



THE BENEFITS OF IMPROVEMENTS IN PUBLIC AND ACTIVE TRANSPORT INFRASTRUCTURE TO QUALITY OF LIFE

RAPID EVIDENCE REVIEW

KEY FINDINGS

- Investment in public transport infrastructure can facilitate better access to education and employment, promote independence and social inclusion, broaden social connections and relationships, and reduces stress and isolation. Therefore, good public and active transport connections can be a catalyst for enhancing overall wellbeing and quality of life, representing a key ingredient of good growth.
- Across a range of quality-of-life measures, people in lower socioeconomic groups experience worse outcomes due to complex interrelated factors. Evidence shows that investment in some types of public and active transport can have a disproportionately positive impact on low-income groups and also help to address some of the drivers of inequality such as poor health and access to education.
- The findings of this short review echo previous Cambridge Ahead research which highlighted reliable, affordable and sustainable transport connectivity as an essential component of quality of life in the Cambridge city region. This evidence reaffirms Cambridge Ahead's commitment to supporting the delivery of crucial transport infrastructure locally.
- However, investment in infrastructure alone will not be sufficient to realise the envisioned benefits to quality of life and the benefits observed in the existing evidence base are highly context dependent. Overall, the findings emphasise the need to adopt a strategic and integrated approach when investing in public and active transport infrastructure. By addressing the complex and interconnected issues of health, employment access, and economic development, such an approach holds the key to fostering a vibrant, inclusive, and sustainable Cambridge city region.

INTRODUCTION

In this document, our objective is to present evidence on the relationship between improvements in public and active transport infrastructure and a range of quality-of-life measures, with a particular focus on how this relationship intersects with socioeconomic inequality. Under the umbrella of quality of life, we emphasise the potential positive impacts transport connectivity can have on health, employment, education, and the economy. We focus on physical interventions, specifically the construction of new infrastructure for public transport and active travel, including pedestrian walkways and cycling lanes (whether as part of other public transport infrastructure or segregated cycle or walking routes), rail systems, metro networks, or the expansion of existing transport facilities. Wider considerations from the literature related to transport policy are included in the final section of the paper.

This rapid evidence review is part of a wider programme of work initiated by the Cambridge Ahead (CA) Transport Group, which includes exploration of the relationship between transport and socioeconomic outcomes and the objectives of “levelling up” in the UK. This document is a first phase of this work, to explore the high-level evidence base. It has several important limitations, including a limited focus on ‘infrastructure’ as opposed to other transport interventions such as community transport initiatives or demand-responsive transport, a focus on academic and grey literature at the national level rather than local data, and limitations in the research itself, particularly a lack of robust evaluation (What Works Centre for Economic Growth, 2022).

In the following section, we offer a short overview of the policy and research landscape on transport and socioeconomic inequality in the UK. Following that, we summarise the supporting evidence on the potential benefits of improvements in public and active transport infrastructure. As noted above, there are important limitations to this evidence base; case studies are included after the findings to provide further detail on specific interventions and their evaluation. A short description of the methodology used for this rapid evidence review, and further information about transport interventions in Abbey Ward, Cambridge, are included as appendices to this paper.

BACKGROUND & POLICY CONTEXT

In the UK, there has been an increase in the policy awareness of the relationship between transport and socioeconomic outcomes in recent decades. For example, the 1998 White Paper on Transport recognised the need to integrate transport with education, health, and wealth creation policies to improve socioeconomic outcomes (Church et al., 2000; Titheridge et al., 2014) and the Social Exclusion Unit's (SEU) 2003 research highlighted the barriers that transport problems can create for people in lower income groups wanting to access work, healthcare, educational and other key services.

Various policies have been introduced to address transport challenges for people in lower income groups, such as providing funding towards school travel costs to ease transport problems for school-going children and establishing free or discounted bus travel for older people. In the 2019 Future of Mobility: Urban Strategy, the Department for Transport (DfT) outlined plans for a more inclusive transport system by focusing on mobility technologies and services to widen the affordability, availability, and accessibility of transport. DfT also aims to narrow existing inequalities in transport provision and use, lower running costs through automation and the transition away from conventional fuels. Combined with greater use of more efficient, on-demand business models, this could enable more frequent and better integrated services in currently poorly connected areas.

In 2022, the UK government, as part of its Levelling Up strategy, acknowledged the significant impact of inadequate transport infrastructure in worsening geographical inequalities. It also highlighted how improvements in public transport infrastructure can support local economic growth by facilitating access to jobs, promoting business connections, enhancing quality of life, and promoting good health, among several other benefits. The Government's third Levelling Up 'mission' is *"By 2030, local public transport connectivity across the country will be significantly closer to the standards of London, with improved services, simpler fares and integrated ticketing."*

Locally, the Greater Cambridge Partnership has an extensive public transport infrastructure programme embodied in four corridors linking Cambridge and South Cambridgeshire in the north, south east, east and west. At the time of writing, one of these schemes – Cambridge South East Transport (known as CSET) – is 'paused', in part due to inflationary pressures on the GCP programme. Nevertheless, GCP schemes remain an important and fundamental investment in public and active travel infrastructure. The GCP is also delivering twelve 'greenways', active travel routes, the Greater Cambridge region which will make it easier and safer for people to travel sustainably.

At the regional level, the Cambridgeshire and Peterborough Combined Authority has strategies in place to improve rail travel by promoting investment in new rail infrastructure. It also established the Bus Reform Task Force in 2019 to tackle challenges related to bus services to promote social inclusion (CPCA, 2020), with a consultation regarding a possible enhanced partnership or franchising model for buses expected in early 2024. The CPCA's Local Transport and Connectivity Plan explicitly refers to an "an aim of increasing social inclusion and reducing the level of deprivation across the region" (CPCA, 2023).

This aim is supported by the evidence, which shows that plans to provide quicker, cheaper and more reliable public transport services have the potential to disproportionately benefit people on lower incomes. For example, annual bus usage statistics show that people in the lowest income quintile are approximately 2.5 times more likely to travel by bus compared to

people in the highest income quintile (44 local bus trips on average annually compared to 16). Bus use is also more common among women, young people and those aged over 70 as well as people in minoritised ethnic groups (Department for Transport, 2022). In 2021, 34% of households in Cambridge did not own a car (Greater Cambridge Partnership, 2023) and analysis by The Health Foundation shows that the poorest households are nearly seven times as likely to have no access to a car as the richest (The Health Foundation, 2023). While the use of different modes is highly complex and interrelated, these statistics suggest that improvements to local bus services would disproportionately benefit people on the lowest incomes.

However, between 2004 and 2022 vehicle kilometres on local bus services run by commercial operators in England (outside London) have dropped by 16% while those run with local authority support have declined by 55% over the same period (Department for Transport, 2023). The challenge of reduced transport services is exacerbated by high fares, which have been increasing at a greater rate than motoring costs (Lucas, 2012). Over the 2004 to 2022 period, local bus fares have increased by 97%, while services have reduced (Department for Transport, 2023), which makes access to services even more demanding, especially for low-income groups. With entry-level jobs and key facilities, such as hospitals, colleges and shopping and leisure centres being relocated to areas that are often not well served by public transport, cutbacks in public transport have compounded accessibility problems (Lucas, 2012). This accessibility can be made even more difficult for those in low-paid jobs who have to work hours that make access difficult by any means other than the car (SEU, 2003). Those without cars and must rely on public transport might often be excluded from participating fully in the everyday activities that the majority take for granted because of the absence or inadequacy of such services in more economically deprived areas (Lucas, 2012).

Policy responses have been criticised for only focusing on time-based exclusion and failing to recognise individual experiences (Curl, 2018) or infrastructure interventions that are not adequately evaluated for their impact on local economies. Subsequent studies have, therefore, emphasised the need to address the multiple layers of social exclusion which vary according to age, gender, ethnicity, and income levels (Clifton and Lucas, 2004; Lucas, 2012). It should be acknowledged that socioeconomic disadvantage is hugely complex, and it is important not to generalise about people's experiences of transport disadvantage, which can be caused by a number of intersecting and compounding factors (Gates et al., 2019).

Finally, at the time of writing, exploration of a long-term vision for Cambridge (informally known as Cambridge 2040) remains underway following a speech by the Secretary of State for Levelling Up, Housing and Communities in July 2023. This work, being undertaken by the Cambridge Delivery Group, provides the potential to make the case for continued investment in local public and active travel infrastructure to central government within the context of a long-term future vision for the sustainable growth of the area.

FINDINGS

Transport plays a crucial role in promoting social inclusion and well-being, with implications for improved economic and social disparities (Gates et al., 2019). Research shows that the improvement of public transport infrastructure can yield a wide range of advantages, including better health outcomes (Mackett and Thoreau, 2015; Mihaylova, 2021; Ogilvie et al., 2016; Van Schalkwyk and Mindell, 2018), improved social connections (Cooper et al., 2019), time and cost savings for both individuals and firms (Venables et al., 2014), and increased employment opportunities and enhanced productivity in struggling regions (What Works Centre for Economic Growth, 2021). In fact, some studies show that disinvestment in public transport infrastructure, such as rail, leads to relative population decline, a decrease in the proportion of educated and skilled workers, and a decline in the number of young people in these areas (Gibbons et al., 2018), which can lead to reduction in the vibrancy of an area.

Improved public transport infrastructure drives economic growth

Improved public transport infrastructure drives economic growth and can help to address regional economic inequalities. A study by the Urban Transport Group (2013) examined the economic contributions of urban bus networks in England, comparing them to public funding for buses. Their analysis revealed a net economic benefit of £2.5 billion, with half of this benefit accruing to bus users, who gain improved access to employment and essential amenities. The other half of the benefit is attributable to non-users, resulting from reduced congestion, lower pollution levels, the promotion of economic agglomeration, and other related factors. Importantly, these economic benefits significantly surpass the public funding allocated to support bus services.

In relation to investment in physical rail infrastructure, including light rail, subway, heavy rail, and high-speed rail, the What works centre for economic growth (2021) reports that investment in the rail network has the potential to impact local communities by reducing transport costs and stimulating the economy. Pogonyi et al. (2021) find that areas located within walking distance of a new metro experience a positive effect on economic activity. Their case study demonstrates that while a new metro may not have created new employment or establishments, it may have increased productivity by shifting towards higher value-added industries and induced higher agglomeration. This underscores the critical role of transport in fostering economic growth and addressing regional economic inequalities.

Improved public transport leads to better employment access

Accessible and affordable public transport can significantly enhance opportunities for employment. Transport is crucial for not only securing a job but also in retaining it or advancing to a better job (Gates et al., 2019). Also, improvements in cycling infrastructure can have a positive impact on employment prospects. Research shows that a good public transport network improves employment outcomes, particularly in economically disadvantaged areas. For instance, in four economically deprived neighbourhoods in the UK, surveys revealed that a substantial portion, ranging from 20% to 98% of respondents, considered the bus service as essential for securing employment, retaining their current jobs, or advancing to better employment opportunities (Lucas et al., 2008). This is particularly important for older populations. A study by RAND Europe, commissioned by Cambridge Ahead, shows that poor access to transportation was raised by interviewees as a vital barrier to employment, particularly within sparser parts of Cambridgeshire and Peterborough. Study participants

suggested infrastructure investments to improve opportunities and outcomes for older workers (RAND Europe, 2023).

Transport can be a significant contributing factor in the exclusion of many low-income groups and communities, particularly in the take-up of employment (SEU, 2003). Inadequate transport has also been linked with low participation in post-16 education and college course withdrawals (Lucas, 2012). In a 2012 survey, the Department for Transport (DfT) found that 13% of working age respondents said they had decided not to apply for a particular job in the previous 12 months because of transport problems; and 40% of young people in rural areas said that transport issues influenced their decisions about post-16 education.

Improved public transport infrastructure leads to positive health outcomes

Research has established a clear connection between lower socioeconomic status and a higher incidence of chronic diseases, with those in higher socioeconomic brackets also typically benefiting from improved access to healthcare services (Schüz et al., 2020; Yong and Yang, 2021). Transport infrastructure can have positive impacts on health, both directly and indirectly (such as through the relationship between transport and education and employment opportunities, discussed above, which are in turn associated with better health outcomes).

For example, a 2017 evidence review by what was then Public Health England emphasised the positive relationship between spatial planning for public and active travel infrastructure and a wide range of physical and mental health benefits (Public Health England, 2017). In analysis of 20 transportation initiatives implemented in rural regions of the UK revealed a spectrum of improvements in health and quality of life more generally. These enhancements included improved independence, expanded social connections and relationships, as well as reduced stress and isolation (Gates et al., 2019). The evidence also suggests a bidirectional relationship between physical health and transport. Buses, in particular, play a crucial role in providing access to health services while the choice of transportation mode and its frequency can impact an individual's health status. For example, car use has been linked to reduced physical activity and negative impacts on physical health. Conversely, an individual's health can influence their choice of transportation mode and frequency of use, with individuals with mobility issues more likely to experience adverse transport impacts, as certain active modes may not be suitable (Cooper et al., 2019).

Modal shift from cars towards public transport and active travel reduces carbon emissions significantly, with important implications for public health. For example, the Centre for Cities estimates that shifting 10,000 people from using cars to using buses for a short commute would remove over 5m tonnes of carbon emissions annually (Centre for Cities, 2019).

Longitudinal population research indicates that walking and cycling journeys contribute to the maintenance and enhancement of physical and mental well-being throughout one's life. In addition, increased street connectivity and walkability in local environments encourage active travel. A shift from car commuting to active travel particularly benefits physical health, especially among females (Closer, 2023). Overall, changes in transportation mode have notable effects on both physical and mental health. Switching from a car to active travel is associated with improved mental health and improved physical health in women. Factors that encourage higher levels of active travel include improved street connectivity and walkability in the local environment, especially in promoting active travel to and from school among young people. Although distance to school is correlated with active travel, research using

longitudinal data shows that a walkable environment has an even stronger association with the likelihood of children using active travel for their journeys to school (Macdonald et al., 2019; Ortegon-Sanchez et al., 2021).

However, for individuals to choose active travel, the existing infrastructure must support this choice. Individuals who perceive the public transport infrastructure in their area as excellent are more than 1.5 times more likely to choose walking or cycling for journeys under 2-3 miles compared to those who rate the infrastructure poorly. Frequent public transport users who perceive the infrastructure as poor are more likely to report worse mental health compared to frequent users who view the infrastructure as excellent (Feng et al., 2017). In Cambridge, a study by RAND Europe revealed that a lack of public transportation led to increased isolation and reduced access for those without cars, which impacted their quality of life (RAND Europe, 2022).

In relation to healthcare, getting to hospital can be particularly difficult for people who rely on public transport, which ultimately affects health outcomes (SEU, 2003). Although acute in rural areas, inadequate access to public transport is also widespread in urban areas, especially in more peripheral areas. In a 2012 survey, the Department for Transport (DfT) found that 69% of missed maternity care appointments were due to transport or transport-related factors.

Improved connectivity enhances social connections

Transport plays a key role in facilitating social interactions and promoting social inclusion (Cooper et al., 2019). The availability of transport options, especially public transport, can have a significant impact on wellbeing as it enables social connectedness. Research has shown that a lack of access to transport or the removal of public transport services can lead to a reduction in social networks and social relationships. Additionally, if transport infrastructure isolates individuals from their community, it can further exacerbate social disconnection.

By contrast, effective transport provision, such as reliable bus links and accessible public transport, can play a pivotal role in facilitating social interactions and promoting social inclusion (Cooper et al., 2019), underscoring the importance of improved transport networks for increased community engagement and enhancing the overall well-being of individuals and communities.

The effect of communities or individuals not having access to a good transport network extends beyond physical access to facilities such as schools and hospitals. It leads to a withdrawal from social interactions, leisure activities, and cultural engagement, as the DfT reports (Department for Transport, 2012). Gates et al., (2019) argue that there is a great overlap between transport and social inclusion, which can be achieved through improved connectivity, 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. At the community level, poor transport links reduce social and economic activity within economically deprived communities, which can contribute to a rise in crime rates and reduce the attraction of an area (Clifton and Lucas, 2004).

CASE STUDIES

In this section, we present case studies to demonstrate the evidence on the effects improvements in public transport infrastructure and services in local settings. Whilst we acknowledge the limitation of examining cases in isolation, the demonstrated outcomes are indicative of the wider effects that transport can have in reducing inequalities and improving socioeconomic outcomes.

1. Cambridgeshire Guided Busway

In a study of the Cambridgeshire Guided Busway, Ogilvie et al. (2016) revealed some important insights into the relationship between high-quality infrastructure and transport choices. One significant finding is that living closer to the busway is associated with increased usage not only of the busway for public transport but also for walking and cycling. The busway connects various towns and villages to key destinations in the region, providing buses that run on a dedicated and segregated guideway. It also offers a high-quality, traffic-free path for pedestrians and cyclists alongside the bus route.

In relation to the health outcomes discussed above, the promotion of active travel, particularly walking and cycling, through this scheme, is likely to substantially enhance the wellbeing of individuals living in close proximity to the busway. Furthermore, the provision of a dedicated bus route reduces journey times, saving commuters time and forging connections between different towns and villages. This improved connectivity serves to promote social interaction and community cohesion, emphasising the broader benefits of infrastructure development.

2. Braunstone Bus, Leicester; the Trevithick Urban Link, Cornwall; the Walsall Workwise initiative, West Midlands; and the Wythenshaw Local Link, Manchester.

Lucas et. al (2009) study four cases: the Braunstone Bus, Leicester - a fixed route service connecting an outlying housing estate with the city centre and key employment sites and facilities in the urban periphery; the Trevithick Urban Link, Cornwall - a fixed route service connecting a number of rural conurbations with new industrial site-based employment and extending the services to cover shift work patterns; the Walsall Workwise initiative, West Midlands - a project to assist people with their travel costs in the first weeks of new employment or for interviews and providing travel advice; and the Wythenshaw Local Link, Manchester - a flexibly routed minibus service that takes local people to key destinations in the local and wider areas using a booking system.

The study established cost savings from the services to individual users and found that each of the projects offered significant cost savings to individuals who use them. These cost savings were significantly more than would generally be anticipated from the fare reductions and journey time savings that would normally have arisen from the introduction of the service alone. In the case of the Braunstone Bus, approximately 15% of the overall growth in patronage was due to the improved accessibility to key destinations that has been created by the service. For the Trevithick Link, the figure is approximately 5% and for the Wythenshaw Local Link, a 40% growth was as a result of the improved accessibility the service brings (this is largely because of the considerable journey time savings from replaced walking trips).

Because the Walsall WorkWise initiative does not offer an actual transport service, it was not possible to calculate its social benefit in the same way. However, the study was able to identify that from the 732 referrals it had supported, 53% of surveyed clients found a new job at a subsidy per client of £123. Lucas et al. (2009) conclude that it is unlikely that any one of the services would have been introduced without the considerable pump-prime money the Government first allocated to them. Even then, they argue that the services still offer reasonable value for money in terms of per passenger trip subsidies, although clearly they are unlikely to become ever commercial due to their peripheral routing and long operating times.

3. FastWay, West Sussex

The Crawley FastWay scheme involved the delivery of a series of bus priority measures along two core routes linking Horley, Gatwick Airport and Crawley. Economic evaluation of the outturn costs and benefits shows that the scheme has delivered an economic return on investment at £4.67 for each £1 spent. The scheme has succeeded in attracting increasing numbers of passengers, exceeding targets, journey times have been reduced, service reliability is high and passenger satisfaction is over 90%. In addition, there is evidence to suggest that the scheme has also resulted in a decline in road traffic, achieving modal shift from cars (Greener Vision, 2015a).

4. Mansfield Public Transport Interchange

The Mansfield Public Transport Interchange scheme consisted of building a new, fully enclosed bus station building with 80m connecting footbridge to the railway station. An economic evaluation of the outturn costs and benefits shows that the scheme has delivered an economic return on investment at up to £6.50 for each £1 spent. The scheme succeeded in meeting most targets and objectives. The observed demand increase has exceeded expectations while passenger satisfaction has improved significantly. Whilst previously high, the reliability of the bus service has improved further since the opening of the new bus station (Greener Vision, 2015a).

5. The South East Hampshire Bus Rapid Transit

The South East Hampshire Bus Rapid Transit (BRT) is a high specification, sub regional public transport network designed to provide a viable alternative to the car and remove the transport barriers to economic growth and development of key sites. The scheme included an off-road busway in a disused railway line, new bus shelters with CCTV and real time passenger information and cycle parking, amongst other infrastructure measures. In addition, the private bus operator committed to providing a new high-quality fleet and route-specific branding (Eclipse). Economic evaluation of the outturn costs and benefits shows that the scheme has delivered an economic return on investment at up to £6.94 for each £1 spent. The scheme has been successful at achieving levels of demand and revenues which exceeded forecasts, service reliability and service frequency have improved, and passenger satisfaction ratings have gone up more than 20% on average. There is also evidence to suggest that the scheme has led to a reduction in traffic levels (Greener Vision, 2015b).

6. Jubilee Line Extension (London)

Pogonyi et al. (2021) study the spatial distribution of establishments and employment in London from 1997 to 2007, to investigate the impact of the Jubilee Line Extension (JLE), a

new metro line. They examined the causal effect of the JLE on the spatial distribution of economic activity and find a complex pattern of effects. Areas within walking distance of the new metro stations experienced a positive economic impact, with significant increases in employment and the number of establishments. Notably, employment within 500 meters of Canary Wharf station increased by 456% between 1997 and 2007, and the number of establishments also saw a substantial increase. In areas within 750 meters of JLE stations, employment increased by 13%, and the number of establishments increased by 27%. Areas located between 750 and 2000 meters from JLE stations experienced more modest growth, with an 8% increase in employment and a 16% increase in the number of establishments. In comparison, the rest of London saw an 11% increase in the number of employed individuals and a 14% increase in the number of establishments during the same period.

Overall, these results underscore the positive outcomes of the JLE in terms of bolstering employment rates, a key catalyst for enhancing social mobility. The study not only highlights the economic transformation brought about by well-executed transportation infrastructure but also emphasises the crucial role such projects play in shaping the urban landscape and providing economic opportunities for residents.

CONCLUSION: THE NEED FOR AN INTEGRATED APPROACH

This review has explored the evidence demonstrating how improved public transport infrastructure can have numerous benefits to quality of life, highlighting the relevance of this evidence to socioeconomically disadvantaged groups where possible. Beyond the immediate convenience of efficient, reliable and affordable transport options, investments in public transport can contribute to improved health, better access to employment and education, and economic growth. The full complexity of these relationships is not captured in this evidence review, but it does indicate the importance of delivering public and active travel infrastructure to quality of life.

However, it is important to recognise that improvements in transport infrastructure alone may not suffice to bring about the envisioned benefits in employment, health outcomes, skills development, and broader economic growth. Evaluating the counterfactual scenarios for transport improvements and their effects on health, employment, education, and social factors is challenging, and the benefits observed in studies are highly context-dependent, making it difficult to extrapolate findings as general conclusions. However, the evidence does suggest that insights drawn from case studies where improvements have yielded positive outcomes can serve as valuable examples for designing transport interventions that address more than just connectivity. Such interventions should also tackle a wide range of socioeconomic inequalities stemming from factors like low incomes, lack of skills, and disadvantages related to ethnicity, gender, or disability.

It is also worth noting that different modes of transportation are not interchangeable, and benefits resulting from rail improvements may not be observed in road infrastructure improvements. For example, research has shown that improvements in rail infrastructure have a more significant impact on productivity, whereas population dynamics are more sensitive to road and metro developments (Redding and Turner, 2014). Additionally, some studies indicate that regional connectivity-focused improvements may inadvertently introduce barriers at the local level for pedestrians and cyclists (van Eldijk et al., 2022). Therefore, a strategic and multi-layered approach to improvements is likely to ensure broader benefits at both local and regional levels, as exemplified by the Cambridgeshire busway case study.

Finally, it is crucial to consider the social impacts of transport improvements in interventions. Neglecting the social equity aspect of transport interventions can potentially compromise the overall well-being and quality of life for communities (Jones and Lucas, 2012). Hence, a holistic approach to transportation planning and development is essential to achieve positive and equitable outcomes in various dimensions of society.

This review has demonstrated the benefits stemming from improvements in transport infrastructure and stresses the multi-layered advantages that can be harnessed through strategic investment. The paper has highlighted how enhancements in public transport not only offer the promise of better health through increased active travel but also serve as channels for improving access to employment opportunities. Simultaneously, the paper has underscored the role that well-considered transport infrastructure plays in accelerating economic growth. Crucially, the findings emphasise the need to adopt an integrated approach when investing in public transport infrastructure. By addressing the complex and interconnected issues of health, employment access, and economic development, such an approach holds the key to fostering vibrant, inclusive, and sustainable urban environments.

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APPENDIX

METHODOLOGY

This review focuses on publications between 1990 and 2023. The reason for this is the growing number of academic and policy studies on social exclusion in the UK since the early 1990s (Milbourne, 2006). Our inclusion criteria were, therefore, UK-based research published in English since 1990. To ensure the reliability and robustness of the data, we reviewed peer-reviewed journal articles, book chapters, and grey literature such as policy reports, working papers, government documents, and reports from think tanks. We excluded any material published before 1990 and those published in a language other than English.

We sourced documents from Scopus and Google Scholar for peer-reviewed articles and scoped the UK government and think-tank websites for policy documents and policy reviews. In our search, we used key words such as transport, connectivity, mobility infrastructure, disadvantage, deprivation, social mobility, financial distress, socioeconomic disadvantage, social inclusion, social exclusion, and socioeconomic inequality to identify the effects of improved public transport services on socioeconomic inequalities. The screening process based on this inclusion and exclusion criteria led to the retrieval of 30 relevant publications for in-depth analysis.

ABBEY WARD IN CAMBRIDGE

While specific evaluations of the impact of public infrastructure improvements in Abbey Ward have yet to be conducted, it is essential to recognise this as a significant case study for understanding how enhanced connectivity can contribute to positive outcomes in the area. The Abbey Chesterton Bridge project serves as an example of such improvements. The bridge connects Cambridge North to Coldham's Lane and facilitates access from East Chesterton to the Barnwell community on the south side of the river and the broader Abbey ward¹.

The bridge provides a safe and traffic-free route for pedestrians and cyclists beneath one of the city's busiest access roads, enhancing safety and convenience for users. This pedestrian and cycling infrastructure also include new active travel paths connecting Cambridge North station to Coldham's Lane. The bridge also opens up access to historically significant green spaces, including Ditton Meadows and Coldham's Common.

Part of the Chisholm Trail, the overall aim of this development is to establish a walking and cycling route that is predominantly off-road and free from traffic, directly linking Cambridge station to the Cambridge North station. According to the GCP, this route is expected to provide various benefits, including:

1. **Improved connectivity:** The trail will facilitate improved travel between major destinations, such as Addenbrooke's Hospital and the Cambridge Biomedical Campus in the south and business and science parks in the north.

¹ [First stage of Chisholm Trail walking and cycling route across Cambridge opens](#)

2. **Reduced traffic:** By encouraging walking and cycling, the Chisholm Trail contributes to reduced vehicular traffic and congestion.
3. **Enhanced mobility:** The trail improved accessibility for individuals who prefer active travel modes, promoting healthier and more sustainable commuting options.
4. **Community access:** By connecting different parts of the city and providing safe routes, the project facilitates community access to recreational and green spaces.

While the specific benefits of the Abbey Chesterton Bridge and the Chisholm Trail are expected, detailed evaluations are required to provide insights into the actual impact of these infrastructure improvements on connectivity, mobility, access to employment, and quality of life in the Abbey Ward and the broader Cambridge area.