Protocol for evidence reviews

Evidence reviews to support the guideline on:

Air pollution: outdoor air quality and health

Stage	Date completed
Review team – draft	26/10/2015
Review team – finalised	
Quality assurance – approval	
Review team – revision	

Guideline webpage	http://www.nice.org.uk/guidance/indevelopment/gid-phg92
Scope available at	http://www.nice.org.uk/guidance/GID-PHG92/documents/air-pollution-outdoor-air-quality-and-health-final-scope2
Committee	PHAC E

IGD team and gIS Lead
Rachel Kettle
Hugo Crombie
Diana O'Rourke
Rachel Adams

Protocol signed off by: Date:

Introduction

This guideline addresses reducing the ill-effects of outdoor air quality on health. It will focus on local authority activities that aim to reduce road-traffic-related emissions by: reducing overall mileage (particularly by highly polluting vehicles); altering the type of fuel used or driving style; aiding dispersion or deposition of pollutants; supporting the uptake of abatement technologies (such as Euro 6/VI vehicle standards); and altering personal behaviour to reduce exposure to pollutants.

Review questions

Topic: Environmental change and development planning

1. Are planning development control decisions and interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

2. Are interventions to develop public transport routes and services, effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

3. Are interventions to develop routes and infrastructure to support low emission modes of transport effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

4. Are measures to promote absorption, adsorption or impingement deposition, and catalytic action effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

Topic: Traffic management and enforcement, and financial incentives and disincentives

5. Are traffic management systems and signal coordination interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

6. Are zoning interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

7. Are parking restrictions and charges effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

8. Are vehicle 'idling' restrictions and charges, including waiting and loading restrictions, effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

Topic: Travel Planning and other initiatives providing information, advice, education and skill development

9. Are settings-based travel planning (such as in workplaces, new residential developments or schools) interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

10. Are personalised travel planning interventions to support low emission travel choices effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

11. Are driver information, education and training interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

Topic: Advice and warnings for the public and people at particular risk:

12. Are interventions providing advice and warnings for the public and people at particular risk effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?

A number of elements within the protocols are common across each question namely:

- searches,
- types of study to be included/excluded;
- participants/population,
- methods for selecting evidence (data screening);
- data extraction and quality assessment;
- strategy for data synthesis;
- analysis of subgroups
- any other information or criteria for inclusion or exclusion.

To reduce repetition these details have been given only in reference to question 1, for other questions please cross refer to protocol 1.

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
Review question 1	Are planning and development control decisions, and interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine the effectiveness of the siting, layout and design of developments at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these interventions should be delivered.	
Searches	The identification of evidence for this review will conform to the methods set out in chapter 5 of the "Developing NICE Guidelines Manual" (October 2014). Relevant databases and websites will be searched systematically to identify relevant qualitative, quantitative and cost effectiveness evidence using a combination of: ((pollution, or emissions or air quality) and (road transport)) and (planning interventions or traffic management interventions or educational interventions or forecasting interventions) Sources to be searched: see Appendix 1. In addition, the following websites will be searched manually: • Department for Transport (DfT - https://www.gov.uk/government/organisations/department-for-transport) • TRL (transport research laboratory – http://www.trl.co.uk) • Passenger Transport Executive Group (PTEG – www.pteg.net)	A call for evidence from stakeholders will be used initially to help identify relevant evidence (12/10/15 – 9/11/15). A second call will be considered later in the process (as indicated in the Methods manual) if necessary.

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
	• Transport Research & Innovation Portal (http://www.transport-research.info/web/index.cfm) • RIVM (http://www.rivm.nl/en/) • DEFRA (https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs) Limits: An English language filter will be placed on the searches if available. Additional limits to be placed on the searches, if available, will exclude studies on animals, as well as editorials, news items and letters. Sources will be searched from September 1995 to Sept 2015. 1995 was chosen as a start date as this corresponds with the passing of the Environment Act which provided the legislative base for the National Air Quality Strategy, the requirement for local authorities to review air quality and the designation of local air quality management areas. Updated searches from September 2015 will be carried out as indicated in the manual before finalising the guideline. See Appendix 2 for details of the search strategy.	
Types of study to be included/excluded	Comparative studies including: • Randomised or non-randomised controlled trials • Cohort studies • Before and after studies	Modelling and desk based studies will be considered if insufficient exposure related outcome studies are identified.

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
	Qualitative studies Economic studies: • Economic evaluations • Cost-utility (cost per QALY) • Cost benefit (i.e. Net benefit) • Cost-effectiveness (Cost per unit of effect) • Cost minimisation • Cost-consequence Exclusions:	Qualitative studies from the UK which provide insight into the context in which interventions should be delivered to improve their uptake or effectiveness and whether this differs by population sub-groups e.g. deprived communities/health inequalities. They must be directly related to the interventions covered by the effectiveness studies. Studies will be limited to the UK (rather than EU/OECD countries as for effectiveness studies) as the context (national legislation, local government structures and powers etc) will be particularly relevant here.

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
	• Cross-sectional and other surveys Systematic reviews will not be included but may be used as a source of primary studies.	Economic exclusions: Only full economic analyses will be included – papers reporting costs only will be excluded.
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk or on the basis of outcomes reported (see 'selecting evidence' below). Priority populations will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	Transport related planning, land allocation and development control decisions including • Building or land use • siting of developments • layout of developments • design of developments and connection to local community	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions •	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
	The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM_{10}, $PM_{2.5}$, particle number concentrations, ultrafine particles, black carbon) • NO_2 • Unintended consequences of an intervention	instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy
Selecting evidence (data screening)	Stage 1. Title abstract screening All references from the database searches will be downloaded, de-duplicated and screened on title and abstract against the criteria above. A randomly selected initial sample of 10% of records will be screened by two reviewers independently. The rate of agreement for this sample will be recorded, and if it is over 90% then remaining references will screened by one reviewer only. Disagreement will be resolved through discussion. Where abstracts meet all the criteria, or if it is unclear from the study abstract whether it does, the full text will be retrieved. Stage 2. Full text screening Full-text screening will be carried out by two reviewers independently on a 10% sample and any differences resolved by discussion. The rate of	As noted above, if large numbers of papers are identified and included at full text, the following may be implemented: • Prioritising evidence with critical or highly important outcomes • Prioritising evidence on groups at greatest risk • Consideration of a date cut off (on advice of

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
	agreement for this sample will be recorded, and if it is over 90% then remaining references will screened by one reviewer only. Disagreement will be resolved through discussion. Reasons for exclusion at full paper will be recorded. Inter-rater agreement will be recorded.	topic expert as available and appropriate) •
Data extraction and quality assessment	Data extraction of included studies will be conducted using approaches described in Developing NICE guidelines: the manual. Each included study will be data extracted by 1 reviewer and the data extraction sheet will be confirmed by a second reviewer. Any differences will be resolved by discussion or recourse to a third reviewer. Quality assessment for all included studies will be conducted using the tools in Developing NICE guidelines: the manual. Each included study will be quality assessed by 1 reviewer and checked by another. Any differences in quality grading will be resolved by discussion or recourse to a third reviewer.	
Strategy for data synthesis	Data will be grouped and synthesised into concise evidence statements in line with Developing NICE guidelines: the manual. See below for potential a priori groupings. If sufficiently homogeneous and high-quality data are located, meta-analysis will be conducted, including any unintended consequences of an intervention.	
Analysis of subgroups or subsets	Subgroup analysis will be undertaken where appropriate. For example: • Those who are exposed to known high levels of pollutants (People who live or work in places with road-traffic-related air	

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
	pollution 'hot spots' (locations predicted or measured to exceed Air Quality Objectives and designated Air Quality Management Areas) • Those who are at higher risk of adverse effects from exposure to air pollution (Children (aged 14 yrs and under) and older people (65 yrs and older); • People with pre-existing health conditions e.g. respiratory and heart problems) • Whether the impacts vary for different population groups (i.e. health inequalities)	
Any other information or criteria for inclusion or exclusion	Exclude • The epidemiology of air pollution and health • Dissertations and theses • Opinion pieces (e.g. letters, editorials, commentaries) • Conference abstracts • Not English language • Not EU / OECD countries Only include published papers (full text only)	

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
Review question 2	Are interventions to develop public transport routes and services, effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	The committee agreed that modelling studies for this question should be included as no effectiveness studies had been identified.
Context and objectives	To determine the changes local authorities can make to public transport routes or services that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	Developing public transport routes and services • Implementation or changes to bus or public transport lanes • Implementation of or changes to public transport services (including cost) • public transport quality improvements • use of standards in commissioning public transport services • provision of information about existing services • action to integrate public transport services with other low emission modes such as walking or cycling	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
	• Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • • . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2	considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • changes to the make-up of the vehicle fleet (for instance, compliance with Euro 6/VI or other standards).

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
Review question 3	Are interventions to develop routes and infrastructure to support low emission modes of transport effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine what local authorities can do to support low emission modes of transport through changes to transport routes and infrastructure that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Implementation of or changes to cycle routes or pedestrianised areas • Implementation of or changes to fueling services for low emission vehicles • Use of low emission public sector vehicle fleets • options for siting of routes (e.g. low traffic vs normal traffic; avoiding inclines; siting and timing of traffic signals)	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
	• • . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2 ○	if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • changes to the make-up of the vehicle fleet (for instance, compliance with Euro 6/VI or other standards).

Topic 1	Environmental change and development planning	
Component of protocol	Description	Additional comments
Review question 4	Are measures to promote absorption, adsorption or impingement deposition, and catalytic action effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	The committee agreed that modelling studies for this question in respect to street trees should be included.

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
		Although there were studies on trees as barriers, there were no studies on street trees. The committee felt this was an important area that should be examined further.
Context and objectives	To determine the measures which local authorities can implement to promote absorption, adsorption or impingement deposition, and catalytic action that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Use of natural and artificial barriers (such as trees and foliage) • Use of surface treatments (such as titanium oxides) • Use of dust suppressants, such as calcium magnesium acetate	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions •	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for

Topic 1	**Environmental change and development planning**	
Component of protocol	Description	Additional comments
	• . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2**.**	instance due to insufficient evidence).

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Review question 5	Are traffic management systems and signal coordination interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	The committee agreed that modelling studies of individual traffic calming measures should be included. Only 1 effectiveness study had been identified (the process of examining modelling studies identified a second). They felt that as an area of significant activity further evidence might be of use.

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Context and objectives	To determine the changes which local authorities can make to traffic management systems and signal coordination that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Road signs, traffic signals and road markings	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
	• Lane control • Traffic calming measures • Vehicle bans or restrictions • Elements of routes (e.g. positioning of traffic lights) • Roadside emission testing	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • • . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon)	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
	• NO_2 ○	to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • types of vehicles used in England (percentage of vehicles using diesel, petrol and other fuels) •

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Review question 6	Are zoning interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine the types of zoning interventions which local authorities can implement that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Congestion charging • cordons or zones • distance-based charging • speed management zones • keep clear zones • time-based charging	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
	• toll road charging.	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2.	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
		to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • types of vehicles used in England (percentage of vehicles using diesel, petrol and other fuels) •

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Review question 7	Are parking restrictions and charges effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine the changes to parking restrictions and charges which local authorities can implement that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Restricted parking zones (including low emission vehicles, car clubs and electric vehicle recharging points) • parking charges • waiting and loading restrictions.	
Comparator(s)/control	Comparators that will be considered are:	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
	• Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2**.**	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
		to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • types of vehicles used in England (percentage of vehicles using diesel, petrol and other fuels).

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
Review question 8	Are vehicle 'idling' restriction and charges, including waiting and loading restrictions, effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine the changes local authorities can make to restrict vehicle 'idling' that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these changes should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
		that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Waiting restrictions • loading restrictions • enforcement of existing restrictions	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo	

Topic 2	**Traffic management and enforcement, and financial incentives and disincentives**	
Component of protocol	Description	Additional comments
	• Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • • . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2**.**	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions •

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
Review question 9	Are settings-based travel planning (such as in workplaces, new residential developments or schools) interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine which settings-based travel planning interventions support people to choose low emission travel options that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which these interventions should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Car sharing schemes • car parking • improved facilities to encourage cycling or other non-motorised travel • cycle-to-work schemes • policies relating to business travel, including using public transport rather than driving, or incentives for businesses to promote cycling at work • management of vehicle movements related to business activities • interest-free season ticket loans • signage and cycle parking • lighting and planting.	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions • • . The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2**.** Changes in travel mode or distance travelled	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions •

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
Review question 10	Are personalised travel planning interventions to support low emission travel choices effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution	
Context and objectives	To determine what support people need to choose low emission travel options that are effective at improving health outcomes associated with, and reducing exposure to transport related air pollution, and the context in which this support should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots'

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
		• People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation
Intervention(s)	• Personalised travel planning to provide individuals with information, education, incentives and motivation to support low emission travel choices	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions • Medication use or prescriptions for asthma • Medication use or prescriptions for other respiratory conditions	Where other related outcomes (such as GP attendance or measures of elemental carbon) are identified these will be considered for inclusion. Other outcomes (such as mortality) will be considered if studies such as modelling studies are included (for

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
	The outcomes that will be considered when assessing exposure are levels of: • Particulate matter (PM10, PM2.5, particle number concentrations, ultrafine particles, black carbon) • NO_2. Changes in travel mode or distance travelled	instance due to insufficient evidence). The following factors will be considered if they are linked to changes in exposure level or health outcomes: • total emissions • vehicle mileage • fuel economy • types of vehicles used in England (percentage of vehicles using diesel, petrol and other fuels)

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
Review question 11	Are driver information, education and training interventions effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments
Context and objectives	To determine what information, education and training is effective in altering driving styles, route, vehicle and fuel choice to improve health outcomes associated with, and reduces exposure to transport related air pollution, and the context in which these interventions should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation

Topic 3	**Travel Planning and other initiatives providing information, advice, education and skill development**	
Component of protocol	Description	Additional comments

Intervention(s)	Information, education and training on:
	• Fuel
	• vehicles (including zero-emission vehicles)
	• route choice
	• driving styles including
	  o the need to avoid heavy acceleration
	  o minimise braking and excessive speed
	  o switching off when stationery.	

Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing behaviours will be • driving style • total mileage • vehicle type • fuel consumption • knowledge about air pollution • average speed	•

Topic 4	**Advice and warnings for the public and people at particular risk**	
Component of protocol	Description	Additional comments
Review question 12	Are interventions providing advice and warnings for the public and people at particular risk effective and cost effective at reducing the health impact of, or people's exposure to, traffic-related air pollution?	
Context and objectives	To determine what advice and warnings enable the public and people at particular risk to reduce their personal exposure to, and the health impact of traffic-related air pollution, and the context in which these interventions should be delivered.	
Participants/population	Whole population or subgroups (see Subgroup analysis section).	In the event of more evidence being identified that is feasible to consider in the time available, priority will be given to considering evidence on groups at greatest risk. This will include (but will not be restricted to): • People who live or work in places with road-traffic-related air pollution 'hot spots' • People aged under 14 yrs and over 65 yrs • People with pre-existing health conditions • Socio-economic deprivation

Topic 4	**Advice and warnings for the public and people at particular risk**	
Component of protocol	Description	Additional comments
Intervention(s)	Provision of: • air pollution forecasts and real time data • air pollution early warning alerts via text or emails • air pollution early warning or monitoring information via web- or app- based geographical systems • support for route choices.	
Comparator(s)/control	Comparators that will be considered are: • Other intervention • Status quo • Time (before and after) or area (i.e. matched city a vs b) comparisons	
Outcome(s)	The outcomes that will be considered when assessing the impact on health are: • Hospital admissions for respiratory disease • Exacerbations of asthma • Exacerbations of other respiratory conditions The outcomes that will be considered when assessing change in behaviour are: • **Physical a**ctivity behaviour • Medication use or prescriptions for asthma	

Topic 4	**Advice and warnings for the public and people at particular risk**	
Component of protocol	Description	Additional comments
	• Medication use or prescriptions for other respiratory conditions • Knowledge about the health impacts of air pollution	

Appendix 1 – Sources to be searched

A systematic search of relevant databases and websites (listed below) will be carried out to identify relevant studies.

Databases

Core databases

- MEDLINE and MEDLINE in Process (OVID)
- Embase (OVID)
- Health Management Information Consortium (HMIC) (OVID)
- Social Policy and Practice (OVID)
- CENTRAL (Wiley)
- Cochrane Database of Systematic Reviews (Wiley)
- DARE (Wiley)

Other databases

- Transport (OVID)
- Greenfile (EBSCO)
- NHS EED (legacy database) (Wiley)
- EconLit (OVID)
- Bibliomap

Websites

- Google / Google Scholar, (with appropriate limits and looking specifically for reports or evaluations of interventions to reduce transport related air pollution)
- Department for Transport (DfT - https://www.gov.uk/government/organisations/department-for-transport)
- TRL (transport research laboratory – http://www.trl.co.uk)
- Passenger Transport Executive Group (PTEG – www.pteg.net)
- Transport Research & Innovation Portal (http://www.transport-research.info/web/index.cfm)
- RIVM (http://www.rivm.nl/en/)
- DEFRA (https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs)

Appendix 2 – search strategy

Database: Ovid MEDLINE(R) <1946 to September Week 4 2015>

Search Strategy:

---

1 ((fuel or emission* or diesel or petrol or exhaust or fume*) adj3 (road* or vehicle* or motor* or car or cars or traffic)).ti,ab. (2942)

2 ("transport pollution" or "street pollution").ti,ab. (15)

3 Air Pollution/ or Air Pollutants/ (51623)

4 Inhalation Exposure/ (7037)

5 Smog/ (388)

6 Vehicle Emissions/ (7631)

7 (particle* or particulate* or "fine particle*" or "ultrafine particle*" or PM10 or PM5 or PM2* or "particulate matter" or "PM emission*").ti,ab. (208946)

8 Particulate Matter/ (9185)

9 ("nitrogen oxide*" or "nitrogen dioxide*" or NO2 or ozone or nox or "black carbon").ti,ab. (26714)

10 Carbon Dioxide/ (76818)

11 Nitrogen Dioxide/ (3775)

12 ("concentrated ambient air particle*" or smog or "air pollut*" or "air toxics" or "inhalation exposure" or "roadside concentration*").ti,ab. (20250)

13 air quality.ti,ab. (5761)

14 or/1-13 (354248)

15 exp Motor Vehicles/ (16179)

16 Automobile Driving/ (14997)

17 Transportation/ (7264)

18 (car or cars or bus or buses or truck* or van or vans or lorry or lorries or taxi or taxis or motorbike* or motorcycle* or automobile* or "motor vehicle*").ti,ab. (54779)

19 fleet.ti,ab. (988)

20 (road* or street* or kerb* or pavement* or highway* or motorway* or "trunk route*" or traffic or multistorey).ti,ab. (62214)

21 (driver* or driving or passenger* or commut* or pedestrian* or cyclist*).ti,ab. (78434)

22 (commut* or traffic or congest* or "rush hour" or tailback* or idling or "school run" or "tail back*" or tail-back* or "rush hour*" or rush-hour*).ti,ab. (80246)

23 or/15-22 (236690)

24 14 and 23 (12222)

25 ((infrastructure* or plan* or develop* or design* or allocat* or control* or space*) adj3 (route* or road* or walkway* or street* or pavement* or urban or city or cities or town* or transport* or green or environment* or building*)).ti,ab. (46847)

26 City Planning/ or Environment Design/ (5687)

27 ("health impact assessment*" or "environmental impact assessment*").ti,ab. (768)

28 Health Impact Assessment/ (230)

29 "cycle route*".ti,ab. (12)

30 ((bus or buses or "public transport*") and (lane* or route* or trip* or service* or plan*)).ti,ab. (795)

31 (("zero emission*" or "ultralow nox" or "ultra low nox" or "ultra-low nox") and (route* or service* or mode or modes or facilit* or develop* or design*)).ti,ab. (17)

32 ("clean bus technology" or "low carbon vehicle procurement" or "city air" or "green bus*").ti,ab. (85)

33 ("green technolog*" or "emission* standard*" or "Euro 6" or Euro6 or "Euro VI").ti,ab. (418)

34 (barrier* or "urban greening" or vegetation or hedge* or planting* or tree* or foliage or "urban woodland*" or "ecological engineering" or ecosystem*).ti,ab. (281199)

35 Trees/ (20220)

36 ((dispersion or deposition or absorption or adsorption or impingement) adj3 (road* or street* or kerb* or pavement* or highway* or motorway* or intersection or traffic or vehicle*)).ti,ab. (212)

37 ("road surface*" or "dust suppressant*" or "porous asphalt" or "very open asphalt" or "calcium magnesium acetate" or "surface treatment*" or "titanium oxide*" or "titanium dioxide*").ti,ab. (5984)

38 (("catalytic action" or photocataly*) and (road* or highway* or street* or pavement* or paving or concrete or asphalt)).ti,ab. (16)

39 or/25-38 (346576)

40 ((traffic or road) adj2 (sign or signal* or light*)).ti,ab. (760)

41 ((continuous adj2 flow*) or "green wave").ti,ab. (7582)

42 ((traffic or road* or vehicle*) adj2 (flow* or control* or ban or manage* or restrict* or enforce* or calm*)).ti,ab. (11872)

43 (speed* adj2 (limit* or restric* or reduc* or charg* or fine*)).ti,ab. (2468)

44 ((charg* or toll* or pay or payment) and (road* or vehicle* or congestion or zone*)).ti,ab. (3061)

45 ("low emission zone*" or "ultra-low emission zone*" or LEZ or ULEZ).ti,ab. (21)

46 ((parking or idling or waiting or loading) and (charg* or restrict* or enforce* or zone* or control*)).ti,ab. (28440)

47 or/40-46 (53669)

48 ("travel plan*" or "journey plan*").ti,ab. (69)

49 (car adj (use* or trip* or journey*)).ti,ab. (143)

50 (((mode* or modal) adj2 (shift* or change* or choice*)) or "active travel*" or "active transport*" or walk* or cycle or cycling or cyclist* or bicycl* or pedestrian* or bike* or "travel mode" or "travel behaviour" or "travel behavior").ti,ab. (448890)

51 (Bikability or "Cycling Cities and Towns").ti,ab. (2)

52 (vehicle occupancy or "CarLite" or ((car or cars or vehicle* or bike or lift) adj2 (pool* or shar* or club*))).ti,ab. (79)

53 or/48-52 (449093)

54 ((educat* or aware* or inform* or advice or advise or develop* or promot* or initiative* or intervention*) and (travel* or fuel or driver* or driving or car or cars)).ti,ab. (50165)

55 ("alternative fuel*" or "compressed natural gas" or CNG or "liquid petroleum gas" or "liquified petroleum gas" or "liquefied petroleum gas" or biofuel* or biodiesel* or "low carbon transport fuel*" or LPG).ti,ab. (7548)

56 ("plugged-in" or ((hybrid or electric*) adj2 (car or cars or bus or buses or taxi or taxis or vehicle*))).ti,ab. (262)

57 ((driver* or driving) adj2 (style* or behaviour* or behavior* or training)).ti,ab. (1751)

58 ("fuel consumption" or "fuel economy" or "fuel choice*" or "stop go driving" or acceleration or deceleration or braking or eco-driving).ti,ab. (37386)

59 ((miles or mileage or vehicle* or route* or travel*) and (habit* or pattern* or drive* or choice* or reduc* or behavior* or behaviour*)).ti,ab. (80986)

60 Hotlines/ or Mass Media/ or Social Media/ (13630)

61 ((warning* or advice or advisory or forecast* or alerts or alerting or telehealth) adj3 (health or risk* or exposure)).ti,ab. (4207)

62 or/54-61 (185282)

63 39 or 47 or 53 or 62 (991405)

64 24 and 63 (3971)

65 letter/ or historical article/ or comment/ or editorial/ or congress/ (1731561)

66 64 not 65 (3931)

67 animals/ not humans/ (4021057)

68 66 not 67 (3659)

69 limit 68 to english language (3441)

70 limit 69 to yr="1995 -Current" (3211)

****