





# Evidence Collections for Climate and Health



Authors

Rebecca Newbould, Rachel Juel, Aparna Dasaraju, Sarah Whitmee, Robert Hughes

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# List of Abbreviations

ATE	Active Travel England
CCC	Climate Change Committee (UK)
DHSC	Department of Health and Social Care
DONE	Determinants of Nutrition and Eating framework <sup>1</sup>
FEED	Food Environment Evidence Directory
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
MMAT	Mixed Methods Appraisal Tool <sup>2</sup>
NDPBs	Non-Departmental public bodies
NHS	National Health Service
NO <sub>2</sub>	Nitrogen dioxide
OECD	Organisation for Economic Co-operation and Development
OHID	Office for Health Improvement and Disparities
PM <sub>2.5</sub>	Particulate matter with diameters 2.5 micrometres and smaller
UK	United Kingdom



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# Introduction

This report brings together two evidence collections exploring the intersection between climate action and improving population health. Each collection provides evidence to support one of the following 'shifts', that may result in benefits to both people and the planet:

- 1. Shifting diets to be healthier and more environmentally sustainable
- 2. Shifting modes of transportation towards active travel

The report begins with an introduction outlining the rationale for focusing on these topics based on their importance, potential impact and alignment with relevant policy goals. It then details the methodology employed in compiling the evidence collections. Subsequent sections present project outputs, highlighting key insights from each evidence collection. Finally, the report offers concluding observations and suggests areas for future research, along with a set of supporting appendices.

#### Background

#### Climate change and population health in the UK

Climate change, driven by unsustainable levels of fossil fuel extraction and combustion, poses immediate and escalating threats to human health in the UK. Increasingly severe weather events, such as heatwaves and flooding, directly jeopardise lives and strain critical infrastructure <sup>3-7</sup>. Harmful greenhouse gas emissions—significant drivers of climate change—degrade air quality and lead to a range of detrimental health effects.<sup>8-10</sup>

Projected data indicates that average temperatures in England are set to increase by 1.3°C by the 2050s compared to the 1981–2000 baseline.<sup>11</sup> This upward trajectory is a consequence of increasing global temperatures. The threshold increase set by the Paris Agreement (a global average increase of 1.5°C above pre-industrial levels) to prevent irreversible damage to the Earth's climate systems is likely to be reached between 2023 and 2027.<sup>12</sup>

To protect the health of current and future generations, climate change is being prioritised as a major public health policy issue. The 2022 UK Climate Risk Assessment <sup>13</sup> identifies extreme weather and associated health effects as high-level risk, while the 2023 National Risk Register<sup>14</sup> identifies the acute risk that both extreme weather and poor air quality pose to the UK population. These risks are projected to intensify<sup>15</sup>, disproportionately impacting vulnerable populations, including the elderly, children, and those living in deprived areas.<sup>7, 16</sup> These will mirror and amplify existing health inequality gradients.<sup>7</sup> Significant coordinated action across health and environmental sectors is needed to mitigate these risks and address climate change within the UK. This includes a judicious mix of actions across sectors which deliver benefits to both the climate and population health.

#### Climate change is bringing UK public health and climate policy closer together.

The UK is committed to achieving net zero emissions by 2050.<sup>17</sup> This will require rapid and ambitious implementation of climate mitigation strategies, requiring both systemic and individual behaviour changes across the UK. At the same time health inequalities are rising, including those driven by behaviours such as diet.<sup>18</sup> Unhealthy diets and physical inactivity are recognized as key risk factors to obesity, chronic diseases, and premature mortality.<sup>19</sup> Changing these behaviours are therefore crucial to achieving the government's public health goals and the priorities outlined in the NHS Plan.<sup>20-22</sup> There is considerable potential overlap between the interventions proposed to tackle these existing and growing public health challenges and candidate policy interventions to mitigate climate change.<sup>16</sup>

Two recent reports by the UK government detail the relationship between climate and health, in 2022 the UK Office for Health Improvement & Disparities (OHID) published the *Climate and Health: Applying All Our Health*<sup>23</sup> and the UK Health and Security Agency (UKHSA) published *Health Effects of Climate Change in the UK* in 2023.<sup>7</sup> These identified four sectors where reducing greenhouse gas emissions can simultaneously address public health challenges: transport, food, housing, and greenspace. These areas all provide "win-win" opportunities for health and the climate crisis, as they can improve both human health and the environment.

#### Transformative shifts: Sustainable Diets and Active Travel

Desk-based research was undertaken to scope the existing literature on climate and health, to identify potential areas of focus. Key policy documents (UK and UN, including the most recent IPCC and Committee on Climate Change reports) were reviewed to generate an initial set of topics. Based on this desk review and a rapid consultation among the LSHTM research team, the focus of this project was refined to two critical shifts that represented clear potential overlaps between climate action and population health improvement: (1) shifting diets towards more healthy and sustainable diets, and (2) increasing the use of active travel (walking, cycling, wheeling and public transport), as highlighted by the UKHSA *Health Effects of Climate Change in the UK* 2023 report.<sup>7</sup> In addition, in view of the need for systemic change in these areas, this project focused on collating evidence on population, rather than individual, level interventions and policies.

#### Spheres of influence: Local Environment and Governance Sphere

The scoping review additionally identified the two policy fields of climate and health have, to date, had a shared focus on individual behaviour. However, extensive research in the health domain suggests that upstream policy interventions aimed at whole populations (e.g. regulatory measures or fiscal policies) are both more effective and more equitable in achieving individual behaviour change than interventions that seek to target individuals at high risk or aim to encourage voluntary behaviour change.<sup>24-26</sup>

#### Project Aim

The project aims to contribute to a shared evidence base for integrated and equity-focused policies that promote improved population health while supporting efforts to mitigate climate change. This has been done by producing a set of open-source Evidence Collections that fill key evidence gaps across two policy fields: 1) healthy and sustainable diets 2) active travel.

To focus within these broad agendas, we chose to:

- Look beyond individual-level interventions and focus on population-level interventions and policies that may be more effective and equitable in achieving change at scale.
- Focus the evidence collection for healthy and sustainable diets on interventions in the food environment (where individuals make decisions about which items to purchase and consume) or policies (which seek to influence individuals' dietary behaviours through governance), rather than those that are directed at individuals.
- Focus the **active travel evidence collection** on evidence to support sub-national level interventions, aiming to target its outputs towards local authorities within the UK; an area that initial scoping identified as a potential gap.

The following section explains further the rationale for focussing on healthy and sustainable diets and active travel.

	Healthy and sustainable diets
	The UK's agriculture sector accounted for 12% of greenhouse gas (GHG) emissions in 2022. <sup>27</sup> Prior to this, the per-capita GHG emission in the UK due to food was reported to be decreasing, primarily due to improvements in agricultural efficiency. <sup>28</sup>
Substantial emissions savings are possible by shifting our diets.	Though innovations in agricultural production have helped to reduce the UK's food-related emissions, the Climate Change Committee's 2023 progress report to the UK Parliament <sup>29</sup> noted that a "high dependency on innovation, with limited focus on demand-side measures" contributes to a lower abatement estimate for 2035 compared to the net-zero standard. Meaning, the current plan for reducing emissions from the UK food system focuses too little on shifting consumer behaviour.
	Emissions from the dietary patterns of most industrialised countries can be significantly reduced if we <b>shift diets to be "plant-rich"</b> , with more plant protein and less saturated fats <sup>30</sup> . Research has shown that additional emissions savings may occur by adopting a lower-carbon diet. Notably, shifting to the Planetary Health Diet in the UK could reduce emissions by 42%. <sup>28</sup> The Planetary Health Diet presented by the EAT-Lancet Commission <sup>31</sup> provides guidance for individuals to optimise their diet for both their health and the health of the planet. The promoted diet is nutrient-dense and "plant-forward". <sup>32</sup>
The current dietary status of the UK	Currently, the UK diet is poor, and is characterised by high-carbon, highly obesogenic food items. Though on average all age groups in the UK ate less than the recommended <i>maximum daily intake</i> of red and processed meat (70 g) <sup>33</sup> , most still exceed the amount recommended by the Planetary Health Diet (98 g <i>per week</i> ). <sup>34</sup>
for improvement	Additionally, in the UK, most people across all age groups eat fewer than the recommended daily portion of fruit and vegetables <sup>33</sup> and the Broken Plate 2023 report revealed over half of the calories consumed by the UK population (aged over 11), comes from ultra-processed foods. <sup>35</sup>
A diet high in animal-sourced products may have additional hidden costs to health	The current diet in the UK is high in animal-sourced products. Though the cost of antimicrobial resistance due to animal-agriculture in the UK is currently unknown, it has been estimated as $\pounds 2.34$ billion in 2015. <sup>36</sup> Notably, in the USA, 22% of antibiotic-resistant human illness was linked to food <sup>36</sup> , indicating the potential for diets high in animal products to have substantial hidden costs to the health of the UK population.
There are multiple health co-benefits shifting diets to be low in GHG emissions.	Transitioning towards sustainable diets, such as the EAT-Lancet reference diet, can potentially prevent a substantial percentage of deaths and cancers <sup>37</sup> . By making small dietary swaps towards plant-based options and lower-GHG emission foods, individuals can not only reduce their personal carbon footprint but also improve their overall dietary quality, leading to a win-win situation for both health and the environment. <sup>38</sup>
A global	The EAT-Lancet Commission report underscores the interconnectedness of human health, environmental sustainability, and food systems, advocating for a holistic approach to ensure a healthier future for both people and the planet.
the food system is needed to achieve maximum health and climate benefits	The 'food systems approach' <sup>39</sup> is a common framework that seeks to limit unwanted "trade-offs" and maximise potential "synergies" between the interconnected areas recognized by the EAT-Lancet Commission. Applying this approach to our diets, requires shifting consumption towards nutrient-dense, plant-based options, while reducing food waste, and ensuring food is produced in sustainable ways. This approach will maximise the potential benefits to both health and the climate.

	Active Travel
The possible emissions savings from decarbonising transport are significant.	Of all sectors, transportation generates the highest quantity of UK GHG emissions. <sup>7</sup> Domestic transport made up 28% of total UK GHG emissions in 2022. <sup>27</sup> These must be drastically reduced to meet the UK's Net Zero target, with the Climate Change Committee reporting that a "90% reduction in transport emissions by 2050 is needed". <sup>40</sup>
Electrification of transport is part, but not all, of the solution.	Reducing our reliance on cars is key to decarbonising passenger transport <sup>41</sup> . Nearly three-quarters of the UK's road transport emissions, which constituted around 90% of domestic transport emissions, were attributable to cars and vans <sup>29</sup> . Although electric vehicles help to reduce emissions, they still contribute to air pollution and a car dependent system. <sup>42, 43</sup> Additionally, a decarbonization pathway for transport that relies almost solely on vehicle electrification may prove less cost-effective and faces increased risks in implementation. <sup>29</sup>
Two of the biggest risk factors for population health in the UK are air quality	Air quality represents the leading environmental factor impacting public health within the UK. <sup>7,44</sup> Between 29,000 to 43,000 deaths a year have been attributed to ambient air pollution. <sup>7,44</sup> It is also linked to various adverse health outcomes, such as cardiovascular and respiratory disease and has been shown to unequally impact deprived populations. <sup>7,45</sup> Road vehicles are a major source of harmful air pollutants like PM <sub>2.5</sub> <sup>i</sup> and NO <sub>2</sub> <sup>ii</sup> , posing a significant health risk, especially in densely populated urban areas. <sup>42</sup> Active travel on the other hand, provides a non-polluting transport alternative.
and physical activity levels.	Modal shift <sup>iii</sup> towards active travel, including walking, cycling, and public transport, provides a great opportunity to increase physical activity. Within the UK, physical inactivity is responsible for one in six deaths. <sup>46</sup> A 2018 review by Public Health England <sup>47</sup> found walking and cycling offer significant health advantages, boosting metabolic function, and reducing the risk of premature death. These activities help prevent chronic diseases like cardiovascular illness, type II diabetes, and certain cancers, while also promoting mental well-being and reducing the risk of dementia. The review also found that the health benefits of walking and cycling far outweigh any potential risks, such as those from injury or pollution exposure <sup>47</sup> . Use of public transport also elevates physical activity levels, providing potential health benefits. <sup>48,49</sup>
Current levels of active travel there is room for large gains to be made.	In 2022, 46% of short trips in English towns and cities were made by walking, cycling or wheeling. <sup>50</sup> The UK Government wants to make walking and cycling the natural choice for these short journeys with a goal to increase the percentage of short journeys in towns and cities that are walked or cycled to 50% in 2030 and to 55% in 2035. <sup>46, 51, 52</sup> "The expected effect of increased cycling in just a few major cities in England on NHS costs could lead to savings of about £319 billion between 2017 and 2040". <sup>7</sup>
Systemic modal shift is likely to be required to gain maximum health and climate benefits.	Promoting modal shift towards walking, cycling and public transport as primary modes of transportation delivers multifaceted benefits. This approach reduces carbon emissions, combats air pollution, and enhances overall physical and mental health. To realise these substantial benefits for the climate and public health, systemic changes are needed, including prioritising public transport and active travel modes while reducing reliance on private car use. <sup>53</sup>

 <sup>&</sup>lt;sup>i</sup> PM<sub>2.5</sub> Particulate matter with diameters 2.5 micrometres and smaller
 <sup>ii</sup> NO<sub>2</sub> Nitrogen Dioxide
 <sup>iii</sup> Modal shift implies a shift in travel patterns away from private motorised vehicles towards active transport (walking, cycling, wheeling and public transport).

#### Key Audiences

This report, and the linked outputs, have been written with several potential audiences in mind, including various stakeholders working at the climate and health policy interface. This includes:

- Policymakers and policy-users from across central and devolved government departments and their non-departmental public bodies (NDPBs) including DHSC and OHID.
- Local and regional public health professionals, including those in local authorities, and other community stakeholders.
- Adjacent key stakeholder groups which may share an interest in active travel such as transport and education, including city planners and school administrators.

It is hoped that these research findings may help contribute to the formulation of effective health and climate-friendly policy solutions.

# Methods

Two different methodological approaches were taken for the evidence collections. Detailed methods can be found in appendix <u>A</u> and <u>C</u>. A summary of each evidence collection's methodology is provided below.

#### FEED - Food Environment Evidence Directory

The Food Environment Evidence Directory (FEED) was created using a top-down approach, first identifying a broad base of relevant literature through a comprehensive and conventional literature search methodology. 160 publications were identified for inclusion into the FEED database through screening of 5255 publications obtained from the search strategy outlined in <u>Appendix A</u>. These publications were used as the basis for the creation of two tools, the FEED Map and the FEED Visualiser. These tools were created to enable users to easily view the landscape of the literature and to explore it in further detail, according to their own queries. Each stage of the research is summarised in Table 1. A detailed methodology for each stage can be found in <u>Appendix A</u>.

Stage	Description and outcome
Scoping the literature	A rapid review of the literature was conducted to scope the existing landscape of evidence on shifting diets. Research to develop the Determinants of Nutrition and Eating (DONE) framework <sup>1</sup> , indicated that interventions in the food environment (where people make their decisions about what food to consume) and the policy sphere (where both deliberate and unintended governance affects food and shapes the food environment and individual's dietary behaviour) were a higher priority for research and may produce better health outcomes compared to individual- level interventions (such as nutrition counselling). Work on Food Environment Typologies <sup>54</sup> indicated food environment interventions and policies could be characterised by different functions which control individual-level dietary behaviour from a higher level.
	Additionally, the scoping review identified a general overemphasis on individual-level interventions in the literature, particularly noting an excess of interventions focused on educating consumers on dietary behaviours. <sup>55</sup>

#### Table 1: Summarised methodology for the Food Environment Evidence Directory

Defining the scope of the FEED	<ul> <li>Based on the findings of the scoping review, the focus of this research was defined by the following aim and objectives.</li> <li>The aim of this research was to create an evidence collection of interventions and policies within the food environment or at population level that may shift diets towards being healthier and more sustainable.</li> <li>The objectives were to: <ol> <li>Systematically categorise consolidated evidence on interventions and policies that may shift diets through changes to the food environment or a policies.</li> </ol> </li> </ul>
	<ol> <li>Create an interactive database of evidence that may be used to direct users to relevant research; and</li> <li>Identify potential gaps within this existing evidence base.</li> </ol>
Literature search	<ul> <li>A search strategy was developed and used to search three online, peer-reviewed databases.</li> <li>Working with a librarian, we developed a search strategy based on three sets of terms. Full search strings for each database can be found in <u>Appendix A</u>.</li> <li>1. Type of evidence: Consolidated evidence, such as: <ul> <li>(systematic\$ adj2 review\$) or meta-analytic\$ or metanalysis)</li> </ul> </li> <li>2. Intervention level: Interventions of any type occurring at any level above the individual, such as: <ul> <li>(population or "food environment" or polic\$)</li> </ul> </li> <li>3. Diet shift outcome: Shift in any intake or uptake of food or diet in any direction, by the individual, such as: <ul> <li>( improv\$ or enhanc\$) and (diet\$ or food\$)</li> </ul> </li> <li>Systematic database searches of MEDLINE, Web of Science and Embase were conducted in January 2023.</li> </ul>
Defining inclusion and exclusion criteria	<ul> <li>For a paper to be included in the review, it had to meet a predefined set of inclusion criteria.</li> <li>Full PICO criteria can be found in <u>Appendix A</u>, and is summarised below: <ol> <li>Publication focuses on any human population</li> <li>Publication assesses interventions trialled in the food environment or at the population-level</li> <li>Publication assesses individual-level food intake or diet uptake outcomes</li> <li>Publication consolidates evidence, such as reviews, systematic reviews, and meta-analyses</li> <li>Publication is written in English, is peer reviewed and was published after 1974.</li> </ol> </li> <li>Reviews were excluded if they were exclusively using evidence from virtual discrete choice experiments (given the uncertainty about how these translate into real-world choices).</li> </ul>
Screening of publications	Three reviewers (RJ, RN, ASD) each independently screened a selection of 5255 publications at title & abstract stage and 309 publications at full text stage, for inclusion in the FEED. The final selection included 160 papers.
Quality appraisal	<b>Included papers were assigned a quality rating of low, moderate or strong.</b> Quality ratings were retrieved from the independent registry of Health

	Evidence <sup>56</sup> for 108 publications. For the remaining 52 publications that were not available on Health Evidence, the Health Evidence Quality assessment tool <sup>57</sup> was used to assess quality. The assessments were completed independently by two researchers (RN, ASD) and quality audited by a third researcher (RJ).
Data extraction	Data extraction was completed using artificial intelligence and manual methods. Two researchers (RN, ASD) manually extracted data on publication type and year. Intervention and outcome data was extracted using Elicit AI <sup>58</sup> and checked for accuracy against a subset (n=13) of manually extracted data by one researcher (RJ).
Data coding	Coding for the FEED Map and Visualiser was completed manually, and in duplicate. Three researchers (RN, ASD, RJ) coded all publications based on the extracted data. Publications were additionally coded based on the function(s) of the intervention(s) reviewed, according to the framework from Downs <sup>54</sup> (see Figure 1), with two additional categories for publications that did not target any specific category or targeted multiple functions (Figure 2).
	Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions, extracted noise bowns 1.         Image: Provide Lindextools of interventions of interventions interventions interventions interventions interventions interventions interventions interventions interventions of interventions interve
	Figure 2. County diagram for diel intervention functions.





Publications were also coded by subpopulation, according to any subpopulations explicitly mentioned in their methods section.

Further explanation of the codes found in the FEED map and visualiser can be found in Appendix A.

Creating the tools and engaging stakeholders for review **Two tools were created using the FEED, the Map and the Visualiser.** The EPPI Reviewer programme <sup>59</sup> was used to create the FEED Map and FEED Visualiser. These tools were pretested with a group of 3 potential stakeholders (nutrition, sustainable diet, and climate researchers) who provided valuable insights on the map design and functionality, informing development of a brief user guide and walk-through videos.

#### Active Travel Evidence Collection

In contrast to the FEED, for the Active Travel Evidence Collection we took a bottom-up approach. The first stage of the process involved reviewing the policy landscape and then holding a stakeholder consultation. These processes were used to identify broad policy-relevant evidence gaps and a much more defined set of pressing evidence questions. The second stage was completing a set of Al-supported rapid reviews. These evidence summaries were rapid summaries guided by, and targeted at, a policy audience.

The two stages of the research are summarised in Table 2. A detailed methodology for each stage can be found in <u>Appendix C</u>.

Stage One: Scoping the policy landscape and prioritising evidence gaps through

#### Table 2: Summarised methodology for the Active Travel Evidence Collection

stakeholder consultatio	n n
The scope of the evidence collection was defined; three rapid reviews on active travel, relevant to UK policy users.	The project aimed to address current gaps in evidence, as determined by those involved in the field of active travel, to help inform, primarily locally led efforts, to promote modal shift. We decided that the best way to support policy makers was through evidence synthesis, specifically by conducting three policy-focused rapid evidence reviews.
The focus was on local government level policy.	As most active travel interventions in the UK are implemented at local government level <sup>60</sup> , we targeted our reviews towards Local Authorities.
Public transport was included in our definition of active travel.	Active travel was defined as transportation by walking, cycling, wheeling and public transport. This definition acknowledges that using public transport often incorporates elements of active travel, such as walking or cycling, and therefore increases users' daily physical activity. <sup>7,8</sup>
Existing national level active travel policies within the UK were identified.	To help identify where evidence would best support a shift to active travel, we found existing UK policies that could support modal shift. These were taken from national government policy and strategy documents, as transport is the responsibility of the devolved governments. Over 75 different policies were identified and reviewed (see <u>Appendix C</u> ).
Policies were prioritised using climate recommendations from CCC, IPCC and the Climate Assembly UK.	A shortlist of 21 high priority policies was created by cross-referencing policies with Climate Change Committee (CCC) reports <sup>61-63</sup> , the Intergovernmental Panel on Climate Change (IPCC) <sup>64, 65</sup> recommendations and Climate Assembly UK outputs <sup>66</sup> . For a policy to reach the shortlist it had to be mentioned by all four devolved governments, or by three devolved governments and more than two climate reports. A full decision tree for the shortlist, and the shortlist itself, can be found in <u>Appendix C</u> .

Outputs from the Climate Assembly UK were drawn on to provide insights into public perspectives on sustainable travel policy.	A participatory research approach was used for this evidence collection, considering both active travel policy makers and end-users as stakeholders. We drew on the outputs from the Climate Assembly UK to capture the carefully collected perspectives end-users of active travel policy. The Climate Assembly UK was a multi-day consultation with 108 citizens from across the UK, where they were asked about their support for policies to decarbonise transport (along with other climate related
	topics). We used the outputs from the Climate Assembly as it consisted of a much larger and more representative sample of the UK population than would have been possible to gather for this project.
The policy shortlist was used in the stakeholder consultation with local and national policy users and policymakers to identify evidence gaps	An online stakeholder workshop was completed with 13 active travel policy users and makers from across the UK. There was a wide variety of attendees from across transport and health disciplines, different levels of government (including local and regional authorities) and advocacy groups.
identify evidence gaps.	Participants were asked to complete three main tasks: 1) Create a prioritisation matrix of our policy shortlist, 2) Identify key barriers and enablers of action at a local level, 3) Generate their own evidence questions based on where they thought the gaps in evidence lay.
The consolidated outputs from the stakeholder workshop created 10 possible review questions, which we asked stakeholders	After thematically sorting the evidence gaps generated by the stakeholder workshop, we formed a list of 10 possible questions for the rapid reviews. This list was sent out to all those invited to the stakeholder workshops (including those who did not attend), asking them to rank the questions in order of priority.
to rank.	Further consultation identified that some of the questions on our review list were already being explored through OHID commissioned reviews (best metrics to assess modal shift/active travel interventions, if/how different socioeconomic groups are affected by active travel interventions, what measures that have been successful in supporting lower socio-demographic groups to uptake active travel); after excluding these, we focused on the next highest priority questions on our list.
The final rapid review questions were selected.	<b>Review 1:</b> What framing should Local Authorities use when discussing 'push' interventions to promote modal shift away from car use to active travel (such as road user charges, vehicle emission zones, reprioritisation of parking spaces) to effectively communicate with the public?
	<b>Review 2</b> : What are the local economic impacts of active travel interventions or shifts to active travel? (including what is the local economic spend of car users versus active travel users in the UK?)
	<b>Review 3:</b> Does emphasising active travel in planning policy result in increased active travel?

# Stage Two: Conducting the rapid reviews

Defining inclusion and exclusion criteria	The PICOS framework defined the eligibility criteria for each review ( <u>Appendix C</u> ). Any study design was included, including reviews and grey literature.
Literature search using Al tools	Al-powered literature search tools allowed for an accelerated and targeted search across different disciplines.
	<ul> <li>The four tools used were:</li> <li>1. Elicit Al <sup>58</sup></li> <li>2. Consensus Al <sup>67</sup></li> <li>3. Google Scholar</li> <li>4. Scite Al <sup>68</sup></li> </ul>
	The search strategies can be found in <u>Appendix C</u> . Elicit and Consensus are AI research search tools that use large language models to search papers from the Semantic Scholar database. Elicit can also extract data from papers. Scite AI is a citation searching tool that also uses the Semantic Scholar database.
Screening of publications	All screening was completed by one reviewer (RN). Screening and duplicate identification was done using Rayyan <sup>59</sup> and EPPI Reviewer software <sup>59</sup> .
Information extraction and data synthesis	Extraction of relevant information was completed manually by one reviewer (RN), with Elicit AI support in two reviews.
	As there was considerable heterogeneity in outcomes for all reviews, manual narrative evidence synthesis was performed. Gemini Al <sup>69</sup> was used to assist with review of draft write-ups and proofreading and we also tested its capability for synthesising manually generated summaries of results; all Al output was thoroughly reviewed and edited before inclusion in reviews.
Quality appraisal	Quality assessment was done formally for review one and two. Papers in review three were informally assessed due to the diversity of publications identified.
	Review one (on framing) used the 2018 Mixed Methods Appraisal Tool (MMAT) <sup>2</sup> and Health Evidence tool <sup>57</sup> to quality appraise the two most relevant studies. Review two (on economic impacts) used the 2018 MMAT to appraise the four most relevant papers. There was no formal quality appraisal completed for review three (on planning policy) due to the amount and diversity of studies found, although quality and risk of bias were informally considered within the narrative synthesis.

# Outputs and emerging insights

#### FEED - Food Environment Evidence Directory

The literature identified for inclusion in the healthy and sustainable diet evidence collection was consolidated into the Food Environment Evidence Directory (FEED), a database that underlays two interactive tools: the <u>FEED Map</u> and <u>FEED Visualiser</u> (Figure 3 &

Figure 4). These two tools form the main outputs of the evidence collection on healthy and sustainable diets.

The tools are accompanied by two documents to guide users and provide a detailed methodology for the review and creation of the tools. Each tool is briefly described below, and the links to each tool and accompanying document are included below. Headline findings from the FEED as well as an example use case are also provided.

#### Figure 3: Screenshot of the (collapsed) FEED Map







### The Map and accompanying documents

The FEED Map is an evidence map that displays the distribution of the 160 publications of the FEED across an interactive visual map (shown in Figure 5 and Figure 6). The map allows you to get an overview of the landscape of the underlying database, and to navigate the included publications by different features, related to the publication itself, and the focus and the content of the reviews.

Each publication is placed in the relevant region(s) of the map according to its categorisation by:

- The function(s)<sup>iv</sup> of the intervention or policy, (affordability, availability, sustainability properties, promotion, quality, having multiple functions simultaneously, or having no prespecified function<sup>v</sup>)
- Relevance of the results to a specific subpopulation(s)<sup>vi</sup> (by age, region, context, and indicators of vulnerability).

Each publication is additionally categorised by the following elements. These appear as filters in the Map, which provide users with more opportunities to navigate the evidence base:

- Publication characteristics (type of publication, year of publication, methodological quality of publication)
- Whether there was a secondary intervention (a non-diet intervention or an intervention targeting individual factors<sup>vii</sup>)
- Any secondary outcome measured besides consumption (related to the environment, health, etc.<sup>viii</sup>).

The FEED Map can be found <u>here.</u>



#### Figure 5: Screenshot of the expanded FEED Map

<sup>iv</sup> Publications may have reviewed more than one intervention and/or policy function and may appear in more than one row in the map.

 $^{\rm v}$  Functions taken from Downs.  $^{\rm 54}$ 

<sup>vi</sup> Publications may have reviewed interventions and/or policies in more than one subpopulation and may appear in more than one column in the map.

<sup>vii</sup> Individual factors include the most direct, individual-level driver of dietary behaviour, such as income, values, beliefs, preferences, social capital, health, knowledge, mobility, skills, and time. <sup>54</sup>

<sup>viii</sup> Secondary outcome categories include environmental outcomes, health-influencing behaviour, health outcomes and metrics, knowledge and attitudes, adherence/effectiveness of intervention, educational outcome, socio-/structural-outcomes, and economic outcomes. These categories were identified from the literature using an inductive approach.



#### Figure 6: Screenshot of selecting an area in FEED Map

Further details on the methods for building the FEED Map can be found in <u>Appendix A</u>. A user guide (and <u>video walkthroughs</u>) for the FEED Map can be found in <u>Appendix B</u>. The video walkthroughs are also linked below in Figure 7 & Figure 8.

#### Figure 7: FEED introduction video

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Figure 8: FEED Map video walkthrough

#### Interpreting the evidence landscape using the FEED Map

The FEED Map presents the distribution of 160 publications according to their relevance to different intervention functions and subpopulations. Although the Map is primarily intended to be a living tool for target inquiry, it was reviewed by the research team to identify trends in evidence clusters and gaps in an attempt to characterise, with caveats, the landscape of the underlying literature reviewed. Table 3 provides trends in evidence clustering and evidence gaps, along with possible interpretations.

## Table 3: Interpreting the evidence clusters and gaps from the FEED Map

What the Map shows	Possible Interpretation
Most literature we identified had a focus on interventions in specific settings (e.g. education or healthcare). When we look at ways of defining the 'population' of focus within the literature on food environment interventions and policies, the 'setting' seems to be the most commonly investigated, followed by 'age'.	It may be that researchers are interested in setting-specific interventions or interventions amongst specific age groups, or that these characteristics are consistently reported in the primary evidence, resulting in their emphasis in the reviews that we identified.
When we look at the functions of the interventions reviewed, reviews that had no specified function ('Function Non-Specific') were the most common, followed by those focusing on 'Availability' and 'Affordability' interventions.	It may be that researchers are seeking interventions to shift consumption, with an 'open mind' about what will be <i>effective</i> . Alternatively, researchers may be seeking <i>examples</i> of types of interventions, for different subpopulations. Availability and affordability are common research themes food security research and thus may have been frequently studied in the primary evidence, resulting in their inclusion in systematic reviews.
We identified few reviews that explicitly looked at both sustainability and consumption or health outcomes.	It may reflect that this is a more recent research field when compared to broader questions about dietary shifts.
'Children' and 'Adolescents' appear to be the most studied subpopulations.	Children and adolescents appear to be a population of interest in diet change literature, likely due to their influential developmental stage. It may be that researchers are interested in seeking <i>effectiveness</i> or <i>examples</i> of interventions for these ages, or that there is an abundance of primary evidence focused on these age groups.
Other vulnerable populations (e.g. low-income groups, ethnic minorities) seem to be the least studied subpopulation in the consolidated literature on interventions to shift diets.	This may reflect a limited amount of diet change evidence focussed on vulnerable populations. Alternatively, researchers may not be placing a methodological focus on these populations, instead discussing these populations in the results or discussion sections, excluding them from the map.
There are in general far fewer reviews looking at policy interventions than looking at interventions in the food environment across all functions, except for policies affecting 'Affordability'.	It appears that policies to shift dietary consumption at the individual level are not as common in the literature as food environment interventions. This may be because reviews of policies are less frequently published through peer review processes, that there are fewer policies studied in the primary literature related to individual consumption, or that food environment interventions are more easily designed and implemented than policies.
	However, the syntheses of policy evidence appear to be more common for affordability interventions. This may be because fiscal instruments are largely transferable across settings and thus, frequently used. Perhaps these interventions are more frequently studied in the primary evidence, resulting in their inclusion in systematic reviews.

#### The Visualiser and accompanying documents

The FEED Visualiser is an online web database application for visualising and exploring the contents of the underlying FEED database in a user-friendly interface. Users can conduct searches and view reference coding in the FEED database to generate tables and visualisations tailored to their specific questions. Digging deeper into the reports and visualisations generated gives access to the individual papers and supports export of those references.

The Visualiser uses the same underlying coding structure as the Map and the FEED itself. All publications are coded based on publication characteristics, interventions, relevance to subpopulations, and outcomes. Users can explore the frequency of publications coded with each of these elements and can produce cross-tabulations that describe the number of publications by two elements of interest or 3-dimensional maps to compare the frequency of publications by three elements.

The FEED Visualiser can be found here.

Further details on the methods for building the FEED Visualiser can be found in <u>Appendix A</u>. A user guide (and <u>video walkthroughs</u>) for the FEED Visualiser can be found in <u>Appendix B</u>. The video walkthroughs are also linked in Figure 9 & Figure 10.

Figure 10: FEED Visualiser video walkthrough

#### Figure 9: FEED General Guidance



#### Example Use Case for the FEED

The following use case was created using the FEED Visualiser to demonstrate a query from someone with responsibility for school nutrition seeking examples for ways to increase the availability of healthy/sustainable foods in their school, with the goal of improving child and adolescent diets (in terms of both health and sustainability). This example is provided in Box 1 below.

An additional use case has been built into the FEED Visualiser accessible here.



#### Scenario:

Someone with responsibility for school nutrition is seeking examples for ways to increase the availability of healthy/sustainable foods in their school, with the goal of improving child and adolescent dietary behaviour.

#### Tailoring the search

The official builds the following map using the FEED Visualiser. They set the "Age" category as the x-axis, "Availability" as y-axis, and "Educational Facility" as the segment in the 3DMap feature of the visualiser. <u>Video 3</u> explains how to do this. You can interact with the visualiser <u>here</u>.

		Age				
		Infants	Children	Adolescents	Adults	Elderly
Availability	Availability - Food environment	•••		••••	•	•
	Availability - Policy					

#### Finding the relevant literature

In this example, the school official is likely to investigate the publications categorised as focusing on food environment interventions where availability is the function of the intervention. Additionally, the official will likely investigate those publications categorised as having a focus on children or adolescents. Additionally, they may choose to focus on publications that are relevant to a specific type of educational facility, such as a primary school setting.

By clicking on the blue circle, representing publications that have a focus on children, and the food environment, and primary school setting (indicated by a yellow star in the photo), the official is able to view the two relevant publications.

2 records		
Children [AND] Availability - Food environment [AND] Primary school		
Citations Excel = To RIS (page)		
Short title	Title	
Buchanan (2022)	A Community Guide Systematic Review: School Dietary and Physical Activity Interventions	
de Sa (2008)	Will European agricultural policy for school fruit and vegetables improve public health A review of school fruit and vegetable programmes	

#### Exploring the literature more deeply

From here, the official can independently search for and access the literature online to learn more about interventions that increase availability of healthy and sustainable foods for children, specifically in primary school settings.

#### Limitations to the FEED

The process for creating the FEED, the Map and the Visualiser, resulted in several limitations, primarily related to the literature review methods, the methods for identifying and coding the focuses of each publication, and the constraining features of the two tools.

#### Limitations of literature review methods

The inclusion criteria for the FEED restricted publications to reviews, systematic reviews, and metaanalyses. This resulted in no primary studies being directly included in the FEED. However, as the FEED features publications that consolidate the evidence, these publications often cite primary studies, and thus, users can identify and access primary evidence through citation searches of most publications included in the FEED.

Additionally, as the FEED exclusively features consolidated evidence published up to January 2023, it is possible that primary evidence published in the last several years (and certainly that *all* evidence published after this date) is missing from the included reviews, as it often takes time for primary evidence to be consolidated and synthesised into published reviews.

#### Limitations of coding methodology

Many publications reviewed multiple intervention functions or subpopulations simultaneously. However, publications were only coded as being relevant to a function or subpopulation if they had a 'methodological' focus (having a search strategy, research question, or inclusion criteria) relevant to the function or subpopulation. If instead, a publication only referenced an intervention function or subpopulation *in the results or discussion sections*, these publications would not have been coded as relevant to that category.

Additionally, the tools contain no indicator for weighting each publication's relevance to different interventions or subpopulations. Therefore, the map does not reflect the number of internal studies or the sample sizes within the review. Reviews that focus on multiple intervention functions or subpopulations *simultaneously* are placed in multiple cells within the map, with equal weighting. To the user, this could imply or be read as 'double counting'.

#### Limitation of the tools

An important limitation of the tools is that neither indicates visually the effectiveness of different interventions in shifting diets to be healthier and more sustainable. Though this limitation is linked to the underlying limitation of using reviews as the source of data (which, for similar reasons as previously mentioned, are challenging to derive effect sizes from if multiple interventions or subpopulations are reviewed simultaneously), the tools additionally limit the ability to indicate effect size, as they were created for systematic reviews and evidence mapping.<sup>70</sup>

#### **Reflections on the FEED**

The FEED and its two tools (the Map and Visualiser) comprehensively categorised 160 publications according to key features of the review, which help users identify and engage with literature that may be relevant to their queries related to shifting diets towards healthier and more sustainable options.

As a comprehensive, categorised, and interactive collection of evidence, the FEED is a resource for beginning deeper searches into the literature. This set of tools opens the door for additional research, particularly related to interventions and policies of different functions that may be relevant to various subpopulations. Notably, this tool may be used to progress research that seeks to identify and promote interventions and policies with more equitable outcomes across subpopulations by enabling users to quickly find research relevant to different age groups, regions, settings, and indicators of vulnerability.

A specific recommendation for how someone could use the map in support of research, or a policy brief would be to identify a priority population and conduct a detailed analysis. The user could analyse the interventions and policy functions to identify which may be the most effective for this subpopulation. For example, one priority population could be infants and children, who have the largest benefits to gain from healthy and sustainable food interventions due to the compounding benefits of a healthy diet and environment, with time.<sup>71</sup> This research could serve as the basis of a research to policy brief or the trial in the food system.

#### Active Travel Evidence Collection: Outputs and Emerging Findings

Three rapid reviews form the Active Travel Evidence Collection. These rapid reviews are designed to be standalone evidence pieces, guided by, and targeted at a policy audience.

The three rapid reviews are as follows:

- Rapid review 1: Framing of modal shift 'push' interventions for effective public communication (Appendix D)
- **Rapid review 2:** Local Economic impacts of active travel (<u>Appendix E</u>)
- Rapid review 3: Active travel within planning policy (<u>Appendix F</u>)

The following section will first examine the insights derived from the policy review and stakeholder consultation process. Subsequently, it will explore the key findings from each individual review. Finally, it will synthesise collective insights from the active travel evidence collection.

#### Emerging Insights from Scoping the Policy Landscape

The review of active travel policies highlighted both the considerable levels of policy ambition and the multifaceted approach likely to be required for modal shift towards active travel.

Policies that were commonly emphasised in policy documents included interventions from a wide range of areas, ranging from general urban planning and design to delivery of specific transport infrastructure such as bus and cycle lanes, to more individually targeted behaviour change interventions. The shortlist of policies is detailed below in Figure 11. It is interesting to note that all behaviour-change incentives included in the shortlist focused on changing cycling behaviour. This focus on changing cycling behaviour may be related to a common focus on commuter travel. For commuting, reduced transportation time is often important, and people may need to travel distances that are impractical by foot. As cycling enables longer and faster trips than walking, incentives for cycling may be more effective in increasing active commuting. However, walking and public transport remain essential forms of commuting and attract commuters who would never choose to cycle. Additionally, as 16% of UK journeys less than one mile and 67% of journeys between one and five miles are still taken by car<sup>72</sup>, behaviour-change strategies that also focus on walking and public transport will be important to achieve a modal shift for these short journeys.

Another prominent theme within the policies was a focus on connectivity and network planning. This focus on systems-based thinking is important to ensure that interventions do not happen in isolation but are part of larger systemic change. System-wide change is something that has been highlighted by the OECD <sup>43, 73</sup> and the Pathfinder Initiative <sup>53</sup> as being key to changing preferences and achieving modal shift.

#### Emerging Insights from the Stakeholder Consultation Process

The stakeholder consultation was an interactive session using a set of online collaborative tools to allow for commenting, voting, card sorts and discussions (using a set of Miro boards). During the first exercise, participants identified additional policies that they believed were missing from the policy shortlist. These included:

- Behaviour-change incentives targeting walking
- E-Scooter interventions
- Direct reference to schools and
- Active travel social prescribing<sup>ix</sup>.

<sup>&</sup>lt;sup>ix</sup> Active travel social prescribing is an interesting policy intervention that has high potential for physical activity improvement within the UK and for which there is growing evidence.<sup>74,75</sup> Active Travel England (ATE) funded active travel social prescribing pilot programmes in eleven Local Authorities in 2023. The evaluations from these schemes will help provide valuable evidence towards their effectiveness.

#### Figure 11: Policy shortlist from scoping of UK policy documents



Participants were asked to arrange the shortlisted policies into a matrix, according to strength of evidence and priority for local action (Figure 12 & Figure 13, larger versions can be found in <u>Appendix</u> <u>C</u>). After completing the prioritisation exercise in smaller groups, nearly all policies were placed in the high priority, strong evidence quartile Figure 12), implying that participants felt that it may not be a lack of evidence that is constraining local action and that stakeholders believed most policies were high priority. Participants felt that the main constraints to local action were politics, including public opinion and dis/misinformation, followed by available funding.

Following the initial prioritisation there was a whole group discussion on the prioritisation matrix and participants were asked to readjust the matrix individually. This led to a much wider distribution of policies around the evidence/priority axes (Figure 13). For one policy (planning policy: require active travel infrastructure), it had been duplicated and placed at opposite ends of the evidence spectrum– both above and below the priority line. This may reflect the difference in priorities between organisations that stakeholders represented. Differing priorities was a point raised in group discussions, with the reflection that priorities on active travel are always changing and depend heavily on central influence and the political climate, which sometimes makes it difficult to maintain action.

discussion.

Figure 13: Prioritisation matrix after whole group



Figure 12: Initial prioritisation matrix distribution after work in the breakout rooms.

Generally, participants felt that the evidence base was quite strong, although it was not always used to decide what policies were implemented. The evidence base and evidence on the benefits of active travel, such as the health gains, was seen as important in helping individuals make potentially difficult behaviour changes. More evidence and monitoring of implemented interventions was highlighted as a key area where more primary evidence was needed. Participants discussed the need for evaluation of interventions in terms of the entirety of transport network, an area highlighted by work done by the OECD on systems change.<sup>43, 73</sup> They emphasised the importance of understanding how networks facilitate interaction between different modes of transport.

Participants felt local action was driven mostly at the local authority level, compared to national or regional, emphasising the need to support policy making within local authorities. To enable action at the local level, stakeholders felt that community engagement and funding were the most important, as shown Figure 14. Multiple participants identified the need for ring-fenced active travel funding, with clear consistent standards on what is and isn't funded by the national government.

Figure 14: Chart of the main enablers of local implementation for active travel interventions suggested by participants, grouped by theme.



In the final exercise, workshop participants generated over 40 suggested evidence gaps and questions. Two key themes that emerged were inequality within active travel and effectiveness of active travel interventions. A quick prioritisation task of the evidence gaps further emphasised the perceived lack of evidence regarding the differential impacts of active travel infrastructure on certain groups. None of our final review questions targeted these themes, as during discussions with another stakeholder from OHID, we were made aware of existing commissioned review projects that aim to find evidence on both inequality impacts and effectiveness of active travel interventions.

# Rapid Review One: Framing of modal shift 'push' policies<sup>x</sup> to effectively communicate with the public.

#### Highlights

- Most literature on framing both 'push' policies and broader environmental policies aims at achieving public acceptability and support, not wider communication aims such as understanding of impacts.
- Any framing used must be perceived as relevant to the issue. Using frames that are seen as not relevant may decrease support.
- Fairness, equity, and effectiveness should be addressed in the communication of any modal shift 'push' policy.

Encouraging a modal shift away from cars towards active travel is a key objective for many Local Authorities within the UK. However, strategies to support effective communication of these modal shift 'push' policies, such as low-emission zones, parking levies and congestion charges, remain unclear. This rapid review synthesised current knowledge on what is and isn't known about how to frame these policies to effectively build public awareness and understanding about their likely impacts. Table 4 is a condensed version of the main findings, for more detail please see the rapid review (<u>Appendix D</u>). Some of the basic framing definitions used within the review are defined in Box 2.

<sup>&</sup>lt;sup>x</sup> Modal shift 'push' policy: Policies or interventions to encourage a move away from cars - such as congestion charging, low emission zones, no vehicle zones, road user charging, parking policies.

Box 2: Basic framing definitions

*Goal Framing:* Framing the goal or consequence of an action or behaviour.<sup>76</sup> The three types of goal framing are:

- Hedonic framing: Prioritises pleasure, improving one's feelings and the avoidance of discomfort.
- *Normative framing:* Activates a moral obligation, a sense of what ought to be done.
- Gain framing: Highlights changes in personal resources, either a gain or loss. 77

Valence Framing: Framing information in a positive or negative light. 76

*Strategic Issue Framing:* A type of emphasis framing, emphasising a subset of potentially relevant considerations to focus attention on those considerations.<sup>78</sup>

Semantic framing: Using the order of words and phrases to prioritise a key point.<sup>79</sup>

Framing of 'push' policies to promote modal shift focuses on achieving public acceptability and support as an outcome.	Four studies assessed the framing of different specific car-use disincentives (parking fees, vehicle miles tax, congestion charges, low emission zones). <sup>80-83</sup> Aside from specific car-use disincentives, two further studies examined car reduction policies more generally. <sup>84-86</sup> None of the studies focused on effective communication in general, enhancing understanding or raising awareness of the policy as an outcome. Instead, they assessed the effect of different framings on public acceptability, support, and attitudes.
Much of the published framing literature looks more generally at climate or environmental policies.	One review and seven studies assessed the impacts of framing of other climate mitigation policies or other environmental issues. <sup>81,85,87- <sup>92</sup> The outcomes that they assess are mainly focused on behaviour change and public acceptance or support. Although there may be some transferability of the framing insights from these topics to policies on car-use disincentives, many of these studies <sup>87-90,92</sup> lacked generalisability outside of the study context.</sup>
We identified no clear consensus on if goal or issue frames work to effectively communicate car-use demand policies.	One study found framing parking fee policy through gain, hedonic or normative framing had an impact on perceived fairness and attitudes. All three frames increased acceptability of the parking compared to the control, and the effect of the normative frame was larger than the gain frame. <sup>83</sup> Public support for congestion charging policies may be improved by using issue framing that highlights the positive impact on air pollution, although evidence was low quality. <sup>80, 93, 94</sup>
There was weak evidence on the positive effect of air pollution issue framing for congestion charges. Multiple studies used a health framing, but the evidence was mixed.	Issue framing, focusing on health, produced mixed results across studies and with studies depending on the policies assessed. Two studies that looked at general car-use demand policies found conflicting results for health framing. One study looked at the effect of four strategic issue frames (health, climate, wildlife habitat and local environment) across three countries, China, Germany and the United States. <sup>84</sup> It found that none of the issue frames had robust effects on public support for policies to reduce fossil-fuel car usage, across the three countries. The second study used a health issue framing only but found that it was effective at increasing public support for a car-reduction policy. <sup>86</sup>

#### Table 4: Headline findings on framing of modal shift 'push' policies

	A study looking at issue framing of multiple policies found different results depending on the policy. It found using a health framing (along with climate and economic frames) had no effect on public support for low emission zones, but it had a positive influence on public support for a policy regarding electric vehicle subsidies. <sup>81</sup>
	Although not examining health as an issue framing, the hedonic goal frame used by Westin <sup>83</sup> included health (along with one more factor), and that it found increased perceived fairness, attitudes, and acceptability for a parking fee policy.
	Multiple studies demonstrated that gain goal framing (gain or loss frames) or valence framing (positive or negative frames) can have an impact on public support and attitudes for car-use and environmental policies, but it was not clear which frame was most effective.
Gain and valence frames can have an impact on public support, but it is not clear if highlighting the gains/positives or losses/negatives is more effective.	Three publications, on parking policy and public perceptions <sup>83</sup> and uptake of electric cars <sup>89</sup> , along with one systematic review examining behaviour change related to air pollution <sup>91</sup> , found positive effects of gain framing. One study of intended behaviour changes towards active travel modes, found more impact from positive framing compared to negative framing. <sup>90</sup>
	Three studies found more impact from negative or loss framing than positive framing. One study examined perceived differences in amounts of CO2 from travel modes <sup>87</sup> while another examined attitudes towards a vehicle miles tax. <sup>82</sup> Davis <sup>88</sup> found highlighting negative consequences to participants and their generation had a larger impact on intended environmental behaviours than a positive framing or highlighting consequences to future generations.
Some studies found the same frame may have a different impact on car- use demand policies depending on the audience member's personal values. Other studies found no differential impact by personal values.	Underlying values and beliefs may impact the way that different frames are interpreted. Two studies found that a person's existing norms, beliefs and values can impact how they will perceive the framing of a car-use demand policy <sup>83, 85</sup> . Westin <sup>83</sup> suggests that biospheric values (concern about the natural environment) may positively influence support for pro-environmental policies like increased parking fees. Another study found no interaction between participants' level of climate scepticism and the impacts of a public health frame. <sup>86</sup>
	One study found that personal values do not influence how people respond to different car-use demand policy frames, with no robust interaction effects between any of the tested frames and individual-level factors. <sup>84</sup>
The published evidence showed that making a frame personally relevant did not have any impact	Walker <sup>86</sup> found that framing a climate policy in relation to issues that affect participants personally can have negative impacts if that issue is not seen as being directly relevant to the policy.
on support or behaviour change for travel mode policies and may have negative consequences.	Mir <sup>90</sup> found that compared to a generic air pollution framing, tailoring the air pollution frame to be more personally relevant did not impact participants' willingness to use active travel.

	Across studies examining public acceptability and support for car- use disincentives, fairness & equity were highlighted as important factors to achieve and communicate. <sup>81, 85, 95-99</sup> Effectiveness was also found to be an important influencing factor. <sup>85, 94-97, 99-101</sup>
Addressing equity and fairness is important in achieving public acceptability and support for 'push' modal shift interventions. Earmarking raised funds towards public transport may help to achieve this.	Some studies suggested that earmarking raised funds for public transport may help with the perception of equity and/or improve public support. <sup>80, 93, 97, 102-104</sup> However, the earmarking of funds does not guarantee support, as discussed by Vigar <sup>105</sup> in the case of the proposed Manchester congestion charge. Despite funds raised by the Manchester charge being earmarked for public transport, the framing used by the media focused on the congestion charge alone, even when articles discussed or quoted people talking about the public transport improvements that would accompany the charge. <sup>105</sup>
	Communicating the economic costs and benefits of policies and addressing implementation concerns may help to address perceived effectiveness. <sup>96, 98, 102</sup>
Methodological issues are prevalent, limiting conclusions that can be drawn.	No studies were found to be methodologically strong. Quality assessment showed issues with bias, particularly in relation to selection and non-response. Many studies were not representative of the target population or had limited information regarding the target population. Population sample sizes were often small, which contributed to the limited generalisability of many studies.

#### Rapid Review Two: Local Economic Impacts of Active travel

#### Highlights

- Active travel interventions offer a positive return on investment, driven by public health gains and potential economic benefits.
- Local economic impacts are likely to be either positive or neutral following active travel changes.
- Active travel users do not spend less than car users over one month. Targeted measures may be needed to support car-centric businesses and maximise economic benefits across sectors.
- More UK specific research would be useful, with a particular focus on economic equity.

Maximising the benefits of limited budgets creates a significant challenge for local authorities seeking to address their communities' growing and complex needs. Active travel interventions, such as enhancing infrastructure for walking, cycling, wheeling, and public transport, offer the potential to improve liveability, contribute to climate targets, and deliver substantial health benefits. However, debates surrounding the speed and extent of these active travel measures often bring forth concerns and reservations regarding their potential economic effects on the local level. This review aimed to identify what the local economic impacts of active travel interventions or shifts to active travel are, including the local economic spend of car users versus active travel users in the UK. Table 5 below is a condensed version of the main findings, for more detail please see the full rapid review (Appendix E).

# Table 5: Headline findings on local economic impacts

For active travel interventions the benefits gained usually outweighs the costs, largely due to health benefits likely to arise.	Cost-benefit analyses for diverse active travel interventions, including walking and cycling infrastructure and school specific interventions, demonstrate largely beneficial outcomes, driven primarily by long-term health savings associated with increased physical activity. <sup>106-111</sup> One UK study looking at the 'mini holland' interventions in London found that the 20-year health economic benefits, from decreases in premature deaths and the number of days of sickness absence, are worth ten times the programme cost. <sup>112</sup>
These health benefits can create significant savings for the local NHS.	A reduction in chronic health conditions within the population offers the potential for significant cost savings for local services like the NHS, with one estimate by Jarrett <sup>113</sup> finding that the NHS could save approximately £17 million over 20 years with increases in walking and cycling and reductions in private car use.
Local businesses usually experience positive or neutral impacts on sales with new active travel infrastructure. Car- oriented businesses and larger home goods stores are the exception.	Two existing reviews on this found that active interventions, including bike and walking facilities, mostly have a positive or no impact on business sales. <sup>114, 115</sup> Pedestrianisation and increased pedestrian facilities in particular are likely to create a positive impact on retail and food service sales. <sup>114</sup> Local businesses mostly experience either increased sales or no change following the installation of bicycle facilities (including when vehicle lanes are removed) or mixed walking and cycling facilities. This did depend on store type however, with some indication that caroriented businesses and larger shops selling home goods experience a decrease in sales. <sup>114, 115</sup>
Active travel users are likely to spend more per month, less per trip than car users.	A review of US studies by Volker and Handy <sup>114</sup> suggests that cyclists and/or pedestrians spend more per month than motor vehicle drivers (spend per trip x number of trips). Per-trip spending by travel mode was more mixed. Spending patterns differed across studies and store types, with motorists spending more on average at supermarkets than active travel users. <sup>114, 116</sup> The US findings align with results from a survey by Sustrans in three UK towns. <sup>117</sup> They found car users spend more than active travellers on single journeys. However, over 1-month, active transport users visited local shops more often than car users and spent more in total. <sup>117</sup>
No negative effects on property values or vacancy rates after active travel interventions were identified, instead there was some indication of an increase in property values.	Commercial and residential property values and rental rates tend to stay stable or rise where active travel infrastructure is enhanced, or in areas with high walkability. <sup>116, 118-120</sup> The rising values mostly occurred in office and retail properties. <sup>116, 118</sup> Three studies found that vacancy rates remained steady or decreased on streets following bike lane installation <sup>121, 122</sup> and following walkability interventions <sup>118</sup> .
Less robust evidence showed positive impacts on footfall and employment after active travel interventions.	One review reported an increase in footfall following the introduction of active travel measures, such as pedestrian improvement measures and a dual-carriage way cycle lane. <sup>119</sup> Benefits to employment include reduced work absenteeism (from improved health), potential improvement of employment equity (from increased accessibility for low-income and disabled adults) and job creation (one review found 8-11 jobs generated are generated municipally for each \$1 million spent on active travel infrastructure in North America). <sup>116, 119, 120</sup>

## Rapid Review Three: Active Travel in Planning Policy

#### Highlights

- Planning policy can help increase active travel, but complementary challenges of translating policy to action, including provision of funding, must be addressed for benefits to be realised.
- Comprehensive, urban-wide planning approaches may mitigate the risk of localised increases being offset by greater car use in other areas.

Despite growing emphasis on active travel within urban planning, there remains a lack of clarity about how effective planning policies that promote active travel are in influencing travel behaviours. To address this knowledge gap and inform future policy directions, this rapid review explores the existing research on the relationship between emphasising active travel in planning policies and active travel uptake. Table 6 below is a condensed version of the main findings, for more detail please see the rapid review (Appendix F).

Few studies explicitly assess the impact of emphasising active travel in planning policy on active travel outcomes.	Two studies explored the impact of including an emphasis on active travel as part of broader planning policy on rates of active travel. These studies assessed planning policies with broader active travel goals. <sup>123-125</sup> A 2006 systematic review analysed policies promoting physical activity, but not active travel specifically. <sup>126</sup> Other research examined the built environment or planning policies' impact on health, without a focus on the link between policy and active travel behaviour.
Broader planning policies, when implemented, can increase active travel.	The RESIDE project in Australia <sup>123, 124</sup> provides evidence that "Liveable Neighbourhoods" planning policies can increase walking for transport when they are implemented. There was limited, though positive, evidence regarding cycling for transport. Three focus areas of the policy (community design, pedestrian-friendly networks, and lot layout) proved effective in improving active travel behaviours. This study did have limited generalisability however, as the study population was limited to new, middle-class developments.
Concurrent changes that shape urban planning may have wider, or conflicting, effects.	Even with planning policies that promote active travel, broader urban development trends can hinder progress, as seen in Kärmeniemi <sup>125</sup> Finnish study where car-centric development in outer areas offset active travel gains in the city centre where most of the emphasis on active travel had been placed.
Translation of policy ambition into action is not automatic; critical factors include implementation, funding, and community engagement.	Emphasising active travel in planning policies can lead to increased active travel infrastructure, as evidenced by one study following the translation of planning policies into bike infrastructure specifically <sup>127</sup> . The effectiveness of the planning policy hinges on implementation, funding, context, infrastructure, and community engagement. This policy process is demonstrated by Figure 15, termed the 'leaky pipe' by the RESIDE study. <sup>124, 128</sup>

#### Table 6: Headline findings on active travel in planning policy

Figure 15: The 'leaky pipe' of the policy pipeline process for the Liveable Neighbourhoods Community Design policy in Perth, Western Australia<sup>128</sup> TATE GOVERNME nt Dia % COMPLIANCE? % COMPLIANCE? COMPLIANCE? derstand where the 'leak' in the system is . . . to 'plug' the in Planning policies influence the built environment through transportspecific infrastructure planning and broader land-use decisions. Specific urban design Localised infrastructure improvements, such as segregated elements within the built cycleways and footpaths, promote walking and cycling while enhancing safety. 129-135 environment can increase physical activity and active travel. Urban design elements like density, land-use mix, street connectivity and walkability have been shown to play a role in increasing active travel. 134, 136-140 It is important to integrate A lack of integration can lead to poorly designed roads and transport, land, and health infrastructure that creates barriers for active travel, even when the distances are achievable by walking or cycling. <sup>140</sup> Poor coordination planning to help increase may result in incomplete active travel networks. <sup>139</sup> Planning policies active travel. need to be integrated between departments and incorporate measurable success indicators. 141 Robust evaluation of planning policies is difficult, as shown by the generally low quality of the studies and as Shaw <sup>142</sup> notes about transport policies. Studies are constrained by the challenges (including Challenges include a reliance on cross-sectional studies and selfself-selection bias) of selection bias. Several reports identified self-selection bias when conducting studies on this examining the link between planning policy, urban design and active travel <sup>126, 140, 143</sup>, although the one study found the link between the topic, reflected by the limited quality of available built environment and walking remained significant even after evidence for the review. adjusting for potential self-selection.<sup>123</sup> Most identified reviews were not systematic and had methodological

limitations.

# Interpreting the evidence landscape underlying the Active Travel Evidence Collection and areas for future research

Across all three rapid reviews in the evidence collection, there was limited evidence to directly answer the research questions, especially that generated from within the UK. The most literature was found on local economic impacts, however much of the peer-reviewed research came from North America, where the local context (including government structure, attitudes, urban infrastructure) around active travel is frequently quite different. UK peer-reviewed research mainly focused on the health savings of active travel, such as cost-benefit analysis of active travel interventions. The planning literature was also focused on contexts different to the UK, with the most relevant planning studies coming from Australia and Finland. The research on framing of cardemand policies was mostly from European countries, including the UK, although it is important to be aware of the differing active travel contexts between European countries. More research specific to a UK context, especially peer-reviewed literature, would be useful to understand these questions around interventions to increase active travel.

An important aspect that appeared to be lacking within the evidence base was analysis of the equity implications of policy. The evidence on framing impacts of 'push' policies for modal shift touched on the importance of including equity within communications about these policies, however active travel literature on framing (and on local economic impacts and planning policy) rarely examined the differential impacts that framing (or policies) may have on different populations. Transport is an important facilitator of social inclusion and wellbeing, and barriers to transport can hinder job opportunities.<sup>144</sup> It is therefore important to include analysis of policy impact on vulnerable groups to identify if active travel interventions and policy are equitable and enable targeted policies where required.

#### Limitations to the Active Travel Evidence Collection

Due to the rapid nature of the review and use of novel AI search tools, some relevant papers may have been unintentionally omitted during the search process, although the reviews attempted to be as comprehensive as possible. Additionally, the specific algorithms employed by the AI search tools are not publicly available, potentially limiting replicability of the search strategy by other users. It is also possible that there is unknown bias introduced by the AI tools. Both Elicit AI and Consensus AI use Semantic Scholar to gather their sources and update their databases monthly.<sup>145, 146</sup> We used the Google Scholar search & citation searching with the aim of finding any missing relevant papers, despite this it is hard to assess how well the literature we found covers the selected topics.

There was limited literature directly answering all three of the rapid review questions. To give a better picture of the surrounding evidence base, we included some papers within the reviews that did not meet the PICO criteria. The discussion of these adjacent topics is only meant to provide adjunct information and not be a formal overview, as the search strategy was not designed to find literature related to them.

Grey-literature (which has not been through the peer-review process) was included despite the potential for increased risk of bias with this literature, although we tried to mitigate this risk by informally appraising methods before including them within the reviews. In general, we found a scarcity of directly relevant and high-quality evidence across all reviews. However, only limited formal assessments of study quality were completed due to the speed of these rapid reviews.

# Conclusions

This project has created two evidence collections of policy-relevant evidence to help achieve carbon mitigation and health 'win-wins'. Created using two different approaches. The FEED used conventional top-down methods, reviewing the breadth of published literature, and identifying a relevant subset for inclusion in the evidence collection. Conversely, the Active Travel Evidence Collection used a bottom-up approach, aligning the search for evidence with gaps identified through stakeholder participation.

Both evidence collections target population-level interventions that may help shift individual behaviour change towards more healthy and sustainable diets and more active modes of transportation.

#### Suggested next steps and ways to build on this work

There are several ways that these evidence collections could be built upon to support future research and policy that aligns climate and health goals:

- **Dissemination** of these outputs to the key audiences described above, including but not limited to DHSC and local authority audiences in the UK. This could include a combination of electronic distribution (through multiple channels) and development of peer-reviewed papers.
- Update the FEED, and potentially develop into a 'living review of reviews': to keep it up to date in this rapidly growing area. One option to make this more efficient could be to draw on some of the emerging AI technologies, that were used in the active travel work, for automated screening and categorisation of published studies as they become available.
- Several of the emerging findings above, including those relating to the paucity of evidence on many of these questions, could usefully **inform research prioritisation** within both academia and amongst research funders.

# Appendices & Links

FEED Map	FEED interactive evidence map
FEED Visualiser	FEED interactive evidence visualiser
Appendix A	Detailed methodology of the <b>FEED</b>
<u>Appendix B</u>	Guide to FEED, including links to both Map & Visualiser
<u>Appendix C</u>	Detailed methodology for the Active Travel Evidence Collection
<u>Appendix D</u>	Rapid Review 1 - Framing modal shift 'push' interventions
<u>Appendix E</u>	Rapid Review 2 - Local Economic Impacts of Active Travel
<u>Appendix F</u>	Rapid Review 3 – Active Travel within Planning Policy

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