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# **Transport and inequality: An evidence review for the Department for Transport**

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# Contents

Executive summary .....	1
<b>1 Introduction .....</b>	<b>7</b>
1.1 The context of socio-economic inequality in the UK.....	7
1.2 Links between transport and inequality.....	9
1.3 Purpose of the review .....	11
<b>2 Study objectives .....</b>	<b>12</b>
2.1 Research Questions .....	12
<b>3 Methodology.....</b>	<b>13</b>
3.1 Overview.....	13
3.2 Inclusion criteria .....	13
3.3 Search strategy.....	14
3.4 Screening and study prioritisation.....	14
3.5 Data extraction and synthesis.....	14
<b>4 Results 16</b>	
4.1 Screening, prioritisation and inclusion.....	16
4.2 Included studies: overview.....	17
4.3 Limitations in the review process .....	17
<b>5 Findings 18</b>	
5.1 Education, training and employment.....	18
5.1.1 Transport and employment .....	19
5.1.2 Young people, transport and education or training .....	22
5.1.3 Transport, opportunities and gendered disadvantage.....	23
5.1.4 The wider economic benefits of transport .....	24
5.2 Social exclusion, poverty and income inequality.....	24
5.2.1 Transport and access to wider opportunities and services .....	25
5.2.2 Transport costs and availability.....	28
5.2.3 Transport, access and wellbeing.....	32
<b>6 Discussion.....</b>	<b>34</b>
6.1 In what ways are transport and socio-economic inequality linked?.....	34
6.1.1 What are the mechanisms by which transport impacts on inequality, and vice-versa? 34	
6.1.2 What does the evidence say on the strength of the links between transport and inequality? .....	37

6.1.3 How do the findings vary across sub-groups? .....	37
6.2 What do we know about transport policies' effectiveness in improving inequality? .....	38
6.3 Links between inequality and health .....	38
6.4 Limitations .....	39
6.5 Research recommendations .....	39
<b>7 Conclusion .....</b>	<b>41</b>
<b>8 References .....</b>	<b>42</b>
<b>9 Appendices .....</b>	<b>44</b>
<b>Appendix A. Detailed methodology .....</b>	<b>44</b>
<b>Appendix B. Scopus database search strategy .....</b>	<b>48</b>
<b>Appendix C. Websites and repositories searched .....</b>	<b>50</b>
<b>Appendix D. Data extraction template .....</b>	<b>53</b>
<b>Appendix E. Documents included in review for data extraction and synthesis .....</b>	<b>56</b>
<b>Appendix F. Documents eligible for inclusion that were not included for data extraction or synthesis .....</b>	<b>59</b>
<b>Appendix G. Characteristics of included documents .....</b>	<b>63</b>

## Figures

Figure 1.0 – Illustration of the relationship between low income, transport costs and employment options .....	4
Figure 1.1 – Income inequality and poverty by sub-group .....	9
Figure 1.2 – The relationship between transport disadvantage, social disadvantage and social exclusion .....	11
Figure 4.1 – Flowchart: Evidence review screening, prioritisation and inclusion process .....	16
Figure 5.1 – Trips per person per year (individuals aged 17+), England 2017 .....	27
Figure 5.2 – Expenditure on travel as a proportion of income, by mode and overall, UK 2017–2018 .....	28
Figure 5.3 – Relative length of journey by public and private transport to Manchester Airport (arriving at 6am Monday–Friday) .....	30
Figure 5.4 – Innovative transport solutions .....	31
Figure 6.1 – Illustration of the relationship between low income, transport costs and employment options .....	35
Figure 6.2 – Illustration of the relationship between income, housing options and quality of transport links .....	36

# Executive summary

## Key findings

### [In what ways are transport and socio-economic inequality linked?](#)

There are three key underlying factors that influence the relationship between transport and inequality:

- 1) **The way people are distributed** geographically, and across social classes.
- 2) **The way opportunities are distributed**, including jobs and education.
- 3) **How accessible the transport system is**, in terms of cost, geographic accessibility and the time and reliability of different transport options.

Where transport is available and affordable, it can provide access to different opportunities:

- Transport is an important **facilitator of social inclusion and wellbeing**, which can affect economic and social outcomes, and therefore inequality.
- **Transport barriers can be intimately related to job opportunities**, but in areas of socio-economic disadvantage, even where local transport is available there may be **limited educational and job opportunities** for people to access.
- If transport is (or is perceived to be) too expensive, then people are not able to make the journeys they need to get into work or move into education/training.

The way transport and inequality are experienced varies by group and location:

- **Different socio-economic groups have differing levels of access to transport options.** People who depend more on the bus network for work tend to be lower paid, live in more deprived areas, and are more likely to turn down jobs due to transport issues, than those on higher incomes, who tend to use cars and trains more often.
- **Some groups can be at higher risk of poverty and transport poverty.** The impacts of transport poverty are worst for poorer people in rural areas. Services are further away, incomes are often lower, and transport costs higher, partly reflecting low population density which makes it harder to run public transport.

### [What do we know about transport policies' effectiveness in improving inequality?](#)

- **Transport can be integral to improving equality**, by increasing access to jobs, education and services. Policies that improve the accessibility and affordability of transport can therefore help promote equality.
- **Cost is a key obstacle to the use of transport.** Policies that make transport more affordable (such as concessionary fares/subsidies) can be an effective way to help people living in poverty to access and maintain work. However, careful consideration is needed to ensure these help those most in need.
- Help with transport costs has a key role to play in schemes to promote employment, with one scheme in Merseyside supporting jobseekers into work reporting a benefit-cost ratio of 5:1 over three months.
- Consideration of the needs of, and likely impact on, **different social groups** can help facilitate **better targeted policies**.
- Transport policy **cannot work in isolation** and **can have most benefit in reducing inequality as part of wider initiatives**, often at a local or place-based level, including on skills, education, employment policy and housing.
- Given this, **transport policy can consider opportunities to develop new or enhanced partnerships and networks** especially at the local level, and to ensure joined up work on transport, land use and housing.

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## Background and Objectives of the Review

Socio-economic inequality and inclusion are central to public policy debates. For this review, socio-economic inequality is defined as the uneven distribution of income and wealth. Inequality has become more of a focus for policy makers, and there is growing interest in the drivers of socio-economic inequality. Public policy, including transport policy, can play a key role in helping to tackle inequality, by improving access to opportunities such as jobs, education and other key services such as healthcare and social networks.

The links between transport and inequality and the scale of those links are not well understood. This is in part because there are different measures of socio-economic inequality, including social exclusion, educational opportunity and low income, as well as many different determinants of inequality, such as family background, social discrimination and personal decisions. Related to this is the fact that transport is complex: measuring accessibility of transport, for example, can include cost of transport, distance to public transport, and length of journey. These transport-related factors in turn interact with personal characteristics including gender, ethnicity and disability. A more detailed understanding of the links between the mechanisms of inequality and transport can inform policy and decision-making processes and the development of more targeted and effective interventions. This understanding is currently missing, and our review aims to address that gap.

This review used systematic search, inclusion, and synthesis processes to develop an understanding of the current knowledge base on the relationships between transport and socio-economic inequality and the scale of those links, the extent to which they vary across groups, and the effectiveness of transport policies in contributing towards reducing inequality.

## Key findings

**Overall, there are three main and connected ways in which transport is linked to inequality.**

1. The first relates to how *people* are distributed geographically, and specifically the distribution of people of different social classes. People with more money have more options in both where to live and how to travel and transport links are a key component of land value and housing costs.
2. The second relates to how *opportunities* are distributed, including employment opportunities. Concentration of jobs and amenities is often facilitated by transport links, meaning access to these transport links is necessary for accessing those opportunities.
3. The third relates to how accessible the *transport system* itself is, in terms of its cost, its geographic accessibility and the scheduling of different transport options.

These three factors are related to each other and can affect one another. These factors are broken down further into key points and are presented below.

Where people may be experiencing multiple disadvantages based on socio-economic group and location, this could be preventing them from using transport in a productive way. For example, **even where local transport is available, there may be limited education and job opportunities on offer in these areas.** This mismatch between 'where people live' and 'where the jobs are' is evidenced in four case study areas; the wider Milton Keynes area; South Hampshire; Greater Manchester and Sheffield City. In

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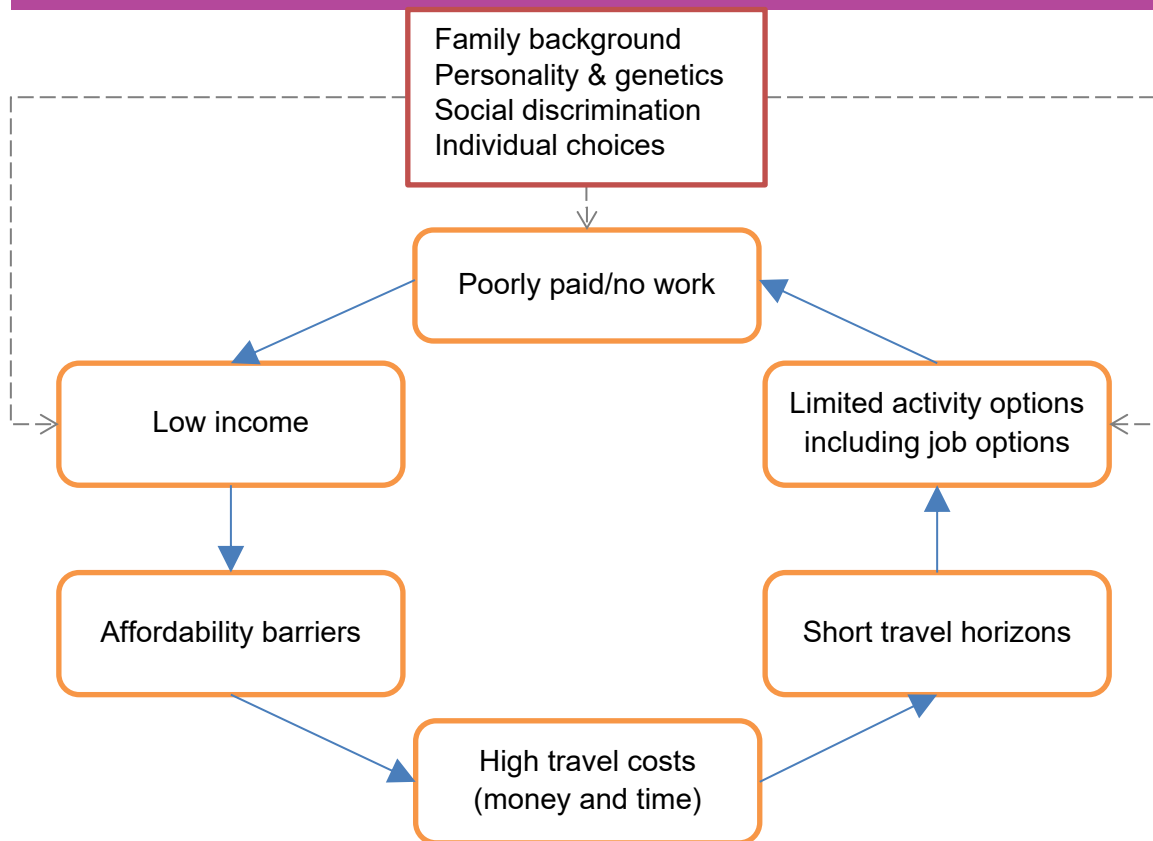
addition to the uneven geographic distribution of employment opportunities in these areas, it was also found that major roads were congested, and bus services were limited, slow and not well integrated. Appropriate interventions varied by type of geographic area, but included providing bicycles and other private transport, subsidising travel and creating new public transport services.

None of the evidence that was reviewed discussed social mobility explicitly. However, there is an obvious theoretical link, with improved income and socio-economic position being key motivating factors for entering employment or getting a better job. If transport interventions were to help disadvantaged people more than they helped privileged people, this would support those disadvantaged people to experience positive social mobility and the interventions may reasonably be said to reduce inequality.

**Cost is a primary obstacle to the use of transport.** Income was found to be one of the defining aspects of socio-economic inequality. Transport costs and affordability are central to the impact of transport on inequality. If transport is too expensive, then people are not able to make the journeys they need to get into work or move into education and training that could improve their prospects. Figure 1.0 illustrates the relationship between low income, transport costs and employment options. Perceived high costs can also affect choice of mode even when actual cost differences between mode are minimal or zero. In other circumstances, lack of options can keep people spending a high proportion of their income on car travel as the only way to access their work.

**Transport is an important facilitator of social inclusion and wellbeing which can affect economic and social outcomes, and therefore inequality.** Social inclusion is the ability to participate and be an active member of the local community. It is a key connection between inequality and health. There is a great overlap between social inclusion and physical and mental health wellbeing. Strong social connections and family relationships can foster social inclusion and wellbeing alongside accessible health and social care services. Transport plays a central role in enabling people to come together and connect. Therefore, there is potential for transport providers and policy makers to be part of a multi-stakeholder approach that involves addressing social inclusion and wellbeing as well as access to education, training and employment.

Figure 1.0 – Illustration of the relationship between low income, transport costs and employment options



Source: authors' own

Transport poverty is a concept that broadly refers to difficulty or inability to make necessary journeys due to a combination of income/cost and service availability (see section 1.2). **Some demographic groups are at higher risk of transport poverty**, including women, students and older people. They may struggle or be unable to make the journeys that they need to accommodate caring or study commitments, or simply be poorly served by services designed to support commuting for full-time employees. However, this review found a lack of evidence on the links between transport and other disadvantages experienced due to social class or ethnic group.

**The impacts of transport poverty are worst for poorer people in rural areas.**

Services are further away in rural areas, while incomes are often lower, and transport costs higher, partly reflecting low rural population density which makes it harder to run public transport. Among those who experience transport disadvantage, the negative impact on subjective wellbeing may be greater for people in rural areas than for people in urban areas.

There is limited evidence on policy effectiveness, but where it exists, it highlights some key channels through which transport policy can help reduce inequality. **Help with costs is effective in making transport more accessible. However, careful consideration of fare structures is necessary to ensure discounts help those that may need them most.** Concessionary travel pass policies have been shown to be effective in making transport more affordable. Discounts on travel can help alleviate the strain of transport costs. As noted in the accompanying report on transport and health and wellbeing, this improved accessibility and affordability also has a positive effect on mental health and wellbeing. However, where fare structures are designed as lump



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sum payments, these discounts could be out of reach for the people that may need them the most including higher education students from low income households.

**Help with transport costs has a key role to play in schemes to promote employment.** For example, the Walsall Workwise initiative provided help with travel costs for people seeking work or in new jobs, costing £123 per person and saving £187–£237 in Jobseeker’s Allowance over the four weeks of the supported travel. Similarly, the Neighbourhood Travel Team in Merseyside, along with other activities supporting jobseekers into work, had a benefit–cost ratio of 5:1 over three months.

**Transport is integral to accessing a range of opportunities to reduce inequality but is not the only factor affecting access. Therefore, transport policy can have most benefit when part of wider strategies to reduce inequality.** Transport is an integral but intermediary component of the wider picture of socio-economic inequality. The main way that transport and inequality are linked is through providing affordable access - from people’s homes to opportunities, including education, employment, family and social networks. Transport policy alone may not be able to directly act as a lever for accessing these opportunities but can perhaps have most benefit when incorporated into a wider equality, cohesion and regeneration strategy. Initiatives, policies and interventions could be more successful if they operated in a way that reflects local macro-economic factors. These transport policies and initiatives may need to be a part of larger scale initiatives that cover other policy areas such as skills, education and employment, and housing for example in order to be effective (Figure 1.0).

**Transport policy should consider where new opportunities lie for partnerships and networks across transport interdependencies.** Transport operates alongside processes, systems, and structures that are designed and operated by other stakeholders. To address inequality effectively, transport policy could consider where the main interdependencies lie and where partnerships and networks can be developed for the purposes of common goals, beyond sectors and domains where transport providers and policy makers are already experienced in working closely together.

**The relationship between transport and land use is key, and housing is an area where there are opportunities for joint work to address inequality.** A multi-stakeholder approach could involve housing policy that focuses on the best-connected areas offering homes that are genuinely affordable to people on low incomes, as well as building affordable mass-transport into new developments to make them well connected. It could also involve skills and employment policy that aims to provide job opportunities for people with varying levels of educational qualifications.

**Overall, the strength of the evidence on the link between transport and inequality varies, with the strongest and most abundant evidence on policy impacts related to the value of bus services and of concessionary travel passes.** The perceived value of the English national concessionary travel scheme for older people in the eyes of users was complemented by a benefit–cost ratio estimated at 1.5:1 across England. There was relatively little evidence found on the differential effects according to demographic groups, with the exception of findings related to poverty/income level, age (especially for older people) and employment status, and some findings related to gender and rural/urban residence. Given the broad scope and rapid nature of this review, the absence of evidence does not mean that no such evidence exists. However, decision-makers would benefit from a programme of research to better understand the evidence on the links between transport and inequality and build a

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stronger evaluation evidence base on policy effectiveness, including through the development of pilot studies.

**Future developments could change the relationship between transport, inequality and poverty.** The sharing economy could help reduce transport costs, with accessibility implications particularly for groups such as young people, families, and lower income groups *if* it becomes more accessible through improved digital literacy. Virtual mobility and online experiences may substitute for physical trips, though as yet there is little evidence of this. These online experiences would not necessarily be an equal alternative to the options others have access to offline. Expansion of the flexible and targeted transport options characterised by demand-responsive transport and mobility-as-a-service may provide a way to meet a range of challenges. It will be important for policy makers to consider such developments in decision-making given the potential implications.

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# 1 Introduction

## 1.1 The context of socio-economic inequality in the UK

The aim of this evidence review is to synthesise research that explores the links between transport and socio-economic inequality. The primary focus is on **socio-economic inequality** understood as disparities in income and wealth, and on **social mobility**, understood as change in socio-economic position. We also consider evidence related to transport and poverty, as poverty and low income are closely linked, and increased income is a key mechanism of upward social mobility. **Inequality** focuses on disparities, which can be economic (as in income and wealth) or social (as in education or health). **Poverty** focuses on the lack of sufficient economic and material resources to maintain an acceptable standard of living.

### Income inequality

Inequality is both outcome-oriented and opportunity-oriented (Yang, 2017: 5). Outcome-oriented inequality is based on material dimensions, including income. Opportunity-oriented inequality is more concerned with the fairness of processes and social structures that lead to the outcomes. Both types of inequality interact with transport: outcome-oriented inequality can have a direct influence on access to transport (such as not being able to afford a car or a season ticket for public transport, or not being able to live in an area that has an efficient and accessible transport infrastructure), which in turn impacts opportunity – which then affects outcomes.

This review considers both opportunity-oriented inequalities, including access to jobs, and outcome-oriented inequalities, particularly income. The UK has among the highest levels of income inequality of all high-income countries. Currently, the top 10% of the population have average net annual incomes of over £80,000, nine times the average income of the bottom 10% (Equality Trust). There is also regional variation across the UK: in 2016/17 median household income, after taxes and benefits and adjusting for family size, was £39,000 in London, compared to £25,000 in Northern Ireland and £27,000 in the North East (Office for National Statistics 2018).

### Poverty

The most common definition of poverty used in the UK is a relative measure, defined as having a “household income, adjusted for family size, which is less than 60% of median income.” (Yang, 2017: 3). Poverty can also be defined purely in monetary terms, or broadly in terms of material deprivation (Yang and Vizard, 2017: 2), but income is a key component. As such, key drivers and indicators of poverty include low pay, low skills, unemployment, and eligibility for and levels of benefits and tax credits. Currently in the UK, 14 million people live in poverty, including eight million working-age adults, four million children and two million pensioners<sup>2</sup> (Joseph Rowntree Foundation 2018).

From the late 1990s, poverty rates declined but as of 2014 they are increasing. While rates of employment have increased – the percentage of workless households is the lowest it has been in 20 years – underemployment, low pay and cuts to benefits mean

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<sup>2</sup> Defined as having less than 60% of median income after housing costs, adjusted for family type. Joseph Rowntree Foundation 2018.

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that there are also more working people in poverty than in previous years. Over half of people in poverty live in a household where at least one person is working (JRF 2018).

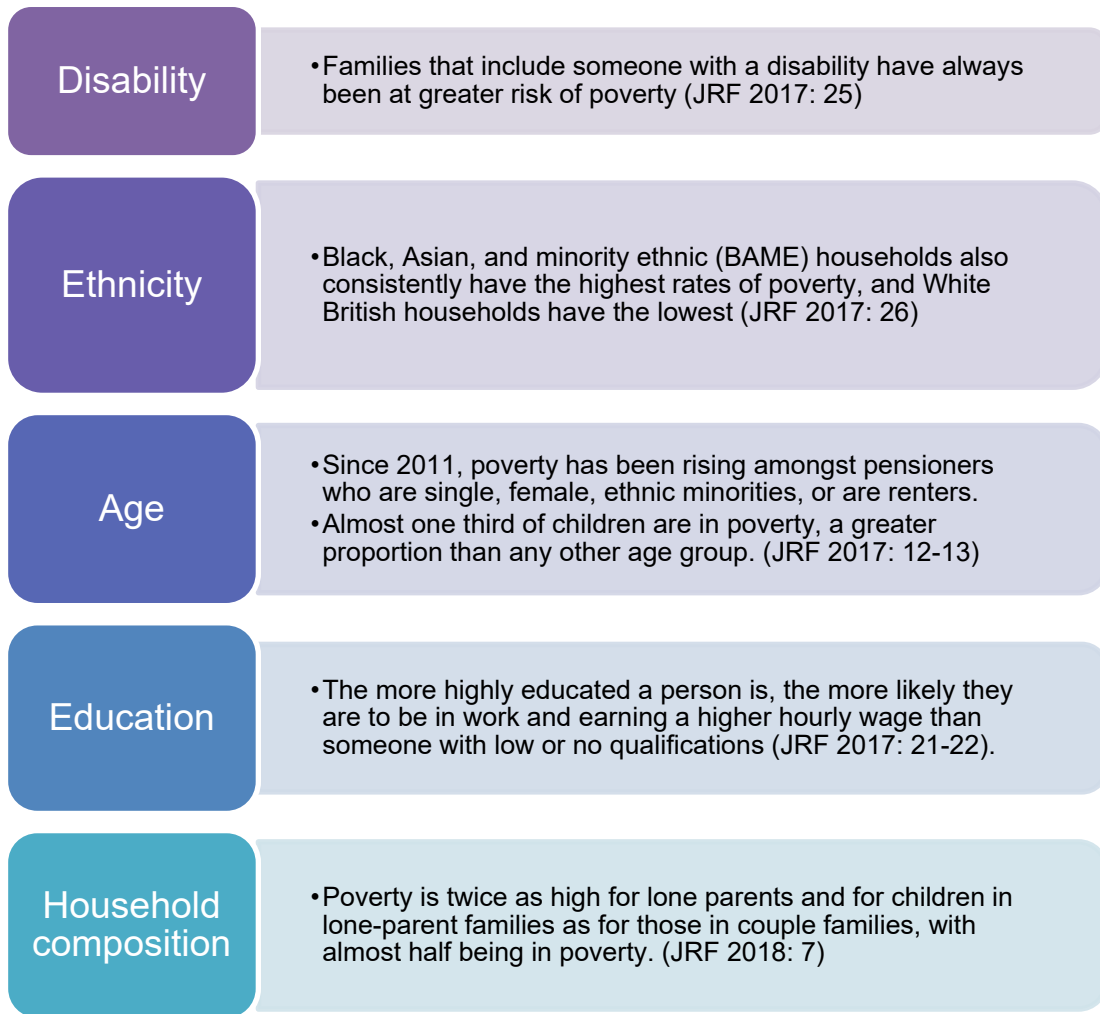
Key vehicles for addressing poverty include welfare and public support, education, cost of living interventions, employment, and social support (e.g. health and social care services, family relationships) (Joseph Rowntree Foundation 2016). Groups traditionally at risk of poverty are families with children and pensioners. In addition, family structure can predict persistent poverty, with lone parent households being most at risk.

Recently, the Social Metrics Commission (SMC), suggested a multi-dimensional definition of poverty that challenges the traditional measure of relative poverty (Social Metrics Commission 2018). With their new measure, the SMC found similar numbers of people in poverty over time as the previous measure, but there was a shift in *who* is considered to be in poverty. The SMC measure is more likely to include people who consider themselves to be materially deprived. For example, a family that has a high income but struggles to pay for necessities would be considered in poverty, but pensioners or families on low incomes but with a high amount of savings would not be. According to the SMC measure, poverty increased during the financial crash and since then has slowly been decreasing.

## Membership of specific demographic groups can predict risk of poverty

Experiences of income inequality and poverty are not the same for everyone. In addition to regional variation, other characteristics can predict risk of poverty or likelihood of having a low household income. Additionally, poverty is not measured in the same way in all statistics. However, Figure 1.1 illustrates the relationship between membership of certain population groups and the risk of poverty and income inequality.

Figure 1.1 – Income inequality and poverty by sub-group



Source: Authors' own

## 1.2 Links between transport and inequality

Existing evidence highlights the complexity of the links between transport and inequality. Much of the literature does not specifically explore inequality, but rather mechanisms and measures of inequality such as social disadvantage, accessibility, poverty, and social exclusion. Additionally, there are several dimensions by which accessibility of transport can be measured, such as modes of transport, cost of transport, distance to public transport and length of journeys to work, school and necessary services. This sub-section provides a brief overview of some of these key issues.

There is a relationship between income and type of transport used. Those on lower incomes use buses more than those on higher incomes, and those on higher incomes use cars and trains more than those on lower incomes (Department for Transport 2017). This is a result of accessibility rather than choice: buses are cheaper to use than trains, and cars are expensive to own and run.

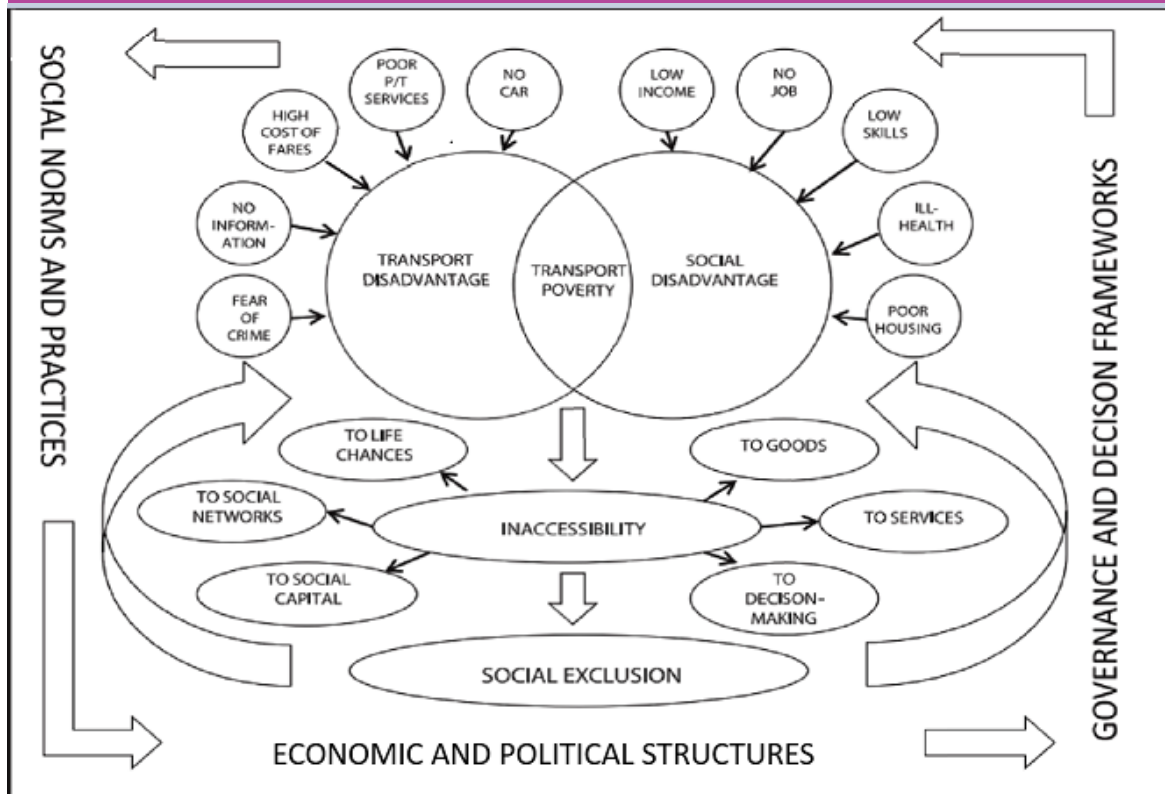
## Transport poverty

- Transport poverty refers to households and individuals who struggle or are unable to make the journeys that they need. There are several definitions, but they tend to comprise **low income**, poor availability of **public transport** and needing a long time to **access essential services**.
- One measure, proposed by Sustrans, determines the risk of transport poverty at the aggregate area level using these three factors:
  - Proportion of households with low income (that would have to spend 10% or more of income to run a car);
  - Proportion of households that are more than one mile from the nearest bus stop or railway station; and
  - Proportion of households that would need to travel for more than one hour to reach essential services.(Titheridge et al., 2014)
- According to this definition, 1.5 million people in England are at high risk of being transport poor.

Transport poverty does not yet have a single agreed definition or measurement, but broadly refers to households and individuals who struggle or are unable to make the journeys that they need. The impacts of transport poverty are worst for poor people in rural areas. This is because all three factors (in the Sustrans definition, see box) can be at play but exacerbated by the fact that low rural population density makes public transport difficult to function in these areas. The circumstances that bring about transport poverty have been described as a cycle (Lucas, 2012: 107). Figure 1.2 provides a simplified representation of this cycle.

Whilst transport disadvantage and social disadvantage are not necessarily synonymous, they do interact, resulting in transport poverty. This leads to the inaccessibility of opportunities such as developing social capital, acquiring goods, and using services. This in turn can lead to social exclusion. For example, lack of transport is a key barrier to employment for many residents living in low-income neighbourhoods, as inadequate infrastructure means the poorest areas of towns and cities are disconnected from their wider labour market areas (Crisp et al., 2018). Transport poverty is then maintained by a combination of social norms and practices, economic and political structures, and governance and decision frameworks (Lucas, 2012: 106-7).

Figure 1.2 – The relationship between transport disadvantage, social disadvantage and social exclusion



Source: Lucas 2012: 107.

### 1.3 Purpose of the review

To date, transport research has largely focused on objective factors such as length of journey or physical access to transport. There are a number of limited studies explicitly investigating the relationship between transport and socio-economic inequality, but this relationship is not well understood. The aim of this review is to explore research that has been published in recent years to help fill this knowledge gap. This report reviews and assesses some of the key evidence related to the link between transport and socio-economic inequality. It is intended that the analysis provided in this report can be used to inform the development of targeted and effective interventions and facilitate evidence-informed policy decisions that could help to reduce inequality.

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## 2 Study objectives

The objectives of this study are:

- To summarise evidence on the links between transport and socio-economic inequality; the different channels of impact (including whether they are direct or indirect); and indication of the scale of those links.
- To contribute to the evidence base that can inform the Department's policies and approach to the spending review and future decisions on social policy.

### 2.1 Research Questions

1. In what ways are transport and socio-economic inequality linked?
  - a) What are the mechanisms by which transport impacts on inequality, and vice versa?
  - b) What does the evidence say on the strength of those links?
  - c) How does this vary across sub-groups (including, but not limited to age, income and urban-rural groups)?
2. What do we know about transport policies' effectiveness in improving inequality?
  - a) How does this vary across sub-groups?



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## 3 Methodology

### 3.1 Overview

This evidence review follows the methodology and structure of a Rapid Evidence Assessment (REA): “A Rapid Evidence Assessment (REA) is a tool for getting on top of the available research evidence on a policy issue, as comprehensively as possible, within the constraints of a given timetable” (Government Social Research Service 2014). This section provides a summary of our criteria and processes for determining the inclusion of studies, data extraction, and the synthesis of findings. Both published and unpublished (grey) literature were considered for inclusion. For a comprehensive description of our methodology see Appendix A.

### 3.2 Inclusion criteria

To be included, studies had to meet the topic, study methodology, setting, language, and date criteria outlined below.

#### Topic criterion

Studies had to include at least one quantitative estimate of the following six broad associations between public or private transport use and/or access, and an outcome related to inequality. See Appendix A for a full list of all types of includable associations:

- **Public transport use and/or access and:**
  1. *income and/or wealth*, such as the proximity to a train station by annual household income.
  2. *gaining employment or moving job*, such as the relationship between a programme that provides free bus access to unemployed individuals and employment attainment.
  3. *accessing education or training*, such as the increase in the number of residents of a small town attending post-secondary education after a new trainline was constructed between their town and a big city.
- **Private transport use and/or access and:**
  4. *income and /or wealth*, such as the likelihood of owning a car by annual household income.
  5. *gaining employment or moving job*, such as the relationship between the proportion of the population that owns a car and the flexibility of the labour market in a country.
  6. *accessing education or training*, such as the difference in the attendance rates at a skills training programme between participants who own and who do not own a car.

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### Methodology criterion

The aim of this evidence review is to identify and assess the relationship between transport and socio-economic inequality. The most relevant study designs in addressing this question were judged to be those that provide a quantitative measure of this relationship. Therefore, we included studies with an experimental or quasi-experimental study design, quantitative methods that investigate correlations or associations, and evidence reviews (such as systematic reviews or meta-analyses) assessing quantitative studies within them.

In terms of a transport criterion, studies had to include data on the following modes of public or private land transport: cars, buses, trains, cycling, walking, trams, and taxis. Finally, included studies had to be published in English from 2008 onwards and have used data collected on individuals or interventions in Western Europe, North America and/or Australasia.

## 3.3 Search strategy

We sourced documents from a search of the Scopus database<sup>3</sup>, websites of organisations and research groups working on transport policy, and recommendations from experts on transport and/or inequality within and outside NatCen. We also performed citation tracking for studies flagged during screening as having potentially relevant citations and further screened the documents arising from this. See Appendix B for the search strategy for Scopus, and Appendix C for a list of the websites/online repositories that were searched.

## 3.4 Screening and study prioritisation

Screening took place at two levels: (1) title and abstract and (2) full text -except for texts recommended by experts, which were screened only at the full text level. Screening tools were developed and piloted by more than one reviewer in the research team to promote inter-screener reliability. Abstrackr<sup>4</sup> software was used to screen database results at the title and abstract level.

Due to the rapid nature of this review, the number of studies included for synthesis was limited to around 30. To determine which 30 studies to include in the review, a prioritisation heuristic was developed. Studies were prioritised for inclusion if they: (1) covered more than one association between transport and inequality; (2) included analyses of how axes such as age, gender and ethnicity mediate these relationships; (3) were more recently published; (4) presented UK data; and (5) were evidence reviews. The 30 studies that scored highest on this heuristic were included in the review. See Appendix A for more detail.

## 3.5 Data extraction and synthesis

Data extraction was conducted using a data extraction tool that was piloted and adjusted before use to ensure inter-researcher reliability. See Appendix D for an example of our data extraction template. After all relevant data had been extracted from the included studies, the results for each of studies were narratively synthesised around topic areas. Evidence is summarised in tables of characteristics presented in

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<sup>3</sup> Google Scholar was also used, but is not included here as the database search did not return any eligible results beyond those already included.

<sup>4</sup> Abstrackr is software that uses machine learning to semi-automate citation screening by prioritising more relevant results.

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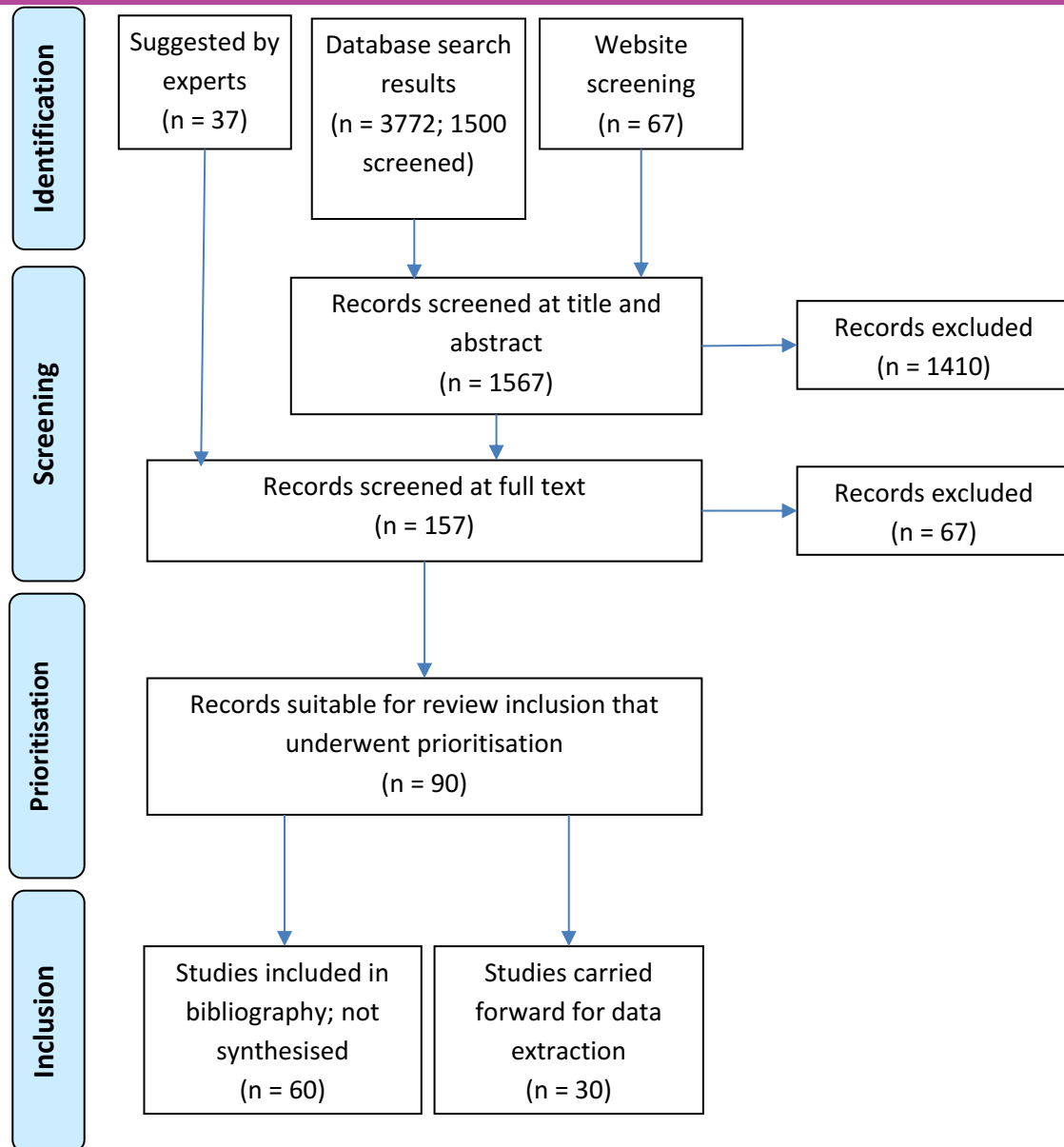
Appendix G. See Appendix A for greater detail on the data extraction and synthesis process.

# 4 Results

## 4.1 Screening, prioritisation and inclusion

The flowchart (Figure 4.1) summarises the REA’s screening and inclusion processes.

Figure 4.1 – Flowchart: Evidence review screening, prioritisation and inclusion process



We searched 16 websites, yielding 67 documents for full text screening of which 30 were eligible for inclusion. We screened 37 documents suggested by experts, of which 28 were eligible.

Searching the Scopus database returned 3,772 unique results. Of these, 1,500 title and abstracts were screened using Abstrackr, which uses machine learning to prioritise

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texts and presents the reviewer with results similar to those they have already selected for full text screening. Of these 1,500, 39 were included for full text screening and five were eligible. There were several documents that would otherwise have been eligible that had already been included through the website search and expert suggestions.

During the full text screening, reviewers identified documents for which citation tracking seemed likely to yield further eligible papers. From citation tracking of these documents and those suggested by experts, 27 further eligible documents were found.

In total, 157 documents met the criteria for full-text screening, and 90 of these met the criteria to be eligible for inclusion in the REA. In keeping with the need for an efficient REA process, and reflecting the protocol, two reviewers then assigned scores to these 90 documents based on coverage of topics across the research questions (see section 3.4 for our prioritisation rules). The top-scoring 30 of these were prioritised for data extraction and inclusion in the final review.<sup>5</sup>

A list of evidence included for synthesis is presented in Appendix E. The remaining documents that met the inclusion criteria but were not synthesised are listed in Appendix F. Tables of characteristics summarising the interventions, methodologies and outcomes from studies included for synthesis are provided in Appendix G.

## 4.2 Included studies: overview

In line with the rapid nature of this review, 30 of 90 eligible studies were included for synthesis. Therefore, the results and findings presented here apply to the 30 studies included.

## 4.3 Limitations in the review process

This research project adapted an REA methodology that was designed to efficiently locate and synthesise a body of relevant literature. Only a proportion of all hits returned from our search of academic databases were screened, though results were prioritised using machine learning to ensure that the most relevant were assessed for inclusion. Inclusion decisions at title and abstract were undertaken by only a single reviewer. This means that it is possible that some relevant studies may have been missed. Due to the need for an efficient review process, we also only synthesised a proportion of the studies meeting our inclusion criteria. The findings section and review conclusions are therefore based on a proportion of all includable studies and do not comprehensively summarise all relevant evidence. Studies were prioritised for synthesis based on relevance as discussed in the methodology chapter.

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<sup>5</sup> Where a document was found during data extraction to not in fact be eligible, the next-highest scoring paper in the list was included.

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## 5 Findings

### Key messages

There are three key underlying factors that influence the relationship between transport and inequality:

- 1) The way people are distributed geographically, and across social classes.
- 2) The way opportunities are distributed, including jobs and education.
- 3) How accessible the transport system is, in terms of cost, geographic accessibility and the time and reliability of different transport options.

This section includes narrative summaries of the findings drawn from the 30 selected studies. There are two sub-sections: the first focuses on transport, education and employment, and the second on social exclusion, poverty and income inequality. These topic areas relate directly to the study objectives and research questions being addressed in this report. The discussion section follows in section 6, and addresses the review research questions, on the basis of an analysis of the findings presented here. While the findings are presented by topics within the broad theme of inequality, many findings are relevant across the theme – for example, findings on transport and access to employment are clearly relevant to income. Some included studies discussed specific modes of transport while others only referred to “public transport,” or transport in general. We have referred to specific modes where they have been specified.

### 5.1 Education, training and employment

#### Section summary

- Access to work is greatly improved by more accessible and affordable public transport opportunities. Transport is important in obtaining a job, keeping a job, or getting a better job. Improving provision for cycling can also have a positive impact on employment opportunities.
- Targeting subsidies according to financial need is difficult, and in practice is usually approximated by supporting groups like students that are in easily identified categories.<sup>6</sup>
- It is not only accessing training that is important but also staying in training through to completion so that it can improve employment prospects. High transport costs can be a major disincentive to staying in training for a prolonged period.
- Again, the cost of transport is also a key barrier for accessing and staying in work. Therefore, support in paying for transport is a key way in which cities can support people living in poverty and wanting to be employed.

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<sup>6</sup> See for example: International Transport Forum (2017), Income inequality, social inclusion, and mobility. Roundtable Report 164. Available at <https://www.itf-oecd.org/sites/default/files/docs/income-inequality-social-inclusion-mobility.pdf>

- Those who depend more on the bus network to participate in the labour market tend to be lower paid, live in areas of deprivation, and are more likely to turn down employment due to transport limitations.<sup>7</sup>
- A lack of adequate public transport creates barriers to women accessing employment and educational opportunities. This is related to their patterns of participation in the labour market which often involves part-time work in order to fit around childcare commitments.<sup>8</sup>
- While there was evidence on moving into employment, none of the studies reviewed here explicitly discussed the links between transport and transitions within the labour market into better jobs.
- There can be wider economic benefits to transport beyond education, training and employment. These are related to better housing options, more amenities and an increase in real wages.<sup>9</sup>

### 5.1.1 Transport and employment

Many of the studies covered aspects of relationships between transport and access to work, education or training, and 11 studies explored access to employment explicitly. Quantitative estimates were relatively sparse, and many of those that did exist were drawn from surveys of service users or beneficiaries of supportive measures. These are subject to non-response, and it is possible that respondents who value schemes overstate their importance for being able to access and sustain work. However, such surveys provide valuable evidence on the *perceived* importance of these schemes to their users, even if they cannot assess impact.

Public transport is not the only mode that can improve access to employment. The review by Rajé and Saffrey (2016) outlined the evidence of the wider economic benefits of cycling, including reducing the disparity of access to employment opportunities. Cycling is regarded as a good way to widen travel horizons for disadvantaged individuals. The authors cited evidence that the lowest economic quintile has a typical commute of around three miles which corresponds to an hour's commute walking. They suggested that cycling could extend the options of employment to include companies within a range of 8 miles (an hour's cycle commute). Recognising that insufficient transport provision is a factor affecting joblessness, the report concluded that wider availability of cycling has the potential to reduce transport inequality and promote access to jobs and education.

Several authors reported the importance of local transport initiatives, particularly in providing or subsidising bus use, in getting jobs and retaining employment. The study by Mackie et al. (2012) quantified the indirect contribution the bus service in Great Britain makes to the wider economy, by capturing its impact on the efficiency of the labour market. The authors carried out an online survey of 1,117 bus users – described as a “random [sample of] bus users” in Britain outside London, though not a random

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<sup>7</sup> See for example: Mackie, P., Laird, J. and Johnson, D. (2012), Buses and Economic Growth: Main report. Institute for Transport Studies. Available at [https://www.its.leeds.ac.uk/fileadmin/user\\_upload/News/BusesEconomicGrowth\\_FINAL-REPORT.pdf](https://www.its.leeds.ac.uk/fileadmin/user_upload/News/BusesEconomicGrowth_FINAL-REPORT.pdf)

<sup>8</sup> See for example: Women's Budget Group (2018), Public transport and gender: Briefing from the UK Women's Budget Group on public transport and gender. Available at <https://wbg.org.uk/analysis/2018-wbg-briefing-transport-and-gender/>

<sup>9</sup> See for example: Thrush, J., Fuller, R. and Bray, J. (2018), About Towns: How transport can help towns thrive. Urban Transport Group. Available at [http://www.urbantransportgroup.org/system/files/general-docs/UTG%20About%20Towns%20AW\\_web.pdf](http://www.urbantransportgroup.org/system/files/general-docs/UTG%20About%20Towns%20AW_web.pdf)

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sample of the workforce – to elicit information about the impact of bus services on access to jobs, education and training.

The research found that 19% of respondents had turned down a job due to the quality of the bus service at some point in time, and 8% had turned down a job in the last year. Focusing on those who normally or reasonably often use the bus to commute to work, the study showed that 11% had turned down an offer of employment in the last year (p. 11). Moreover, the research showed a significant association between being more likely to turn down a job due to the quality of the bus service and being more dependent on the bus (meaning not having access to a car and not living within walking distance of the city centre).

Regarding desired improvements to bus services, respondents prioritised speed and cost: 61% of those saying a bus service would give access to a better job considered this would happen if the bus was faster/more direct; 45% if the bus was cheaper; 35% if the bus was more frequent (p. 13). Thus, the study highlighted the important role of public transport in providing access to employment, especially since those who depend more on the bus network to participate in the labour market tend to be lower paid, live in areas of deprivation, and are more likely to turn down employment due to transport limitations. Mackie and colleagues also reported that buses particularly serve lower-paid workers: the median pay of a worker commuting by bus was 86% of the median for Great Britain nationally.

**Those who depend more on the bus network to participate in the labour market tend to be lower paid, live in areas of deprivation, and are more likely to turn down employment due to transport limitations.**

Based on a meta-analysis of 12 Large Projects conducted under the Local Sustainable Transport Fund in England, Sloman et al. (2017, 2018) looked at activities implemented, including: discounted or free transport; help with transport planning; loans of mopeds; loans or free provision of bicycles; direct job creation; and improving non-car access to employment sites. Many initiatives, including help with travel costs and access to peripheral employment sites, focused on bus travel. Train travel was more integral to initiatives aimed at reducing car use.

For seven of the 12 Large Projects the authors conclude there is some evidence that the funded work helped decrease unemployment. Although an average of 10% of local unemployed people participated in these projects, there was no discernible effect on unemployment rates at local-authority level which overall followed wider trends across the country. The authors regard this as “unsurprising, given the relatively small proportion of job-seekers who secured employment as a direct result of the programmes and the wider macro-economic factors that affect unemployment levels.” (2017: 189). The benefit–cost ratio (BCR), across the projects (including benefits unrelated to employment) was 5.2–6.1, while three Large Projects that specifically assessed the BCR of support for job-seekers found this to be “high” (2017: 13).

These types of project are similar to some of the case studies presented by Thrush and colleagues (2018), primarily of post-industrial towns, where transport-related projects were contributing to a range of economic development goals, including improved employment prospects. Although the authors did not report estimates of impact, their work outlines the substantial diversity of responses available to public authorities.



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Residents in low-income neighbourhoods in northern England and Scotland reported transport barriers to be “intimately related” to employment options for people on low incomes (Crisp et al. 2018). Transport was, in practice, seen as a constraint to getting back to work rather than an enabler. Residents described long, multi-modal journeys that entailed risks of missing connections as well as increased costs due to travel across modes. The authors concluded that further use of existing policies and technologies, such as comprehensive journey-planning tools and integrated ticketing, would be valuable to minimise the negative effects of these complex commutes.

Across four deprived neighbourhoods in the UK, between 20% and 98% of people surveyed reported that the bus service was crucial to getting a job, staying in their existing job, or being in a better job (Lucas et al. 2008). The Walsall Workwise initiative provided help with travel costs for people seeking work or in new jobs, costing £123 per person and saving £187–£237 in Jobseeker’s Allowance over the four weeks of the supported travel. These bus services also had multiple other benefits for users in terms of access to health services, leisure activities and shopping. Women and lone parents were particularly helped by the interventions.

Similarly, Green and colleagues (2015) found that support in paying for transport was a key way in which cities can support people living in poverty to access and maintain work. Such support was particularly valuable for people entering employment or in their first weeks of a job. The authors gave the example of the Neighbourhood Travel Team in Merseyside, which along with other activities supporting jobseekers into work, had a benefit–cost ratio of 5:1 over three months.

## Support in paying for transport is a key way in which cities can support people living in poverty to access and maintain work.

A report from Centre for Cities (Clayton et al. 2011) reviewed the role of transport in improving access to work in four case study areas: the wider Milton Keynes area; South Hampshire; Greater Manchester and the Sheffield City region. Focusing particularly on the spatial mismatch between where people live and where jobs are, the report suggested several shortcomings in existing public transport options. Low density and geographic dispersal of employment limited access to jobs, while major roads were congested for those who can afford to run cars, and bus services were unintegrated between operators, slow and limited in hours. Transport interventions were found to work best as part of a wider policy mix targeted at unemployed individuals, taking into account their skills and the matching economic opportunities they could access.

The International Transport Forum (2017) evaluated the capacity of mobility policies to address transport-related exclusion of lower income groups. The review showcased significant evidence across countries that lower-income populations tend to experience more restricted transport options, have lower quality transport services available to them, and travel under worse conditions (in terms of safety, security, reliability and comfort). Moreover, broad evidence was found to suggest that limited transport options contribute to the creation of “poverty traps” by hindering individuals’ access to jobs, educational institutions and social networks. The authors concluded that targeted subsidies, as opposed to generalised support, are a better way of striking a balance between financial sustainability and service affordability. They acknowledge, however, that targeting subsidies according to financial need is difficult, and in practice is usually approximated by supporting people in easily identified categories such as older people or students.

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Targeting subsidies according to financial need is difficult, and in practice is usually approximated by supporting people in easily identified categories such as older people or students.

In summary, access to work is greatly improved by more accessible and affordable public transport opportunities. Transport is important in obtaining a job, keeping a job, or getting a better job. Improving provision for cycling can also have a positive impact on employment opportunities.

### 5.1.2 Young people, transport and education or training

The key themes that emerged with regards to education and training were similar to that for accessing and sustaining employment. Titheridge and colleagues (2014) highlighted the importance of affordable transport for young people from deprived backgrounds. Their review included evidence that higher education students from low income households do not make many of the journeys needed to participate fully in academic and social activities. Many are not able to use discounted travel cards because they require a one-off payment. Moreover, survey evidence reviewed suggests that a third of young people who were not in education, employment or training (NEET) or in un-skilled jobs said they would have engaged in work or training after Year 11 at school if they had received help with covering transport costs.

Abrantes and colleagues (2013) reviewed evidence on public support for urban bus services in England and found multiple and overlapping benefits including those related to access to jobs and education. With regards to education, affordable and available bus services mean that students have more choice about where to study and can base their decision more on the courses available, and the quality of the establishment, rather than the costs of getting there. From the age of 16 onwards, the bus becomes an important tool in enabling young people to access employment and training. As many of the jobs available to young people are part-time or poorly paid and involve working during evenings and weekends to fit around study or training, high transport costs can be a major disincentive to staying in training for a prolonged period.

**High transport costs can be a major disincentive to staying in training for a prolonged period.**

The Department for Transport (2015) reviewed evidence on trends in multiple factors related to car use in recent decades. The cost of learning to drive is the most commonly cited reason for not driving among people aged under 30. Car usage and income are associated with age: between the early 2000s and 2013, distance driven declined for people aged under 40, and increased only among the 60+ population. At the same time, incomes fell for younger people, particularly those aged 18 to 29, and only increased for people aged 60+. This came alongside falling employment rates for younger people and rising employment rates for older people. Uncertainty intervals or estimates of statistical significance were not presented, but associations are likely to be robust as they are drawn from national surveys and other large datasets.

These papers suggest that public transport has the potential to unlock education and training opportunities for young people, particularly accessible and affordable public

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transport. It can also enable young people who are in education or training to participate fully in those activities.

### 5.1.3 Transport, opportunities and gendered disadvantage

Several reports highlighted that men and women have different transport needs when it comes to supporting access to employment. Programmes involving subsidised as well as free travel for different modes of transport are found to differentially affect men and women. None of the reports discussed non-binary or transgender people.

Two reports discussed the gendered nature of accessibility and affordability of transport for work. The UK Women's Budget Group (WBG 2018) highlighted the disproportionate impact that cuts to subsidised bus services have had on women, since they make more bus journeys than men. On trains, women alongside other part-time train users, benefit less than men from discounted fares and season tickets. Since women are more likely to be in part-time work and exercise caring responsibilities that may require them to make multiple short journeys during a day, their transportation needs are not adequately met by the majority of transport services that are designed following a "hub and spoke model", enabling people to travel into the city centre for work in the morning and back to residential areas in the afternoon.

The report emphasised that a lack of adequate public transport creates barriers to women accessing employment and educational opportunities, thus hindering their ability to participate in public life. Reflecting the disruption to work of making multiple short journeys related to caring responsibilities, Green and colleagues (2015) reported that childcare, alongside transport, was a "wraparound" area of support that cities could provide to help connect people living in poverty with jobs.

**A lack of adequate public transport creates barriers to women accessing employment and educational opportunities, thus hindering their ability to participate in public life.**

Starkey and Hine (2014) highlighted similar issues in urban areas in low- and middle-income countries: women who balance both work and care responsibilities are disadvantaged by the low frequency of public transport and fare structure in peripheral zones. This fare structure includes discounted fares that the WBG (2018) refer to. Having less access to private means of transport such as bicycles, motorcycles and cars, women are inclined to take work closer to home, often in the informal sector, which may limit their opportunities for finding better paid or higher skilled positions. This may be exacerbated by a limited availability of part-time work or work that fits around school hours.

Kamruzzaman and Hine (2012) highlighted that an understanding of access to activity spaces can shed light on the gendered dynamics of social exclusion. For example, women had more transport constraints than men, as childcare constraints meant they were less likely to take longer journeys. They were also less likely to travel at night or on weekends due to perceptions of safety, stemming from a lack of transport during these periods.

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## 5.1.4 The wider economic benefits of transport

Several papers discussed how and by how much transport can generate wider economic benefits. Thrush and colleagues at the Urban Transport Group (2018) presented a series of case studies outlining the ways in which a range of transport-related measures aim to widen access to employment, education, and training in towns. Such measures work by, for example, widening the accessible labour market, improving housing options and increasing investment. The authors acknowledged that transport measures should be “part of a bigger plan to stimulate activity, optimism and investment in towns” (2018: 5). The report does not present any evaluation of the case studies, in many of which the transport component occurred alongside interventions in other domains.

Abrantes and colleagues (2013) made a detailed estimation of the economic contribution of urban bus networks in England, including comparison to public funding for buses. They calculated a net economic benefit of £2.5 billion, half of which reflects benefits to bus users including access to employment and amenities, and half of which is benefits to non-users, related to reductions in congestion and pollution, encouraging economic agglomeration and other factors. The benefits are substantially higher than the public funding received.

In a paper for the International Transport Forum, Lewis (2011) discussed the knock-on effect that transport and infrastructure can have on investment, employment and wider opportunities. The author suggested that better roads and railways could improve the range of employment opportunities available to poorer individuals, by making more employment opportunities geographically accessible. Infrastructure might also raise real wages by generating concentrations of related businesses in urban areas. The paper also presented evidence from a range of surveys on difficulties disadvantaged people face in accessing work, learning opportunities, healthcare, food and activities due to the availability or cost of transport.

However, even if it generates economic benefit in the aggregate, transport infrastructure per se does not necessarily improve inequality. Starkey and Hine’s (2014) literature review on poverty and sustainable transport in low- and middle-income countries highlights that transport interventions such as investing in rural roads and urban transport interventions can reduce absolute poverty. However, they largely benefit the middle-income sections of the population because the greatest social and economic benefits of these interventions usually go to those with the capital to invest in the new opportunities available. By not having the resources to travel to the newly accessible employment markets, the poorest households might get left behind. Therefore, investment in interventions alone may not be an efficient measure for tackling inequality or eradicating deprivation.

## 5.2 Social exclusion, poverty and income inequality

### Section summary

- Transport barriers relating to accessing employment, education and training are also relevant to understanding a lack of access to other opportunities central to living a connected and fulfilled life.

- Key domains of social exclusion and transport disadvantage include inaccessible recreation opportunities, a lack of personal mobility and poor access to a full range of goods and services.<sup>10</sup>
- People from ethnic minorities<sup>11</sup>, young people not in education, employment or training<sup>12</sup>, students, older people and women were all reported to be particularly at risk of transport poverty.
- Rural and small urban communities experience transport disadvantage due to a lack of transit and a low density of employment, education, recreation and other opportunities.
- Where there are several activities that cannot be done due to transport problems, the result can be a decreased quality of life and wellbeing which overlap with social exclusion.
- Transport and regeneration policy can operate together to facilitate accessibility to not only education, training and jobs but also social support and a spectrum of key services.<sup>13</sup>

## 5.2.1 Transport and access to wider opportunities and services

Lewis (2011: 6) noted that “most investigators agree that poverty, inequality and social exclusion are tied to personal mobility and to the accessibility of goods and services.” The discussion of social exclusion is important here because “it reaches beyond a description of poverty to provide a more multidimensional, multi-layered and dynamic concept of deprivation.” (Lucas 2012: 106). This section highlights a range of evidence that demonstrates the importance of affordable and accessible transport in tackling social exclusion, and how transport is often seen as a route out of poverty.

An important recurring theme in a number of papers was the affordability and accessibility of public and private transport, and how this can be predicted by type of household or the region in which one lives. Lewis also highlighted the significant link between improved transport and diminished regional income disparities in “literally all the world’s economies” (2011: 6). That discussion found the disparity between those with and without access to a car to be a common international issue, since even in high-income countries, affordability was a significant obstacle to getting access to a car.

Rural residents were frequently reported as being at risk of transport disadvantage and associated social exclusion. Studies from Northern Ireland and Indiana, USA, found that given the lower density of opportunities for a range of activities, rural residents were especially vulnerable to limitations in transport availability. Kamruzzaman and

<sup>10</sup> See for example: Kamruzzaman, M. and Hine, J. (2012), Analysis of rural activity spaces and transport disadvantage using a multi-method approach. *Transport Policy* 19(1): 105-120. <http://dx.doi.org/10.1016/j.tranpol.2011.09.007>

<sup>11</sup> See for example: Mott MacDonald (2013), Valuing the social impacts of public transport. Department for Transport. Available at <http://www.socialvalueuk.org/app/uploads/2016/07/DfT-final-report.pdf>

<sup>12</sup> See for example: Titheridge, H., Christie, N., Mackett, R., Ovideo H., D. and Ye, R. (2014). *Transport and Poverty: A review of the evidence*. UCL Transport Institute. Available at <https://www.ucl.ac.uk/transport-institute/pdfs/transport-poverty>

<sup>13</sup> See for example: Curl, A., Clark, J. and Kearns, A. (2018), Household car adoption and financial distress in deprived urban communities: A case of forced car ownership? *Transport Policy* 65: 61–71. <http://dx.doi.org/10.1016/j.tranpol.2017.01.002>

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Hine (2012) took a mixed-methods approach to examine the links between transport disadvantage and the size of activity space in rural Northern Ireland, by combining survey data with qualitative data from focus groups. They concluded that “group specific policy interventions need to be developed more fully for those identified as transport disadvantaged (e.g. low-income, non-car, female, working) in order to increase their accessibility to goods and services.” (p.118).

Pyrialakou et al. (2016) developed a spatial, multi-perspective approach to quantify and evaluate transport disadvantage in the US, accounting for three essential elements: accessibility, mobility, and realised travel behaviour. Taking Indiana as a case study, their research indicated that transport disadvantaged residents are likely to be affected by the impacts of low transit supply. In particular, rural and small urban communities experience transport disadvantage due to a lack of transit and a low density of employment, education, recreation and other opportunities. They found that limited accessibility and mobility can result in decreased quality of life and wellbeing, as well as social exclusion.

### Rural and small urban communities experience transport disadvantage due to a lack of transit and a low density of employment, education, recreation and other opportunities.

There was some evidence against the association of transport disadvantage with social exclusion. Delbosc and Currie’s (2011) study in Victoria, Australia examined the correlation between transport disadvantage and social exclusion in urban and rural areas. They investigated how geographic context may influence transport disadvantage by looking at two different measures of transport disadvantage: frequency of difficulty accessing activities due to lack of transport, and number of activities that cannot be done due to transport problems. The study found that, for both measures, correlations with social exclusion were either low or not statistically significant. This contradicts previous literature, but Delbosc and Currie argue that this is due to the simplicity of the correlation measure. In a different paper using more sophisticated statistical techniques with the same sample, they found a significant relationship.

Two studies looked at the role of buses in helping people to do desired activities. Through a literature review, Abrantes, Fuller, and Bray (2013) assessed the benefits of public support for urban bus services. They find that to successfully connect people to opportunities, public transport services must be: available, accessible, affordable and acceptable. A lack of public transport which fulfils these four criteria can leave people stranded and cut off. Bus networks tend to be of greatest service to the most vulnerable groups in society, be it those on low incomes, those trying to find work, young, older or disabled people. The increased access to opportunities which bus networks provide to these groups can make a powerful contribution to greater social inclusion, social mobility and reduced government spending on social care and welfare payments. The authors presented a benefit–cost ratio for the national concessionary travel scheme for older people of 1.5:1. The benefits amounted to £377m, including £19m of wider economic impacts, £16m of health benefits to users and society and £42m of benefits in decongestion and other externalities.

Mott MacDonald (2013) examined the social impacts of local bus access. The aim was to produce a monetary valuation of the potential social benefits of bus interventions. Mott Macdonald developed a model that predicts, for a given individual and trip, whether not going on the trip would be the best alternative to using the bus. The study measured social impact in terms of the value that travellers place on the activity that

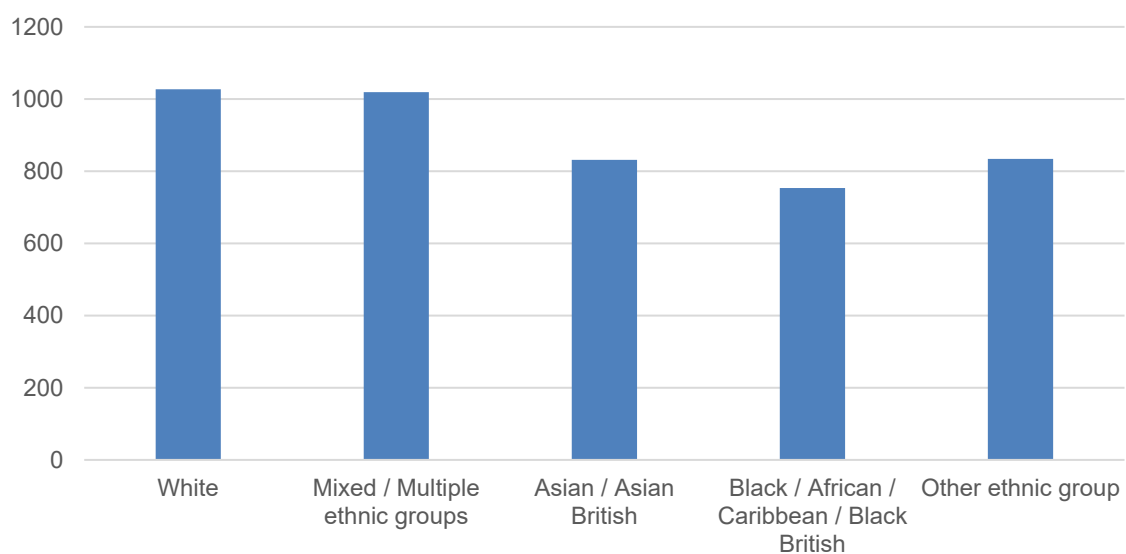
they undertake at the destination of their trip. Social benefit only applies when a traveller would not make the journey in the absence of a bus, and the values represent only the direct social benefit to the individual based on their willingness to pay.

Mott Macdonald found that essential or very important journeys are most likely to be retained and made by another mode. When including socio-economic explanatory variables in the model, employment status is most strongly associated with the preference to not go. Compared to full-time employees, part-time workers, those seeking work and students all had lower values for “not go”. The explanation given is related to individual income effects, since those in full time employment can afford to pursue higher value activities. Also, there are significant differences for ethnicity, gender and disability: Asian respondents, women and disabled individuals have lower values for “not go”, while Black/African/Caribbean respondents have higher values than White ethnic groups. Citing earlier research, the authors suggested that although the effects captured have no obvious causal link, the variation in value assigned to bus trips might be related to variation between ethnic groups in attitudes towards walking and cycling.

**People from ethnic minorities, young people not in education, employment or training, students, older people and women were all reported to be particularly at risk of transport poverty.**

Variation by ethnicity, age and gender was also reported by Titheridge and colleagues (2014). Having reviewed evidence on the relationship between transport and poverty in the UK, the authors pointed out the complexity of this link, as disadvantaged groups present a range of characteristics apart from just being more likely to be on a low income and carless. People from ethnic minorities, young people not in education, employment or training, students, older people and women were reported to be particularly at risk of transport poverty. Adults from Asian, Black or other ethnic groups took substantially fewer trips per person in 2017 than those from white or mixed groups (Figure 5.1).

Figure 5.1 – Trips per person per year (individuals aged 17+), England 2017

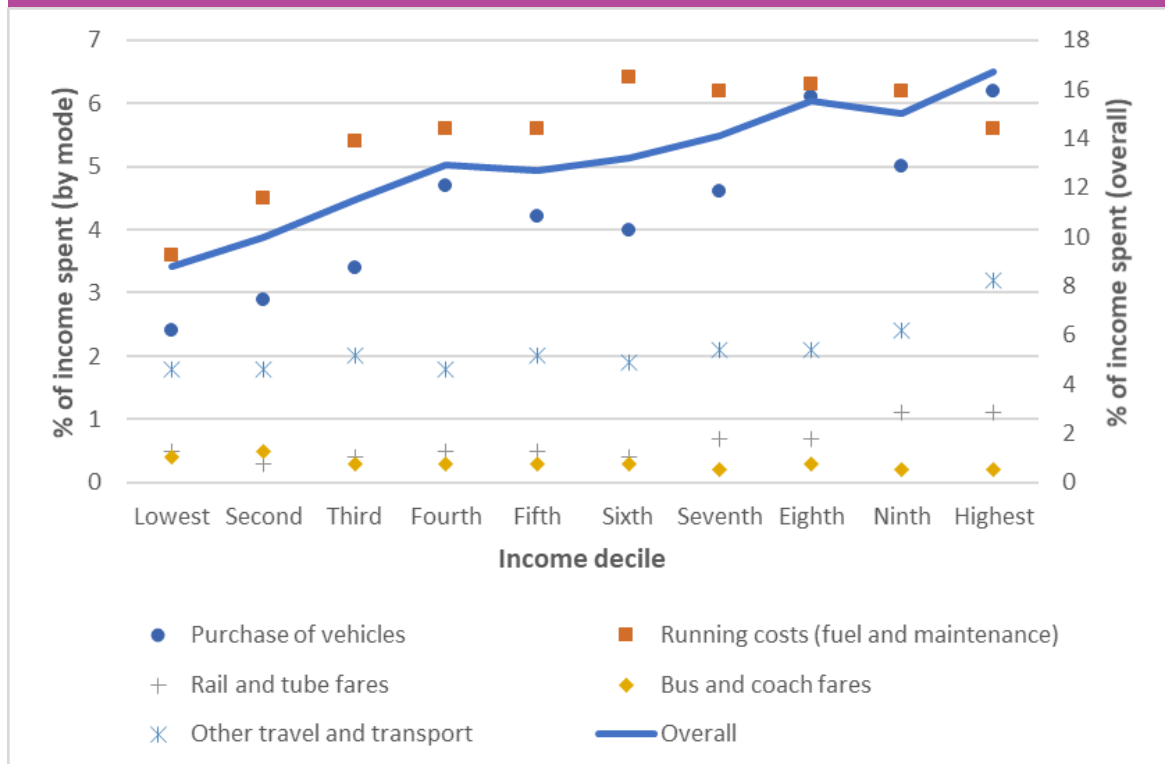


Source: National Travel Survey 2017.

## 5.2.2 Transport costs and availability

As noted, affordability of transport is an important factor in poverty and social exclusion. Several papers presented data on transport costs, with mixed findings on the proportion of income spent on travel at different income levels, and for different purposes. Titheridge and colleagues (2014) reported that expenditure on travel as a percentage of total expenditure increases with income, as does expenditure on the purchase of cars, and rail and tube fares; expenditure on bus and coach fares decreases with income (Figure 5.2).

Figure 5.2 – Expenditure on travel as a proportion of income, by mode and overall, UK 2017–2018



Source: Adapted from ONS data (Office for National Statistics 2019)

Pisarski (2016) explored the lack of transport affordability experienced by in-work households. The paper included an assessment of the present context against which evolving socio-economic patterns and trends in the United States operate. Pisarski found that individuals in the highest income quintile groups spend less as a proportion of their earnings than people in the middle-income quintiles on transport. In addition, transportation spending increases with each additional worker in the household, so households with more working adults can save less at the same level of income. In addition, transportation as a proportion of spending rises in rural areas when compared with central cities. Rural areas also exhibit greater absolute spending – although incomes are considerably lower than in city centres, housing costs are also substantially lower.

Although richer people may spend more of their income on transport overall, this varies with the reason for the trip. Bocarejo and colleagues (2012) looked at transport accessibility for employment in Bogota, Colombia across six social classes defined by average household income in the neighbourhood. They found that in areas primarily



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inhabited by the richest two classes, households spent 3–6% of income on travel for employment, while in areas primarily inhabited by the poorest two social classes, the proportion was 24–27%. They proposed a metric for evaluating the impact of transport policies on employment-related accessibility, which may be particularly useful for settings where geographical distribution and socio-economic level are highly related.

Tinson and colleagues (2014) conducted a literature review examining evidence for links between poverty and the cost of living. Poverty measures assess the cost of essential services, and transport is one of the services considered essential. Transport expenditure varies by family type: for single adults 8% of income goes towards transport costs, and for couples with no children it is 7%; the rate is higher for families with children, as both lone parents and couples with children spend 13% of their income on transport. More rural households tend to have higher transport costs, while access to transport can allow savings in other areas – for example, being able to access supermarkets allows access to food at lower prices than in smaller, local shops.

Poorer people spend a lower proportion of their total income on travel, travel less and use cars less (Titheridge et al. 2014). At the same time, many poorer people live in areas with little public transport provision and are reliant on cars despite the cost (Crisp et al. 2018; Curl, Clark and Kearns 2018). While car travel becomes more common as you go up the income distribution, cars play an important and complex role in the lives of some people on low incomes.

Curl, Clark, and Kearns (2018) explored forced car ownership, by examining the relationship between car ownership and financial circumstances for people living in disadvantaged urban communities in Glasgow. This is a longitudinal study based on household surveys conducted in the years 2006, 2008 and 2011. By examining changes in car ownership and financial difficulty in combination with area-level measures of income deprivation, they found that having children in the household is a significant predictor of car ownership.

Overall, forced car ownership in Glasgow is growing, because it is seen as a route out of poverty and deprivation. Poor households are less willing to relinquish their cars to ease money problems when under financial stress. For some people, acquiring a car can be seen as necessary to improve their circumstances. The authors found little evidence that the sustainable transport agenda is reaching disadvantaged communities. Curl and colleagues concluded: “That forced car ownership is growing in areas which have been the focus of regeneration initiatives is a concerning trend and suggests that transport and regeneration policy need to work in tandem to ensure that the car is not a necessary route out of deprivation but, rather, that transport and land use planning support accessibility to jobs and services.” (2018: 69).

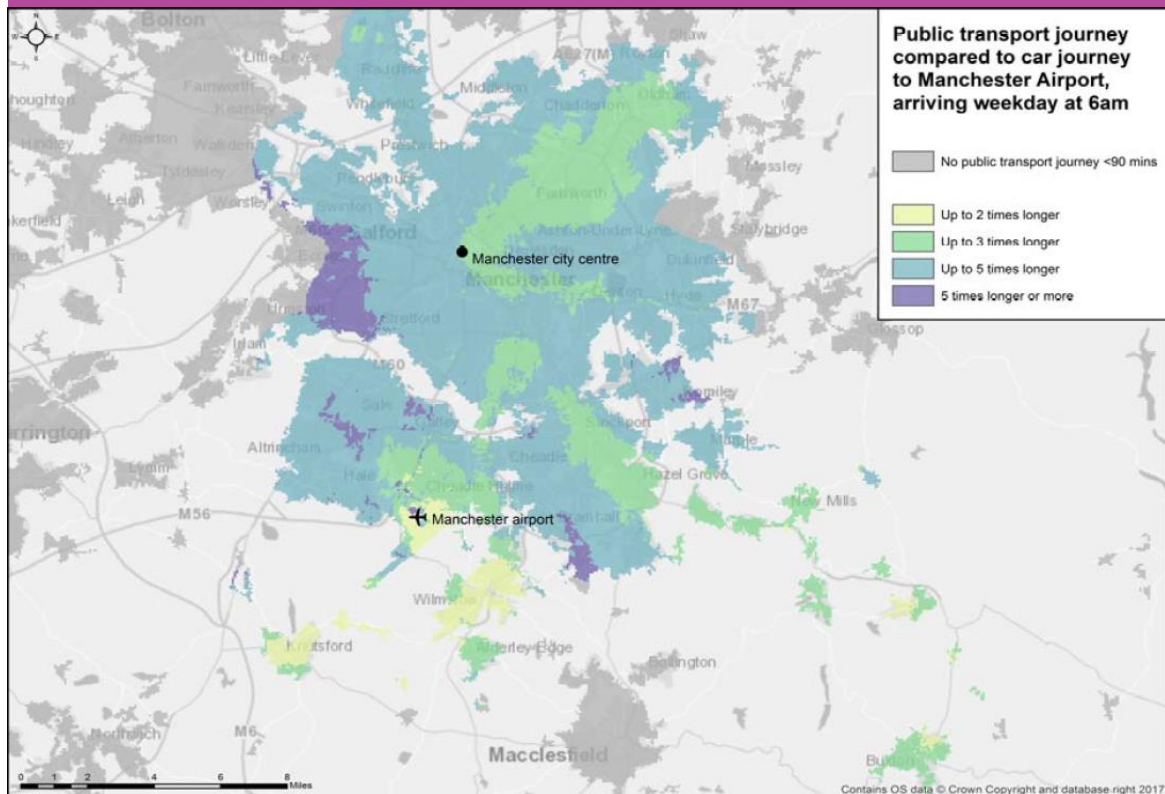
**“Transport and regeneration policy need to work in tandem to ensure that the car is not a necessary route out of deprivation but, rather, that transport and land use planning support accessibility to jobs and services.”**

A similar finding was reported in the 2018 review document on road pricing from the International Transport Forum: a 2008 survey on the distributional impacts of congestion charging in Scotland (Cain and Jones 2008, cited in ITF 2018) found that poorer households saw driving as a means of accessing basic needs, and that congestion charging “would have increased hardship for the poorest drivers especially

when they were already spending far above the affordability threshold defined by the study.” (ITF 2018: 18).

Crisp and colleagues (2018) examined the relative length of journeys by car and by public transport, including from surrounding areas to Manchester Airport, a major local employer. This illustrated the concept of forced car ownership, showing the dramatically higher travel times associated with public transport, for arriving at the destination for a 6am start (Figure 5.3).

Figure 5.3 – Relative length of journey by public and private transport to Manchester Airport (arriving at 6am Monday–Friday)



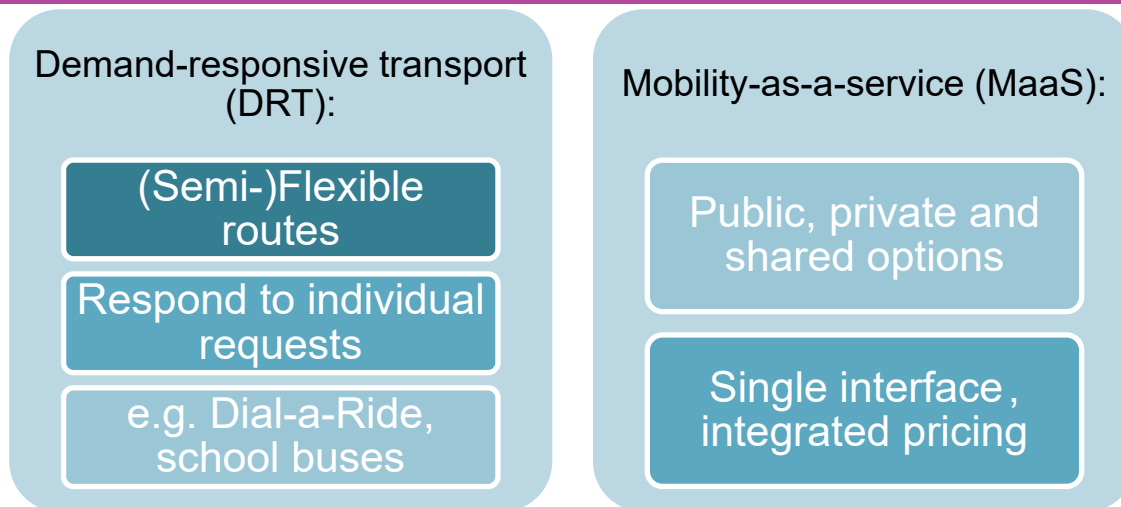
Source: Crisp et al. (2018), page 7

In their paper examining car-related economic stress (CRES) in the UK, Mattioli, Wadud, and Lucas (2018) used economic modelling estimates to assess the degree of car dependence and adaptive capacity of households. They highlighted that affordability is one part of a broader transport poverty issue. They also used elasticity estimates to assess the impact of fuel prices on CRES in the UK. They found that poor UK households have low elasticity of expenditure on transport, and that car ownership tends to result in economic stress especially when fuel prices rise. Affordability becomes more problematic due to mismatches in income, prices and energy efficiency. Commuting costs are prioritised by households over other expenses including domestic energy.

The International Transport Forum (2018) reported an analysis of the fairness of congestion prices, using a survey on how individuals would vote in a (hypothetical) referendum about congestion charges in 4 European cities: Stockholm and Gothenburg (Sweden), Helsinki (Finland) and Lyon (France). In Stockholm and Gothenburg congestion charging was already implemented; in Helsinki, the system was proposed and under discussion; and in Lyon, the question referred to a hypothetical system where all cars entering the urban centre would pay EUR 3 per day.

In all cities, high income groups were found to pay much more than low income groups. In Gothenburg and Helsinki, however, the highest income group pay less than the middle groups. In Helsinki it is because the highest income group tend to live and work more centrally, and hence drive shorter distances on average, while in Gothenburg it is because company cars are exempt from congestion charges (according to Swedish tax law), and high income groups have access to company cars to a much larger extent. However, people with the lowest incomes pay more relative to their income in all locations. In Gothenburg, for example, the lowest income quintile pays almost 1% of their income in tolls, while the highest income quintile pays less than 0.5%. The authors also show that the congestion charges are regressive in all the cities, using the Suits index of regressivity.

Figure 5.4 – Innovative transport solutions



Source: Crisp et al. 2018; MaaS Alliance.

Evidently there may be a tension between alleviating pressures on people experiencing car-related economic stress and supporting public transport in areas where it is difficult to make public transport economical. Crisp and colleagues suggest that “Integrating DRT [demand-responsive transport] and MaaS [mobility as a service] with classic high-volume transport corridors may help overcome the contradictory mission problem” (2018: 51). Demand-responsive transport refers to mainly mid-sized services such as minibuses that set their route wholly or partly based on the wishes of users, who can book them in a variety of ways. Examples include the Dial-a-Ride service, or school buses. Mobility-as-a-service (MaaS) refers to an integrated transport system combining mass public transport, ride-/car-/bike-sharing schemes, car rental and potentially other mechanisms.

Finally, we can note that actual costs are only part of the picture. Perceived cost can also affect choice of transport mode: discussing transport-related barriers to employment, residents of low-income areas tended not to consider train travel, even where this was available, seeing it as too expensive. This meant instead opting for much slower travel by bus, which often cost almost as much as and sometimes more than the train (Crisp and colleagues 2018).

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### 5.2.3 Transport, access and wellbeing

Although this review does not focus on wellbeing, this is a theme that also emerged in the studies, particularly in relation to access to services. In addition to their findings about transport and social exclusion, Delbosc and Currie also examined correlations between transport disadvantage and subjective wellbeing. There were two key findings. First, that “correlations between transport disadvantage and wellbeing were fairly consistent”, and second that the correlations were “highest among the regional sample” (that is, those who live in more rural areas) (2011: 1136). The highest correlation was between the frequency of difficulties accessing activities and subjective wellbeing. Their interpretation is that living in a more rural area does not necessarily mean you will experience transport disadvantage. However, if transport disadvantage is experienced, the negative impact on your subjective wellbeing would be greater if you lived in a rural area than it would be if you lived in an urban area.

**While living in a more rural area does not necessarily mean you will experience transport disadvantage, the negative impact of transport disadvantage on your subjective wellbeing would be greater if you lived in a rural area than it would be if you lived in an urban area.**

Those findings, from the Victoria region of Australia, suggest that in more transport-dense areas, relative disadvantage is less serious as absolute disadvantage is lower. This is reflected in Inayathusein and Cooper’s (2018) paper on accessibility indicators in London, which highlighted a strong correlation between access to public transport and access to services. Overall, access to services improves with access to public transport. However, poor access to public transport does not necessarily mean poor access to services, particularly if services are accessible by walking. The correlation between public transport and access to services becomes lower as access to services including employment as well as hospitals, schools and retailers increases – where there is good access to most services, public transport provision becomes less relevant.

Mackett’s (2014) review of the effectiveness of concessionary travel passes (CTPs) found that CTPs can be an important resource in tackling social isolation as they can be an important facilitator of social interaction for older people. Being able to use the bus freely allows older people to visit friends and family, interact with people on the bus, and attend community activities, thus helping to address social exclusion. These findings were mirrored in an evidence review by the Department for Transport (2016) examining the impacts of concessionary bus travel on social exclusion amongst older people. They found that people holding concessionary travel passes often credited these schemes with enabling various forms of social participation and activity including shopping and meeting people, as well as attending necessary appointments and accessing important services.

Investigating the relationship between commuting time, income and self-reported job satisfaction in the Cardiff region, Crawley (2014) found commuting time to be associated with job satisfaction, which in turn is closely related to wellbeing. Commute time did not affect job satisfaction for people earning above average, but for those earning below average, longer commutes were associated with lower job satisfaction. Similarly, this research found no significant association between using multiple modes of transport and job satisfaction overall or among workers receiving below-average

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pay; however, among workers earning above average, there was a positive relationship of multi-mode travel and job satisfaction. The authors suggested this might mean that “people who earn more are willing to use a number of means to get to work offsetting the negative externalities of commute.” (Crawley et al. 2014: 1275).

Transport and wellbeing are discussed at more length in the accompanying report on transport, health and wellbeing (Cooper et al. 2019).

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## 6 Discussion

This section synthesises the findings of this review, addressing the questions set out at the beginning of this report, and giving suggestions for future research.

### 6.1 In what ways are transport and socio-economic inequality linked?

Affordable access to opportunities is at the centre of the relationship between transport and inequality. These opportunities include education and training, paid work, and social inclusion through the development and maintenance of social contacts with friends, family and other networks, and access to activities, goods and services. To encourage equitable access to these opportunities, transport policy needs to take into account the nuanced dynamics of disadvantage experienced by different groups.

In terms of findings on inequality, the literature was focused on the relationship of transport with factors related to income, such as disadvantage or job-seeking, and some literature addressed certain social groups and characteristics. Nothing discussed social mobility explicitly, though improving income and aspects of socio-economic position underlie the widespread interest in entering employment or getting a better job.

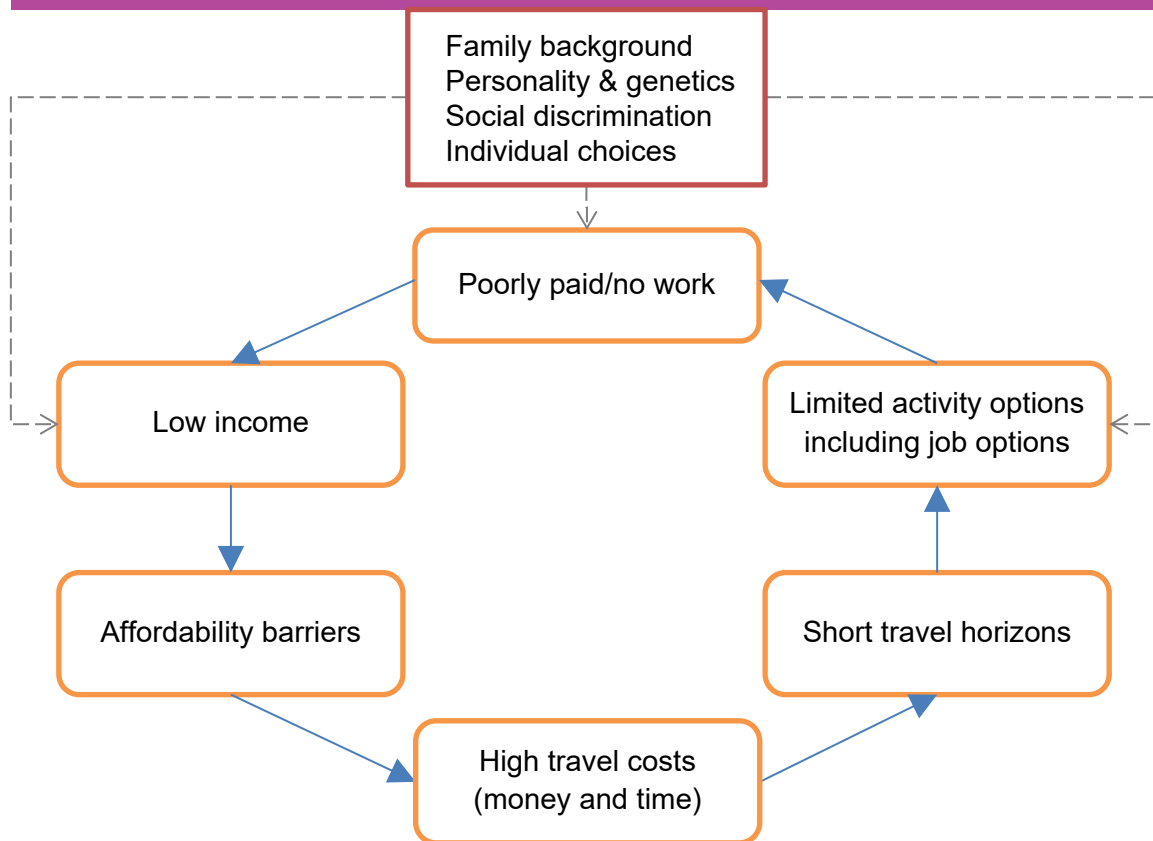
#### 6.1.1 What are the mechanisms by which transport impacts on inequality, and vice-versa?

Cost is an important mechanism by which transport impacts inequality. **Cost is a primary obstacle to use of transport – and help with costs is a leading type of intervention to encourage equality.** Where transport use is for work, this in turn enables access to income; where it is for non-work activities, it increases social connection and wellbeing. The latter is most evidenced for older people, but there is little reason to doubt that transport increases social connection and wellbeing across the population.

We found more on interventions around affordability than availability, though some of the Large Projects presented by Sloman and colleagues involved the provision of new transport. The relationships of transport to income, employment, and potentially reducing inequality are similar whether the barrier is cost or availability, and is outlined for cost in Figure 6.1. People with low incomes face affordability barriers to travel (as well as other barriers in terms of time and availability). This limits the scope of activities available to people on low incomes, including the ability to travel to find (better paid) work.

Affordable transport is integral for students who need to access education providers, job-seekers for attending interviews and recruitment meetings as well as employees who want to get to work (Abrantes, Fuller, and Bray 2013, Titheridge et al. 2014, Green et al. 2015, Sloman et al. 2017, Sloman et al. 2018, Crisp et al. 2018, Lucas et al. 2008).

Figure 6.1 – Illustration of the relationship between low income, transport costs and employment options



Source: Authors' own

Discounts on travel through travel cards and season tickets can help alleviate the strain of transport costs. However, **where travel discounts require a lump sum payment up-front, they can be out of reach for people on low incomes who may benefit from them the most** (Titheridge et al 2014). In addition, discounted tickets for full-time workers may be regressive from an inequality standpoint, as they relatively disadvantage part-time workers, which disproportionately impacts women.

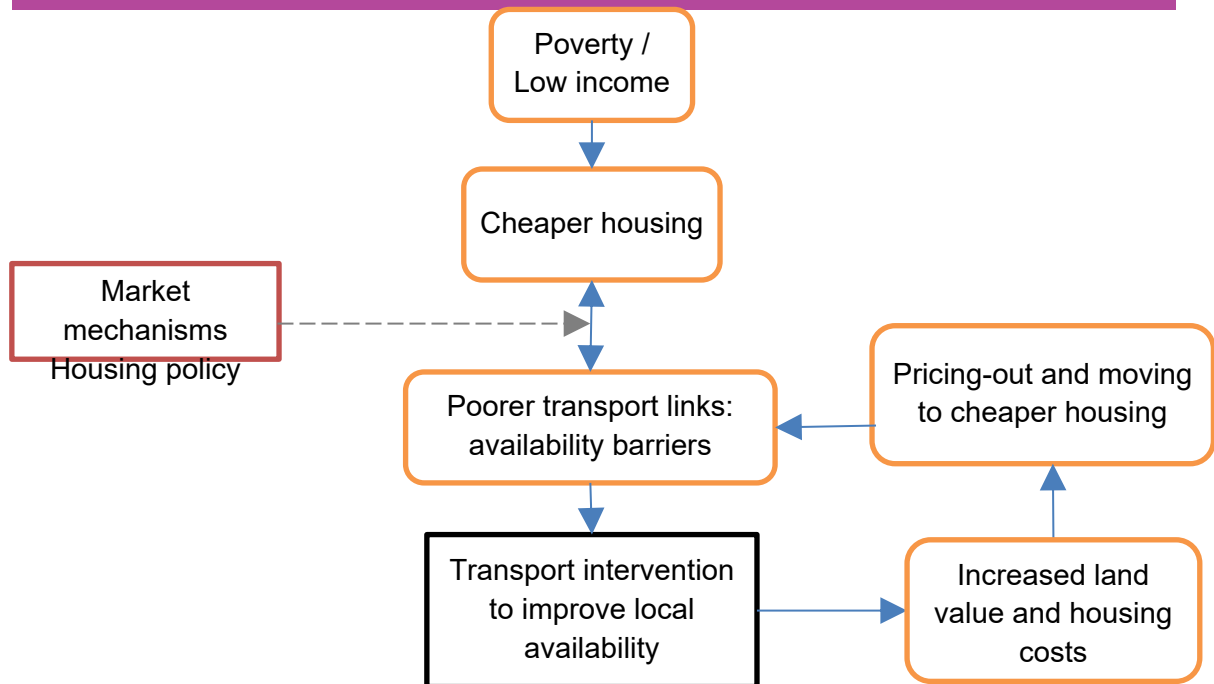
The evidence included in this review shows that **concessionary travel pass (CTP) policies are effective in making transport more affordable**. However, this is more so for older people that are likely to be the target groups of these policies. CTPs can be an important resource in tackling social isolation by facilitating social interaction (Mackett 2014, DfT 2016). Other sub-groups at risk of experiencing transport poverty may not be the target groups for CTPs, due in part to difficulty in establishing eligibility (ITF 2017). This, along with difficulties in accessing discounts they may be eligible for, could make it difficult for those experiencing financial difficulty to engage in education and/or find and keep a paid job.

Concessionary travel is only useful if services are available. Availability is the key mechanism by which transport affects or alleviates the particular vulnerability to social isolation of residents of rural areas or urban areas poorly served by public transport (Crisp et al. 2018, Curl et al. 2018). **One phenomenon in areas poorly served by public transport is that cars become essential, despite their high cost**, for accessing employment and other activities. This contributes to a reliance that is difficult to substitute (Mattioli et al. 2018). That said, evidence on cars may need more focused consideration as there are mixed indications from our findings, and it is unlikely that the same policy responses would be effective in different contexts. Cars clearly meet a

need in certain settings, but given that car ownership is associated overall with higher income and wealth, measures to relieve car-related economic stress through general support for car ownership and use would risk worsening inequality.

In areas with high levels of deprivation and lower public and private investment, there may be limited availability of job opportunities that match the skills people have as well as their working patterns. Much recent UK evidence emphasised that **interventions could be more successful if they reflected local macro-economic factors and were part of larger scale initiatives that cover domains beyond transport** including skills, education and employment policy, and housing (Urban Transport Group 2018, Sloman et al. 2017, 2018, Crisp et al. 2018, Curl et al. 2018).

Figure 6.2 – Illustration of the relationship between income, housing options and quality of transport links



Source: Authors' own

Figure 6.2 illustrates the advantage of taking a multi-domain approach, using the case of transport availability and housing: with a market in land/housing, value in that market will be determined partly by transport links (Transport for London 2017; Venables et al. 2014). Over time therefore, interventions to improve transport links in areas with poor links (and cheaper housing) risk raising land prices and pricing poorer people out to areas with cheaper housing; these areas may in turn have poorer transport links. Housing policy can affect this – for example, through interventions to create non-market housing options (such as social housing) or to affect people's participation in the market (such as help to buy). These are very much housing policies though; transport policies that could have a similar effect by saturating all areas with sufficient choice that the transport differences between them became less important (c.f. Inayathusein and Cooper 2018, Delbosc and Currie 2011), or to prioritise accessibility or cost interventions toward places where housing is both affordable and secured against price rises.

Different transport policies promote different forms of access to economic opportunity and have different relationships to inequality. Providing services to access areas of dense employment may also promote that access for people who are not poor, and not



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affect inequality – though in practice poor transport links are often a feature of areas with higher socio-economic deprivation. By contrast, **financial or other support to access transport, targeted at people with low incomes, has a direct positive relationship with promoting equality.**

Inextricable from financial effects are those effects related to wellbeing, social inclusion and connection. The evidence reviewed suggested that affordable, available transport allows greater social contact, leisure activities and use of amenities. Poorer people spend a lower proportion of their income on travel, which probably reflects use of cheaper modes and taking fewer overall trips (Department for Transport 2017). Unavoidable travel, including that related to work, means people at all income levels have to make a certain number of trips, but there is flexibility in travel beyond core necessary travel. Therefore, both poverty and transport poverty constrain the opportunities available to poorer people in leisure and other chosen travel, as well as in employment-related and other more-necessary travel.

### 6.1.2 What does the evidence say on the strength of the links between transport and inequality?

There is evidence that measures to help people into work and to initially remain in work are effective in achieving those immediate aims, and have impressive benefit-cost ratios (with one scheme in Merseyside supporting jobseekers into work reporting a benefit-cost ratio of 5:1 over three months), even if we cannot conclude anything about their longer-term impact on inequality itself. Some of these schemes took multi-dimensional approaches, and were a more rigorous, better measured implementation of the kind of local economic regeneration activities outlined in the case studies by Thrush and colleagues (2018). Even if the latter did not point to evidence of strong effects, it is policy-relevant to understand the breadth of transport-related options available for such activities.

The range and consistency of evidence on the value of buses suggests that support to this sector plays a strong role in achieving multiple outcomes related to broad wellbeing as well as narrower outcomes around job-seeking and retention. We cannot conclude that support for using buses is uniquely placed to achieve these kinds of outcomes – it is plausible that support to use of other modes could have a comparable effect, although where those modes are more expensive, a high benefit-cost ratio might be more difficult to achieve. Indeed, the widespread evidence of benefits from concessionary travel passes is not limited to bus use. CTP schemes have strong, direct benefits. It is mostly older people who benefit from them and they contribute greatly to reduced costs and improved access to friends, family, community groups as well as health and social care providers (Abrantes, Fuller and Bray 2013, Mackett 2014, Department for Transport 2016).

### 6.1.3 How do the findings vary across sub-groups?

Our research questions also asked how our findings vary across sub-groups. In the evidence reviewed there was relatively little discussion of sub-groups beyond income status. Most such discussion related to transport in the lives of older people and sometimes disabled people, and the positive role that public transport and concessionary travel can play. There was some mention of population groups who are more likely to work part-time or non-standard hours – particularly women and younger people – who are poorly served by public transport schedules and subsidies that target full-time workers.

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Some evidence highlighted that women, lone parents, families with children, and young people along with older people who may be retired and in receipt of a pension can be at particular risk of transport poverty. For teenagers and young adults in education, the jobs available are part-time or poorly paid and involve harmonising work and study commitments. High transport costs can be a major disincentive to staying in training for a prolonged period and make people vulnerable to student poverty (Abrantes 2013).

Women may be fitting in work around childcare and caring commitments. Often, working part-time, they are not always able to access discounted, subsidised or free travel to get to work. Transport is a multi-faceted issue for women where different factors including work, costs, family and safety are at play (Kamruzzaman and Hine 2012, Starkey and Hine 2014, WBG 2018).

For older people who are no longer in the labour market and are in receipt of age-related benefits and pension payments, cost is a big factor. Where transport is affordable, it can help connect older people with their wider social networks. Bus networks tend to be of greatest service to the most vulnerable groups in society including older and disabled people, though public subsidy for aspects of bus travel also benefits a wide range of people including those using the bus for work. The increased access to opportunities which bus networks provide can make a powerful contribution to reduced government spending on social care and welfare payments and wider economic benefit. For example, one Ring and Ride service in the West Midlands that serves 31,000 active registered blind and disabled users is estimated to save the health sector between £13.4m and £58.5m (Abrantes, Fuller and Bray 2013).

## 6.2 What do we know about transport policies' effectiveness in improving inequality?

Most of the evidence reviewed related to intermediate factors related to inequality, such as income, or job availability, rather than to analysis of inequality per se so we can say very little about inequality itself. Moreover, most evidence related to associations – such as that between commuting time, income and job satisfaction, or between rural residence and transport costs. These are valuable and can tell us about plausible effect mechanisms and potential points for policy intervention.

Multiple studies suggest that transport policy is better able to reduce inequality when designed and implemented alongside policies in other domains (Sloman et al. 2018, Thrush et al. 2018, Curl et al. 2018). Different schemes and programmes will have different target groups and this may have been incorporated into their design. Small programmes on their own can make a difference but they may be more effective if they are planned and operationalised in a way that 1) they account for a number of factors that characterise these target groups and 2) they might operate alongside other mechanisms and processes associated with multiple disadvantage and still be effective (Sloman et al. 2018).

## 6.3 Links between inequality and health

The way we think about both inequality and health is changing. When we conceptualise inequality, we are now not just thinking about income, unemployment, or highest level of education. It is about social inclusion, being able to participate in the community, and being an active member of the local community. In terms of health, again we are not just looking at it in the physical sense; we are also talking about mental health and wellbeing.

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Wellbeing can be conceptualised as an index, including physical and mental health measures, socio-economic indicators, and social cohesion. Key vehicles for addressing poverty include education, cost of living, employment and social support. Social support does not only include social welfare and family relationships, but also other relationships as well as health services. Through conducting this review, it is evident that the main connection between health and inequality is wellbeing. Although this review does not focus on wellbeing, this is a theme that has emerged in the data, particularly in relation to access to services.

## 6.4 Limitations

This review took a systematic approach, adapting the methodology of a Rapid Evidence Assessment. The 30 studies included in the review were objectively assessed as the most relevant to addressing the research questions for this study but, inevitably, they do not encompass all relevant evidence. The review addressed a broad research question, and while that broad overview is a strength it also means that it was not possible to consider narrower sub-aspects of the questions in detail.

Many of the findings were from well-designed analyses and give us confidence in our conclusions, although we must note that most related to associations; robust evaluations allowing strong causal claims are rare. The strongest evidence in this review related to the impact of the 12 National Sustainable Transport Fund Large Projects, but even that did not establish counterfactual scenarios needed for a thorough evaluation. Moreover, those interventions were multi-faceted and teasing out the effects of individual components is difficult.

Most evidence was from less rigorous studies or was reviewing evidence of a varied nature. Nonetheless, in some cases the breadth of evidence from different sources all pointing in a consistent direction gives us confidence in those findings.

## 6.5 Research recommendations

One response to the phenomenon of high reliance on cars despite substantial economic stress might be to investigate the value for money of supporting buses, demand-responsive transport or other modes in rural and peri-urban areas, similar to Abrantes and colleagues' study on urban buses. Such cost-benefit analysis is a powerful tool for appraising the impacts of interventions, but there is potential for perverse findings related to the indicators that are valued. For example, a cut in out-of-work benefits would decrease the benefit ratio of a successful programme to support jobseekers' travel costs, despite arguably becoming more valuable to beneficiaries in such a case; also, the value of some people's work to the economy, as expressed in part via their wage, means benefits will be lowest for interventions that support access to the lowest-paid work. Additional **appraisal indicators** such as perceived benefit to beneficiaries, or expansion of opportunities (e.g. through expansion of people's activity space), might be considered alongside. It would be beneficial to investigate the feasibility and practicality of such metrics of appraisal.

We highlighted Crisp and colleagues' suggestion of the potential of mobility-as-a-service and demand-responsive transport for overcoming problems of integration and costs associated with multi-modal travel. Given the particular challenge of making long or multi-modal trips from rural areas or those poorly served by public transport, it would be worthwhile investigating **the potential of MaaS or DRT to provide acceptable alternatives to high-cost car use** in such areas.

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There was strong evidence that **schemes to support transport for jobseekers** had positive and often high benefit–cost ratios. These were generally based on short- or medium-term analyses, and longer-term assessment of their value would help to provide even stronger evidence of the effectiveness of a simple intervention.

Following their thorough review of evidence on income inequality, social inclusion and mobility, the International Transport Forum (2017) identified three priorities “as universal for advancing the inclusive transport agenda”:

- a) developing policies that are driven by improved data and analysis;
- b) co-ordinating housing and transport policies because of their indissociable relationship and their central role in people’s livelihoods; and
- c) setting coherent pricing policies for each transport mode that support both sustainable mobility and social inclusion goals.

These three themes seem relevant priorities in light of our findings. First, much of the evidence we found was generated with only moderately robust methods, and we found few studies designed to robustly evaluate the impact of transport policies. Second, several papers explicitly discussed the phenomenon of mismatch between where people live and where (those people's) jobs are – and this phenomenon arguably underlies the overall rationale for considering the role of transport in relation to work and income. Housing is a key policy area interacting with the relationship between transport and inequality and is integral to the concept of spatial mismatch. And third, aspects of pricing come up frequently, both as barriers and as facilitators where help is provided for transport costs. Innovation in this area links well with the development of MaaS. **Proposed MaaS schemes could prioritise future evaluation in their set-up** and include the collection of baseline data among their activities.

It would be illuminating to **investigate the net effect of improved transport links at the individual level**, taking account of both the pricing-out of poorer residents and of the greater income potential offered by the improved infrastructure. Existing national cohort study data are unlikely to have sufficient power at the local level to detect effects of individual schemes, but prospective work could be undertaken alongside the development of new proposed schemes. Such an investigation might allow the pricing of negative utility from land price increases into appraisal of proposed transport projects, which at present consider such price increases a benefit in cost-benefit terms, but which from an inequality perspective might be considered a cost.

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## 7 Conclusion

Transport is an integral yet intermediary component of the wider picture of socio-economic inequality. The main way that transport and inequality is linked is through providing affordable access to a range of opportunities. These not only include access to education, training and employment opportunities, but also family and social networks, housing, recreation and amenities, community engagement activities, and key goods and services. What transport policy is unable to do, is to act as a lever for ensuring that these opportunities are acceptable and appropriate to those that may need to benefit from them the most. In this way, transport policy can perhaps have the most potential for benefit when it is incorporated into a wider equality, cohesion and regeneration strategy.

Transport operates alongside processes, systems, and structures that are designed and operationalised by other stakeholders. This is even more so now as inequality is no longer defined by income, unemployment, or highest level of education. It is about social inclusion, being able to participate in the community and being an active member of the local community. This then highlights the potential of a multi-stakeholder approach. This is especially true given that social inclusion and wellbeing are an important link between inequality and health. In terms of what this means for transport, it is about considering where the main interdependencies lie and where partnerships and networks can be developed for the purposes of common goals beyond sectors and domains where transport providers and policy makers are already experienced in working closely together.

A multi-stakeholder approach could involve housing policy that focuses on the best-connected areas offering genuinely affordable homes or skills and employment policy that aims to address job opportunities for people with varying levels of educational qualifications. There is also the wider issue of disadvantage based on locality and the environmentally sustainable agenda with an emphasis on strong, cohesive, and diverse communities (London Borough of Hackney 2018).

In terms of future directions, the way in which travel features in wider definitions of poverty could change. The sharing economy is expected to grow and if it becomes more accessible through improved digital literacy amongst those from lower socio-economic groups, it can help reduce the cost of transport and other costs of living for young people and their families (Khambhaita, Adams and Luheshi 2018). Furthermore, digitalisation in a world where there is increasing importance of ICT in everyday life and mobility is conducted from several perspectives may feature more heavily in future concepts of transport poverty. Virtual mobility did not feature much in the evidence included here but is beginning to receive more focus by researchers, including how virtual mobility and online experiences can substitute physical trips (see for example Konrad and Wittowsky 2018).

Finally, different groups are at risk of poverty and transport poverty respectively. While the purpose of this report was to provide a high-level understanding of the big picture and specific groups were not included in the search strategy, an understanding has emerged around particular groups and the disadvantages they face. These include women, students and older people. However, very little was found on the ways in which social class-related transport disadvantage interacts with other disadvantages around ethnicity, gender or other factors. This could be a priority area for further research.

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References for papers cited in the introduction, footnotes and discussion. Full lists of studies meeting the review's inclusion criteria that were and were not included in the review are included in Appendix E and Appendix F respectively.

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## 9 Appendices

### Appendix A. Detailed methodology

#### Inclusion criteria

##### Study designs

Quantitative studies and evidence reviews were included in this REA. We included studies using a range of methods, including experimental and quasi-experimental designs; correlation or association estimates; survey results; and evidence reviews bringing together other findings either narratively or quantitatively.

##### Participants

Inclusion of studies was not determined according to participant criteria.

##### Interventions

Systematic reviews and meta-analyses often synthesise studies that measure the effect of a specific intervention on an outcome or outcomes. For example, a study that measures the effect of an intervention to promote walking to school by comparing the number of students walking to school before and after the intervention. This evidence review did not require that studies be evaluations of interventions in order to be included, as we are interested in the relationship between transport and inequality more generally.

##### Outcomes measured

To be included, studies had to examine the association between public and private transport use and/or access and at least one of three outcomes: (1) income and/or wealth; (2) gaining employment or moving job; and (3) accessing education or training. Table A:1 below describes each association.

Appendix table A:1 Associations included in the review

Outcome 1	Outcome 2	Description	Example
Public transport use and/or access	Income and/or wealth	Investigate if there is an association between the income and/or wealth level of an individual or group and their use of and/or access to public transport.	A regression analysis that investigates whether proximity to train stations increases as household income increases.
	Gaining employment or moving job	Investigate if there is an association between individuals or groups gaining employment or moving job and their use of and/or access to public transport.	An RCT that provides a treatment group of unemployed individuals currently searching for employment with a free bus pass and compares the proportion of participants that gain employment to a control group that did not receive a free bus pass.



Appendix table A:1 Associations included in the review

	Accessing education or training	Investigate if there is an association between individuals or groups accessing education or training and their use of and/or access to public transport.	An interrupted-time series study that compares the change in the number of residents of a small town attending post-secondary education before and after a trainline was constructed between their town and a big city.
Private transport use and/or access	Income and/or wealth	Investigate if there is an association between the income and/or wealth level of an individual or group and their use of and/or access to private transport.	A logistic regression analysis that estimates the likelihood of a household owning a vehicle by annual household income.
	Gaining employment or moving job	Investigate if there is an association between individuals or groups gaining employment or moving job and their use of and/or access to private transport.	A regression analysis of the proportion of the population that owns a car and the flexibility of the labour market in a country.
	Accessing education or training	Investigate if there is an association between individuals or groups accessing education or training and their use of and/or access to private transport.	A systematic review of interventions that measure the effect of providing bicycles to low-income students and school attendance.

### Transport

To be included studies had to include the following modes of public or private land transport: cars, buses, trains, cycling, walking, trams, and taxis. Studies relating only to air or maritime transport were excluded.

### Setting

Studies had to use data collected on individuals or interventions in Western Europe (United Kingdom, Ireland, Denmark, Sweden, Norway, Germany, Netherlands, Belgium, France, Spain, Portugal, Italy, Austria, and Switzerland), North America (Canada and the United States) and/or Australasia (Australia and New Zealand).

### Language

Studies had to be published in English.

### Date

Studies had to be published from 2008 or afterwards.

### Inclusion and exclusion process

Screening took place at two levels: (1) title and abstract and (2) full-text level. Where documents did not have an abstract, we screened an appropriate summary of the

document contents. Prior to screening at each stage, screening tools were developed and piloted by a group of reviewers to promote inter-screener reliability. Differences in screening results amongst researchers were discussed and any differences in interpretations clarified before official screening began. Documents suggested by experts were only screened at full-text.

Abstrackr was used to screen database results at the title and abstract level. Abstrackr is software that uses machine learning to semi-automate citation screening by prioritising more relevant results. See Gates et al. (2018) for more detail about use and reliability of the software. This allowed us to prioritise the most relevant results from the database results.

## Study prioritisation

Due to the rapid nature of this review, the number of studies included for synthesis was limited to 30. To determine which 30 studies to include in the review, a prioritisation heuristic was developed. Each study screened at full text was scored on five criteria. Table A:2 outlines and describes the five criteria. The 30 highest scoring studies were included.

Appendix table A:2 Prioritisation criteria			
Criteria	Description	Example	Highest possible score
Association	A study was given one point for each of the six associations covered, meaning the more associations covered, the greater number of points awarded.	A study covering the association between public transport and income, private transport and access to education, and private transport and wealth would be given three points.	6
Analysis of axes	A study was given one point if it included one or more analyses of how individual and group characteristics mediated the association between transport and inequality. Characteristics included any status covered by the Equalities Act (for example, race or gender), as well as any indicators of social class and education level.	A study covering the association between access to public transport and gaining employment included sub analyses of how this association varied between men and women and older and younger people would be given one point.	1
Publication date	Studies were given a score between 0.69 and 2.48 based on the year it was published, with the most recent studies retrieving the highest scores. Scores were the natural logarithm of the publication year minus the year 2006.	A study published in 2017 would be given a score of 2.40 (the natural logarithm of 2017-2006=2.40)	2.48
Geographic setting	Studies were given one point if they presented data from the United Kingdom.	A study presenting data from Italy, Sweden and the UK would be given one point.	1

Appendix table A:2 Prioritisation criteria

Methodology	Studies were given one point if they were an evidence review, rather than a primary study.	Any review would be given one point.	1
Quality	Studies lost half a point if their methods were unclear or inappropriate to their goal	A review that did not describe where it conducted its search would lose 0.5 points.	0
<b>Total Possible Score</b>			<b>11.48</b>

## Data extraction

Data extraction was done using a data extraction tool that was piloted before use. Two researchers extracted data from the same two studies. Differences in the data extracted were discussed and the data extraction tool was amended and clarified to ensure inter-researcher reliability. See Appendix 5 for the data extraction template.

The data extraction tool included an appraisal of study quality. For primary studies, the rigour and reliability of the study method was assessed in relation to the reporting of the population or sample size, the data source, the description of variables, and the use of statistical techniques. For evidence reviews, the rigour and reliability of the search process and appraisal of the quality of included studies was assessed.<sup>14</sup>

## Synthesis

After completing the data extraction, the 30 included studies were narratively synthesised using the ‘framework method’. This method involves creating a matrix in which the columns represent the key thematic areas and research questions of the review, and the rows represent the included studies. The key information of each study was summarised in the relevant cells with a link or reference to the original source. The key thematic areas were the six associations between transport and inequality. The advantage of this presentation method is that it links the synthesised evidence explicitly to the thematic areas, allowing for the evidence of each research question to be easily viewed and interpreted.

<sup>14</sup> A study was considered to have performed a systematic search if the resources searched and the search string(s) used were clearly reported. A study was considered to have performed a quality appraisal if the quality of each included study was assessed using a recognised risk of bias or quality appraisal tool, such as those outlined in Chapter 8 of the Cochrane Handbook (<http://handbook-5-1.cochrane.org/>)

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## Appendix B. Scopus database search strategy

Searches were conducted on the 8<sup>th</sup> of November 2018.

The following represents the search string for articles presenting findings from selected other high-income countries, apart from the United Kingdom.

```
( TITLE-ABS-KEY ( bicycl* OR cycling OR road* OR car OR cars OR autos OR automobile* OR vehicle* OR transport* OR taxi OR taxis OR minicab* OR coach OR coaches OR tram OR trams OR bus OR buses OR rail OR commut* OR railway* OR metro OR tube OR underground OR ( train W/3 ( travel* OR journey* OR ride* ) ) OR trains OR driving OR motoring OR cyclist* OR bike* OR pedal-power OR motorised OR motorized ) ) AND ( ( TITLE-ABS-KEY ( socio-economic OR socioeconomic OR inequalit* OR inequit* OR unequal OR disadvantage* OR poor* OR poverty OR deprived OR deprivation OR income OR wage* OR remunerat* OR salar* OR compensation OR unemploy* OR employment ) ) OR ( TITLE-ABS-KEY ( ( ( access* OR accept* OR need* OR demand* ) W/3 ( work OR job* OR employ* OR unemploy* OR vocation* OR education OR educational ) ) ) ) OR ( TITLE-ABS-KEY ( ( ( marginali* OR underserved OR "under served" OR impoverish* ) W/5 ( population OR group* OR communit* OR neighbo?rhood* ) ) ) ) OR ( TITLE-ABS-KEY ( ( social W/5 ( disparit* OR equit* OR disadvantage* OR gradient* ) ) ) ) OR ( TITLE-ABS-KEY ( ( ( urban OR rural OR "inner city" OR "inner cities" OR slum OR slums ) W/2 ( difference* OR specific OR analysis OR disparit* ) ) ) ) OR ( TITLE-ABS-KEY ( ( social W/2 ( analysis OR specific OR difference* OR factor* OR disparit* OR mobility ) ) ) ) ) AND ( TITLE-ABS-KEY ( ( "quasi experiment*" OR quasi-experiment* OR "random* control* trial*" OR "random* trial*" OR rct OR ( random* W/3 allocat* ) OR matching OR "propensity score" OR psm OR "regression discontinuity" OR "discontinuous design" OR rdd OR "difference in difference*" OR difference-in-difference* OR "diff in diff" OR did OR "case control" OR cohort OR "propensity weighted" OR propensity-weighted OR "interrupted time series" OR ( ( pretest OR "pre test" ) AND ( posttest OR "post test" ) ) OR "research synthesis" OR "scoping review" OR "rapid evidence assessment" OR "systematic literature review" OR "Systematic review" OR "Meta-analy*" OR metaanaly* OR "meta analy*" OR "Control* evaluation" OR "Control* treatment" OR "instrumental variable*" OR heckman OR iv OR ( ( quantitative OR "comparison group*" OR counterfactual OR "counter factual" OR counter-factual OR experiment* ) W/3 ( design OR study OR analysis ) ) OR qed ) ) ) AND ( TITLE-ABS-KEY ( australia* OR canada OR canadi* OR denmark OR danish OR france OR french OR german* OR netherlands OR dutch OR "new zealand*" OR sweden OR swedish OR usa OR "united states" OR american ) ) AND ( LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2011 ) OR LIMIT-TO ( PUBYEAR , 2010 ) OR LIMIT-TO ( PUBYEAR , 2009 ) OR LIMIT-TO ( PUBYEAR , 2008 ) )
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The search string for articles presenting findings for the United Kingdom:

( TITLE-ABS-KEY ( bicycl\* OR cycling OR road\* OR car OR cars OR autos OR automobile\* OR vehicle\* OR transport\* OR taxi OR taxis OR minicab\* OR coach OR coaches OR tram OR trams OR bus OR buses OR rail OR commut\* OR railway\* OR metro OR tube OR underground OR ( train W/3 ( travel\* OR journey\* OR ride\* ) ) OR trains OR driving OR motoring OR cyclist\* OR bike\* OR pedal-power OR motorised OR motorized ) ) AND ( ( TITLE-ABS-KEY ( socio-economic OR socioeconomic OR inequalit\* OR inequit\* OR unequal OR disadvantage\* OR poor\* OR poverty OR deprived OR deprivation OR income OR wage\* OR remunerat\* OR salar\* OR compensation OR unemploy\* OR employment ) ) OR ( TITLE-ABS-KEY ( ( ( access\* OR accept\* OR need\* OR demand\* ) W/3 ( work OR job\* OR employ\* OR unemploy\* OR vocation\* OR education OR educational ) ) ) ) OR ( TITLE-ABS-KEY ( ( ( marginali\* OR underserved OR "under served" OR impoverish\* ) W/5 ( population OR group\* OR communit\* OR neighbo?rhood\* ) ) ) ) OR ( TITLE-ABS-KEY ( ( social W/5 ( disparit\* OR equit\* OR disadvantage\* OR gradient\* ) ) ) ) OR ( TITLE-ABS-KEY ( ( ( urban OR rural OR "inner city" OR "inner cities" OR slum OR slums ) W/2 ( difference\* OR specific OR analysis OR disparit\* ) ) ) ) OR ( TITLE-ABS-KEY ( ( social W/2 ( analysis OR specific OR difference\* OR factor\* OR disparit\* OR mobility ) ) ) ) ) AND ( TITLE-ABS-KEY ( ( "quasi experiment\*" OR quasi-experiment\* OR "random\* control\* trial\*" OR "random\* trial\*" OR rct OR ( random\* W/3 allocat\* ) OR matching OR "propensity score" OR psm OR "regression discontinuity" OR "discontinuous design" OR rdd OR "difference in difference\*" OR difference-in-difference\* OR "diff in diff" OR did OR "case control" OR cohort OR "propensity weighted" OR propensity-weighted OR "interrupted time series" OR ( ( pretest OR "pre test" ) AND ( posttest OR "post test" ) ) OR "research synthesis" OR "scoping review" OR "rapid evidence assessment" OR "systematic literature review" OR "Systematic review" OR "Meta-analy\*" OR metaanaly\* OR "meta analy\*" OR "Control\* evaluation" OR "Control\* treatment" OR "instrumental variable\*" OR heckman OR iv OR ( ( quantitative OR "comparison group\*" OR counterfactual OR "counter factual" OR counter-factual OR experiment\* ) W/3 ( design OR study OR analysis ) ) OR qed ) ) ) AND ( TITLE-ABS-KEY ( ( "united kingdom" OR uk OR britain OR british OR english OR scottish OR scots OR welsh OR england OR scotland OR wales OR "northern ireland" OR ulster ) ) ) AND ( LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2011 ) OR LIMIT-TO ( PUBYEAR , 2010 ) OR LIMIT-TO ( PUBYEAR , 2009 ) OR LIMIT-TO ( PUBYEAR , 2008 ) )

## Appendix C. Websites and repositories searched

Searches conducted between the 25<sup>th</sup> October and the 6<sup>th</sup> November 2018.

Website	URL searched	Search terms
CIHT	<a href="https://www.ciht.org.uk/">https://www.ciht.org.uk/</a>	inequality income
ADPH	<a href="http://www.adph.org.uk/">http://www.adph.org.uk/</a>	transport
Sustrans	<a href="https://www.sustrans.org.uk/">https://www.sustrans.org.uk/</a>	Inequality
Urban Transport Group	<a href="http://www.urbantransportgroup.org/resources/social-inclusion">http://www.urbantransportgroup.org/resources/social-inclusion</a>	Screened reports under "social inclusion" tab of Resources page
International Transport Forum	<a href="https://www.itf-oecd.org/">https://www.itf-oecd.org/</a>	Inequality
Transport Studies Unit, Oxford University	<a href="https://www.tsu.ox.ac.uk/pubs/wpapers.html">https://www.tsu.ox.ac.uk/pubs/wpapers.html</a>	Search not available. Screened all working papers
UK Department for Transport	<a href="https://www.gov.uk/government/publications?departments%5B%5D=department-for-transport">https://www.gov.uk/government/publications?departments%5B%5D=department-for-transport</a>	income OR unemployment OR wealth OR "economic opportunity" OR employment OR inequality OR poverty OR "social exclusion" OR "social mobility"

OECD	<a href="https://www.oecd-ilibrary.org/search?value2=country%2Fau&amp;value2=country%2Fat&amp;value2=country%2Fbe&amp;value2=country%2Fca&amp;value2=country%2Fdk&amp;value2=country%2Ffi&amp;value2=country%2Ffr&amp;value2=country%2Fde&amp;value2=country%2Fie&amp;value2=country%2Fit&amp;value2=country%2Fnl&amp;value2=country%2Fnz&amp;value2=country%2Fno&amp;value2=country%2Fpt&amp;value2=country%2Fes&amp;value2=country%2Fse&amp;value2=country%2Fch&amp;value2=country%2Fgb&amp;value2=country%2Fus&amp;value1=theme%2Foecd-48&amp;option1=pub_themeld&amp;option2=pub_countryld&amp;facetOptions=51&amp;facetNames=dterms_language_facet&amp;operator51=AND&amp;option51=dterms_language_facet&amp;value51=%27en%27">https://www.oecd-ilibrary.org/search?value2=country%2Fau&amp;value2=country%2Fat&amp;value2=country%2Fbe&amp;value2=country%2Fca&amp;value2=country%2Fdk&amp;value2=country%2Ffi&amp;value2=country%2Ffr&amp;value2=country%2Fde&amp;value2=country%2Fie&amp;value2=country%2Fit&amp;value2=country%2Fnl&amp;value2=country%2Fnz&amp;value2=country%2Fno&amp;value2=country%2Fpt&amp;value2=country%2Fes&amp;value2=country%2Fse&amp;value2=country%2Fch&amp;value2=country%2Fgb&amp;value2=country%2Fus&amp;value1=theme%2Foecd-48&amp;option1=pub_themeld&amp;option2=pub_countryld&amp;facetOptions=51&amp;facetNames=dterms_language_facet&amp;operator51=AND&amp;option51=dterms_language_facet&amp;value51=%27en%27</a>	Limited publications by theme and countries (Transport and 17 countries listed in tool)
Swedish National Road and Transport Research Institute	<a href="https://www.vti.se/en/publications/">https://www.vti.se/en/publications/</a>	inequality Income Employment
Equality Trust	<a href="https://www.equalitytrust.org.uk/search/node/transport">https://www.equalitytrust.org.uk/search/node/transport</a>	transport
Joseph Rowntree Foundation	<a href="https://www.jrf.org.uk/search?query=transport&amp;f%5B0%5D=field_taxonomy_article_type%3A1">https://www.jrf.org.uk/search?query=transport&amp;f%5B0%5D=field_taxonomy_article_type%3A1</a>	transport
Bus Users	<a href="https://www.bususers.org/publications/#position-papers">https://www.bususers.org/publications/#position-papers</a>	No search; looked at publications, position papers (per instruction)
Transport and Environment	<a href="https://www.transportenvironment.org/search/site/%2528income%2520OR%2520inequality%2520OR%2520social%2520exclusion%2529%2520">https://www.transportenvironment.org/search/site/%2528income%2520OR%2520inequality%2520OR%2520social%2520exclusion%2529%2520</a>	(income OR inequality OR social exclusion)
Women's Budget Group	<a href="https://wbq.org.uk/?s=transport">https://wbq.org.uk/?s=transport</a>	transport
What Work Centre for Local Economic Growth	<a href="http://www.whatworksgrowth.org/policy-reviews/transport/">http://www.whatworksgrowth.org/policy-reviews/transport/</a>	Looked under transport tab

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Resolution  
Foundation

<https://www.resolutionfoundation.org/?s=transport&filter=>

transport



## Appendix D. Data extraction template

Broad category	Category	Further guidance
Descriptive information	ID	
	Researcher (Coder)	
	Title	
	Authors	
	Publication date	
	Country	
Study/ Intervention	Summary of study/intervention	Briefly summarise study/intervention
	Transport variables	Non-exhaustive list of examples: * Transport (general, undefined) * Concessionary travel * Car ownership * Bus funding
	Population	Describe any target groups that the study focuses on/intervention targets, e.g. unemployed, those in training or education
Quality appraisal: primary studies	Study Design	An overview of the study design e.g. intervention evaluation, secondary data analysis etc.
	Methodology	This should focus on the rigour and reliability of the methods used: do they accurately report population/sample size, data sources, are variables described fully, justify statistical techniques?
Quality appraisal: reviews	Study Design	Choose from list: * systematic review (SR) * rapid evidence assessment * rapid review

		<ul style="list-style-type: none"> <li>* literature review</li> <li>* meta-analysis</li> <li>* SR with meta-analysis</li> <li>* other synthesis</li> </ul>
	Systematic search	This should focus on the rigour and reliability of the methods used: Do they list the resources (databases and websites) searched? Do they provide a search string for databases?
Outcome measures	Outcome topics	<p>List all outcomes that apply from the following list:</p> <ul style="list-style-type: none"> <li style="width: 50%;">- Inequality</li> <li style="width: 50%;">- Income</li> <li style="width: 50%;">- Wealth</li> <li style="width: 50%;">- Wage</li> <li style="width: 50%;">- Economic opportunity</li> <li style="width: 50%;">- Poverty</li> <li style="width: 50%;">- Social exclusion</li> <li style="width: 50%;">- Social mobility</li> <li style="width: 50%;">- Un/employment</li> <li style="width: 50%;">- Access to employment, education or training</li> <li style="width: 50%;">- Deprivation</li> </ul>
	How outcome is measured	How outcome is measured (list all outcome measures separately) Include page numbers citing page where outcome is defined.
	Relationship of outcome to transport	Describe how the inequality outcome relates to the transport variable.
	Location of quantitative estimate	Page number, table number, section number.
	Quantitative estimate	<ul style="list-style-type: none"> <li>* Prevalence estimate (e.g. prevalence of transport as a barrier to employment)</li> <li>* Association (e.g. time to work and type of transport available)</li> <li>* Impact estimate</li> </ul> <p>Size of impact or association between variables. Report all mentions of an outcome construct in text, tables or figures.</p>
	Location of narrative data	Page number or section number
	Narrative summary	From paper if sufficient. Otherwise summarise in 2-3 sentences narrative conclusion.

	Outcome notes	Any other notes
Analysis: In what ways are transport and socio-economic inequality linked?	What are the mechanisms by which transport impacts on inequality and vice versa?	This should include how the outcomes are achieved, what are the key drivers and mechanisms that cause, for example, a 10% increase in income
	What does the evidence say on the strength of those links	This should be an assessment of the weight of the evidence based on the significance of the coefficient results
	How does this vary across sub-groups	This should include subgroups such as: Location                      Employment status                      Age Gender                              Education
Analysis: What do we know about transport policies' effectiveness in addressing inequality?	How does this vary across subgroups?	Again, this should include subgroups such as: Location                      Employment status                      Age Gender                              Education

## Appendix E. Documents included in review for data extraction and synthesis

Full citations	
1	Abrantes, P., Fuller, R. and Bray, J. (2013), The case for the urban bus: The economic and social value of bus networks in the metropolitan areas. PTEG. Available at <a href="http://www.urbantransportgroup.org/system/files/general-docs/pteg%20Case%20for%20bus%20report%20FINAL.pdf">http://www.urbantransportgroup.org/system/files/general-docs/pteg%20Case%20for%20bus%20report%20FINAL.pdf</a>
2	Bocarejo S., J.P., Oviedo H., D. R., (2012), Transport accessibility and social inequities: a tool for identification of mobility needs and evaluation of transport investments. <i>Journal of Transport Geography</i> 24: 142–154. <a href="http://dx.doi.org/10.1016/j.jtrangeo.2011.12.004">http://dx.doi.org/10.1016/j.jtrangeo.2011.12.004</a>
3	Clayton, N., Smith, R. and Tochtermann, L. (2011), Access all areas: Linking people to jobs. Centre for Cities. Available at <a href="http://www.centreforcities.org/wp-content/uploads/2014/09/11-09-14-Access-all-areas-Linking-people-to-jobs.pdf">http://www.centreforcities.org/wp-content/uploads/2014/09/11-09-14-Access-all-areas-Linking-people-to-jobs.pdf</a>
4	Crawley, A. (2014), The relationship between commuting time and workers' utility, <i>Applied Economics Letters</i> 21:18, 1273-1276. <a href="http://dx.doi.org/10.1080/13504851.2014.922663">http://dx.doi.org/10.1080/13504851.2014.922663</a>
5	Crisp, R., Ferrari, E., Gore, T., Green, S., McCarthy, L., Rae, A., Reeve, K., Stevens, M. (2018), Tackling transport-related barriers to employment in low-income neighbourhoods. Joseph Rowntree Foundation. Available at <a href="https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods">https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods</a>
6	Curl, A., Clark, J. and Kearns, A. (2018), Household car adoption and financial distress in deprived urban communities: A case of forced car ownership? <i>Transport Policy</i> 65: 61–71. <a href="http://dx.doi.org/10.1016/j.tranpol.2017.01.002">http://dx.doi.org/10.1016/j.tranpol.2017.01.002</a>
7	Delbosc, A., Currie, G. (2011), The spatial context of transport disadvantage, social exclusion and wellbeing. <i>Journal of Transport Geography</i> 19: 1130–1137. <a href="http://dx.doi.org/10.1016/j.jtrangeo.2011.04.005">http://dx.doi.org/10.1016/j.jtrangeo.2011.04.005</a>
8	Department for Transport (2015) Understanding the drivers of road travel: Current trends in and factors behind roads use. Available at <a href="https://www.gov.uk/government/publications/understanding-the-drivers-of-road-travel-current-trends-in-and-factors-behind-roads-use">https://www.gov.uk/government/publications/understanding-the-drivers-of-road-travel-current-trends-in-and-factors-behind-roads-use</a>
9	Department for Transport (2016) Evaluation of concessionary bus travel: The impacts of the free bus pass. Available at <a href="https://www.gov.uk/government/publications/evaluation-of-concessionary-bus-travel-the-impacts-of-the-free-bus-pass">https://www.gov.uk/government/publications/evaluation-of-concessionary-bus-travel-the-impacts-of-the-free-bus-pass</a>
10	Green, A., Sissons, P., Broughton, K., de Hoyos, M., Warhurst, C. and Barnes, S. (2015), How cities can connect people in poverty with jobs. Joseph Rowntree Foundation. Available at <a href="https://www.jrf.org.uk/report/how-cities-can-connect-people-poverty-jobs">https://www.jrf.org.uk/report/how-cities-can-connect-people-poverty-jobs</a>
11	Inayatousein, A. and Cooper, S. (2018), London's accessibility indicators: Strengths, weaknesses, challenges. International Transport Forum, Discussion paper. Available at <a href="https://www.itf-oecd.org/london-accessibility-indicators">https://www.itf-oecd.org/london-accessibility-indicators</a>
12	International Transport Forum (2017), Income inequality, social inclusion, and mobility. Roundtable Report 164. Available at <a href="https://www.itf-oecd.org/sites/default/files/docs/income-inequality-social-inclusion-mobility.pdf">https://www.itf-oecd.org/sites/default/files/docs/income-inequality-social-inclusion-mobility.pdf</a>
13	Kamruzzaman, M. and Hine, J. (2012), Analysis of rural activity spaces and transport disadvantage using a multi-method approach. <i>Transport Policy</i> 19(1): 105-120. <a href="http://dx.doi.org/10.1016/j.tranpol.2011.09.007">http://dx.doi.org/10.1016/j.tranpol.2011.09.007</a>

14	Lewis, D. (2011), Economic perspectives on transport and equality. International Transport Forum Discussion paper, No. 2011-09. Available at <a href="http://dx.doi.org/10.1787/5kq9mq4dwzq1-en">http://dx.doi.org/10.1787/5kq9mq4dwzq1-en</a>
15	Lucas, K. (2012), Transport and social exclusion: Where are we now? Transport Policy, 20, 105-113. <a href="http://dx.doi.org/10.1016/j.tranpol.2012.01.013">http://dx.doi.org/10.1016/j.tranpol.2012.01.013</a>
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17	Mott MacDonald (2013), Valuing the social impacts of public transport. Department for Transport. Available at <a href="http://www.socialvalueuk.org/app/uploads/2016/07/DfT-final-report.pdf">http://www.socialvalueuk.org/app/uploads/2016/07/DfT-final-report.pdf</a>
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## Appendix F. Documents eligible for inclusion that were not included for data extraction or synthesis

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## Appendix G. Characteristics of included documents

Table of characteristics					
<i>Citation</i>	<i>Population/Setting</i>	<i>Transport aspect</i>	<i>Inequality aspect</i>	<i>Study design</i>	<i>Score</i>
Abrantes et al. 2013	England. Focus on: young people, people from lower income groups, older people.	Bus services	- Access to economic opportunities, education and training; - Social inclusion; - Social mobility	Literature review	6.9
Bocarejo and Oviedo 2012	Bogota, Colombia	Transport accessibility	-Social Exclusion; - Access to employment	Policy evaluation based on quantitative analysis of transport accessibility levels for different groups	5.3
Clayton et al. for Centre for Cities 2011	Employment-deprived individuals living in Milton Keynes, South Hampshire, Greater Manchester, Sheffield	The role of transport in overcoming spatial mismatches between skill levels and employment opportunities	Access to employment	Policy report based on a cross-sectional comparison between four different types of regional areas	7.5
Crawley 2014	Cardiff city region	Commuting time	Self-reported job satisfaction	Quantitative analysis based on a survey conducted within the Cardiff city region to explore workers' utility (n= 1529); Employs three econometric models	7.1
Crisp et al. 2018	Six low-income neighbourhoods in England and Scotland	-Time/ distance to work; - Transport provision	- Access to employment; - Poverty	Cross-sectional comparison based on 6 case study areas; Interviews conducted with 79 residents and 51 stakeholders	5.5

Curl et al. 2018	Disadvantaged urban communities in Glasgow	Forced car ownership	- Income deprivation for people living in disadvantaged urban communities; -Social exclusion	-Longitudinal case study analysis; -Secondary data analysis	5.5
Delbosc and Currie 2011	Inner and outer urban areas of Victoria, Australia	Transport disadvantage	-Social mobility; - Social exclusion; - Subjective wellbeing	Quantitative analysis: examines correlation between transport difficulties and social exclusion scores and wellbeing scores	5.6
Department for Transport 2015	UK	Road use of car drivers	-Income; -Employment	Review of evidence on road traffic trends	6.2
Department for Transport 2016	Pensioners and disabled people in England	Concessionary bus travels	-Access to services; -Social exclusion	Intervention evaluation	6.3
Green et al. 2015	Case studies on interventions targeting groups with a high vulnerability to poverty (i.e. second earners in low-earner households, lone parents, tenants in housing associations)	-Transport availability -Transport cost -Transport support services as a pathway into work	-Employment -Access to employment	- Review of evidence on local approaches to connecting people out of work with jobs. - Thematic case studies of successful interventions	6.2
Inaythusein and Cooper 2018	London	-Public transport on the TfL network; -journey time and distance	Access to economic opportunities, education or training	Report highlighting tools and methodologies for assessing accessibility indicators.	5.5
International Transport Forum 2018	Evaluation of congestion charges in: Stockholm, Lyon, Helsinki and Gothenburg	-Transport (general, undefined); -Congestion taxes	Income inequality	Evidence review: Includes quantitative analysis on the fairness of congestion charges	10.4
Kamruzzaman and Hine 2012	Northern Ireland. Different genders, income groups, ages,	<i>Spatio-temporal distribution of trips- patterns of transport disadvantage</i>	Social exclusion (through transport disadvantage)	Mixed-method study combining survey data with Quantitative analysis: binary logistic	5.8

	employment status, and car/house ownership status			regression of spatial distribution of trips	
Lewis on behalf of the International Transport Forum 2011	Doesn't focus on a particular section of the population, but compares the factors producing transport inequalities in developed and developing countries	Transport accessibility	-Regional disparities in income and wellbeing; - Disparities between those and without access to a car; - Access to economic opportunities, education and training	Literature review	8.1
Lucas 2012	Specific reference to the UK and Australia	Transport disadvantage	Social exclusion	Literature review	5.8
Lucas et al. 2008	Four deprived neighbourhoods in England: Braunstone, Leicester; Camborne, Pool, and Redruth, Cornwall; Wythenshawe, Manchester and Walsall, West Midlands.	Public transport	Access to employment, education and services	-Qualitative analysis supplemented by survey data; -Intervention evaluation	5.7
Mackett 2014	Older and disabled people (add geographic area)	Concessionary travel passes	-Social exclusion; -Access to services	-Literature review; -Analysis of overtime trends in CTP usage by examining a range of datasets: DfT surveys, NatCen reports, ONS survey data	5.6
Mackie et al. 2012	economically active bus users in the UK	Bus use	Access to employment, education or training	Quantitative analysis on the link between bus use and access to employment. Data provided by an online survey with bus users and a survey of stakeholders	6.8

Mattioli et al. 2018	Doesn't focus on a particular section of the population, but categorises households by income	-car-related economic stress; - fuel vulnerability	Adaptive capacity and vulnerability of households to fuel price rises	Quantitative secondary data analysis	5.5
Mott MacDonald 2013	Focus groups: Speke, Liverpool, and Shrewsbury Interviews: inner and outer Shrewsbury, Liverpool metropolitan city centre, and Perry Barr, Birmingham (local centre in a large conurbation)	Public transport	Access to economic opportunities and services	Quantitative analysis based on a survey collecting data about the value bus users place on the activities they undertake with the help of public transport.	6.9
Pisarski 2016	issues around aging patterns in the USA	transport expenditure	Share of transport spending by income quintile	Quantitative analysis: cross-sectional comparison	7.3
Pyrialakou et al. 2016	US rural and small communities - case study on Indiana	Transport disadvantage- includes three essential elements: accessibility, mobility, and realised travel behaviour	-Social exclusion; -Access to opportunities and social networks; -Transport equity: horizontal approach ignores differences in transportation need among populations with different socio-demographic characteristics; vertical approach accounts for such differences	- Literature review on various ways of measuring transport disadvantage; -Secondary data analysis aimed at applying the measurement technique developed for assessing transport disadvantage in Indiana, United States	7.3
Rajé and Saffrey 2016	No restriction specified on setting or population	Cycling	Employment	literature review	6.8
Sloman et al. 2017	12 UK local authorities - large urban centres outside London	- Traffic and car use (as a proxy for carbon emissions); - Congestion	-(Un)employment; - Employment accessibility	Meta-analysis of the 12 Local Sustainability Transport Fund (LSTF) Large Projects. The	6.4

		(as a measure of economic efficiency); - Bus use; - Cycling; - Walking; - Modal shift from behaviour change initiatives		outcome report for previous interim report, as well as secondary datasets are analysed.	
Sloman et al. 2018	96 local authorities in the UK	Evaluation of the 96 projects supported by the Local Sustainable Transport Fund (LSTF) that assisted unemployed adults in the process of job-seeking by: •providing free or discounted public transport tickets or cycle vouchers •providing bus services to peripheral employment sites •improving bus punctuality	Access to employment and economic opportunities	Synthesis of evidence including meta-analysis	7.5
Starkey and Hine 2014	Poor people in rural and urban areas in low- and middle-income countries.	- Motorised transport; - Walking and cycling; - Rural transport; - Intermediate means of transport;	-Poverty; - Inequality; - Social exclusion (defined as isolation); -Differential access to employment, education and economic opportunities	literature review	10.00
Thrush et al. 2018	Post-industrial towns in the UK	Public transport	Access to employment, education and economic opportunities	Report presenting several case studies of post-industrial	5.5

				towns: cross-sectional comparison study	
Tinson et al. 2014	Focus on UK, even though evidence from other high-income countries is used in constructing arguments	Transport expenditure	Share of transport expenditures out of overall expenditures for different quintile groups and family types	Literature review	6.6
Titheridge et al. 2014	<i>UK</i>	Transport (general, undefined)	- Transport poverty-measurement based on 3 indicators: •time taken to access essential services; •distance to the nearest bus stop or train station; •family income. - Transport-related social exclusion (reduced access to economic and social opportunities)	Evidence review	7.1
UK Women's Budget Group 2018	<i>UK</i>	-Public transport (buses and trains); -Gendered patterns of transport choices	-Women's economic opportunities; -Access to employment, education and involvement in public life; -Gender inequality	Policy briefing	7.0