or develop* or propos* or build* or construct* or plan* or project* or impact) modified as necessary according to database, eg with the addition of terms such as health*, illness, disturbance, annoyance, injur*, accident, communit*, resident*.

A ‘search diary’ will be maintained detailing the names of the databases searched, the keywords used and the search results. Titles and abstracts of studies to be considered for retrieval will be recorded on an Endnote database, along with details of where the reference has been found. Inclusion/exclusion decisions will be recorded on that database. Retrieved studies will be filed according to inclusion/exclusion decisions.

Selection Procedure: See Figure 1. studies will be selected for retrieval after abstracts and titles identified in electronic searches have been appraised by the information scientist and lead reviewer for relevance (note that abstracts and titles that clearly have nothing to do with road transport will be excluded by the information scientist only). All references provided by expert contacts will also be retrieved. All retrieved studies will be examined by the lead reviewer who will exclude any that make no reference to new roads or no reference to health or social impacts. Studies that do make a reference to one or more new roads will be assessed for relevance independently by three reviewers.
Data Management: At least two reviewers will abstract data onto a proforma and independently summarise what they consider to be the most important results from each study. These summaries will be compared by the three reviewers and any differences of opinion will be resolved by discussion and consultation with the original study. Any further calculations on study data considered necessary will be conducted by the lead reviewer and checked by another reviewer.

Assessment of Methodological Quality: Critical appraisal of included studies will be conducted by three reviewers independently using criteria agreed between them and based on a review of methodological literature from the fields of transport studies and health studies. When reviewers’ conclusions over the validity of a study differ, the study will be reviewed jointly. Initial scoping has suggested that the studies fall into three broad types: those dealing with routinely collected data on road accidents and injuries; those based on quantitative data from research-specific surveys (e.g. interviews and questionnaires of residents of areas affected by a new road); and those based on qualitative data. Our critical appraisal criteria will differ in some regards.
depending on which of these three types of study is being appraised (although some criteria will be common to all studies). A list of appraisal criteria for each type of study is provided below.

For studies of routine data on road accidents and injuries we will use the following criteria to appraise the robustness of the study design, and the reliability of the outcome measures:

- Use of matched control or control for general trends.
- Control for regression to the mean.
- Whether study is prospective or retrospective
- Time period used when assessing accident data
- Source of accident data
- Sample size
- Whether study provides sufficiently detailed outcome measures to allow conclusions to be made about the impact of new roads on the number of accidents involving injury, the number of individuals injured and the severity of injuries.
- Whether study considers accident migration across a wider road network
- Presentation of enough data to validate results.

If the study uses questionnaires or interviews, we will make critical appraisals based on the following:

- Use of matched control or control for general trends.
- Size and representativeness of sample.
- Whether follow up rate >60%
- Appropriateness of exposure measures
- Length of follow-up
- Whether or not the study considers the possibility of differential effects between main roads and secondary roads.
- Whether the study is prospective or retrospective
- Presentation of enough data to validate results.

For qualitative studies we will make critical appraisals based on the following

- Whether the study is prospective or retrospective
- Use of individual interviews and/or focus group
- Whether sampling method is justified
- Sufficient use of quotes to validate author conclusions
- Whether interpretation of data is made by a one or more than one independent reviewer
- Whether authors include description of interview technique and any theoretical position underpinning their approach to the study.

**Catagorising studies:** We intend to categorise by intervention and outcome. Three reviewers will do this independently. When the studies themselves do not give us sufficient information to categorise, we will contact the authors.

New roads will divided between primary roads and secondary roads. Primary roads include main roads through towns, ‘A’ roads, motorways (or their equivalent none-UK names, eg. freeways, highways, autobahns etc.). Secondary roads include small
residential streets, and other roads not intended for heavy traffic and not providing the principal connecting route between two urban areas. We will also distinguish between roads going through urban areas, out-of-town bypasses, and rural roads designed to connect two areas.

Outcomes will be categorised into accident related injuries, specific mental health outcomes, specific physical health outcomes and less specific outcomes such as general well-being and disturbance. Studies that look at road crossing behaviour, access to amenities and social networks will categorised under the heading of community severance.

**Synthesis.**
As we expect the studies we identify to be of an extremely heterogenerous nature we will initially employ a narrative synthesis method. However, if a subset of data we identify appears amenable, we will investigate the possiblity of conducting more formal meta-analysis techniques on this data. In such an eventuality we would then compare the conclusions of our narrative synthesis with the conclusions of the meta-analyses to see if their any inconsistencies and potential biases.

For the narrative synthesis, the studies will be grouped into intervention type and then sub-grouped by outcome type. The methodologies and results of studies belonging to both the same intervention and outcome category will then be compared to see if there is any association between methodological features and results. The results will then be discussed with appropriate emphasis given to the studies that are more methodologically robust. The results will also be tabulated in a way that demonstrates the methodological robustness of each study. The narrative will be written by the lead reviewer and then checked independently by two other reviewers who will then feed back with comments. Any disagreements will be decided by all three reviewers.

4. **Timeframe**
The review is expected to take 12 months to complete.

5. **Plans for Updating the Review**
As part of its continuing Evaluation Programme, the MRC Social and Public Health Sciences Unit intends to employ a permanent systematic reviewer who will update this review.

6. **Conflict of interests**
Reviewers are unaware of any potential conflict of interests.

7. **References**


