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journal homepage: [www.elsevier.com/locate/jth](http://www.elsevier.com/locate/jth)Public transport investments as generators of economic and social activity<sup>☆, ☆ ☆</sup>Jacob Albin Korem Alhassan<sup>a, \*</sup>, Paulo Anciaes<sup>b</sup><sup>a</sup> Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan, Canada<sup>b</sup> UCL Energy Institute, Bartlett School of Environment, Energy and Resources, University College London. Central House, 14 Upper Woburn Place, London, WC1H 0NN, United Kingdom

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## ABSTRACT

**Background:** High-quality public transport systems increase accessibility, which is linked to wider economic and social benefits that improve the health of the populations served. This paper reviews evidence on the existence and magnitude of these wider benefits.

**Methods:** We searched for academic studies that evaluated the effects of specific public transport investments or disinvestments on levels of economic and social activity.

**Results:** Public transport improvements increase economic activity, both at an aggregate level (higher gross domestic product) and household level (higher income), although the effect can be geographically imbalanced. Better public transport boosts employment but tends to increase house prices, leading to gentrification, although suitable policies can prevent this effect. Public transport improves social connections, especially for older people in isolated rural areas. In urban areas, it can reduce connections due to barriers to pedestrians. Disinvestment in public transport, such as closure of bus services, has multiple economic and social costs, although the evidence is still scarce.

**Conclusions:** Public transport has potentially wide but possibly unequal economic and social benefits.

## 1. Introduction

Efficient and reliable public transport systems contribute to better health outcomes among the populations served. The availability of public transport improves the ease of reaching health facilities. In contrast, the unavailability of public transport and long travel times often explain why some people miss health care appointments (Moist et al., 2008; Jennings et al., 2013). Public transport is also related to health via its positive effects on physical activity. This could be because travelling by public transport often involves the use of active modes (walking and cycling) to access rail stations and bus stops (Coroni-Cronberg et al., 2012; Lachapelle and Noland, 2012). It could also be because public transport allows people to access green areas and recreation sites where they can engage in

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physical activity. Good public transport can also improve health by facilitating access to a variety of food stores, including those providing healthy food, thus contributing to better nutrition (Murphy et al., 2017). Satisfaction with travel and absence of constraints to travel are also predictors of better subjective wellbeing (Bergstad et al., 2011; Friman et al., 2017). At an aggregate level, a transport system with a high public transport share also reduces health-related environmental problems such as noise and air pollution, compared with a system dependent on private motorised transport (Borck, 2019).

However, public transport also contributes to better health outcomes indirectly, by facilitating people’s participation in economic and social activities, which are essential social determinants of health.

For example, public transport allows access to jobs, training, and education, improving individuals’ employment prospects (Kawabata, 2003; Johnson et al., 2017). Evidence suggests that individuals who live in areas with poor public transport accessibility to jobs are more likely to be unemployed or on welfare, compared to those with better accessibility to jobs (Blumenberg and Ong, 2001). Better public transport also improves access to local shops and other businesses, which increases customer expenditure (Living Streets, 2018) and can contribute to attract further investment to the areas served. These changes then lead to an increase in average income, which tends to be associated with better health outcomes at the neighbourhood level (Kivimäki et al., 2021).

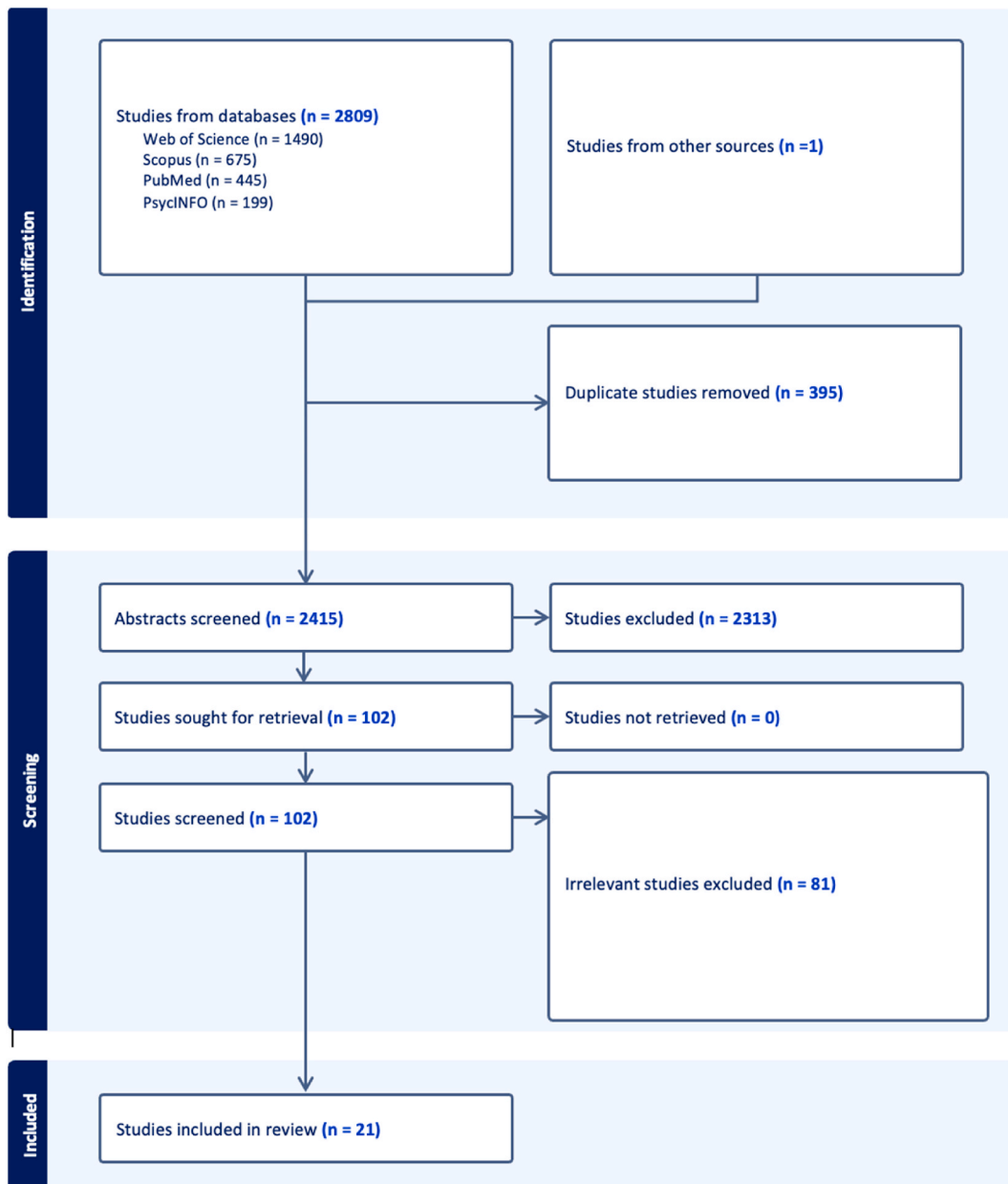


Fig. 1. PRISMA flow chart.

Public transport is also linked to increased and improved social activity. Social interaction can happen during travel, as passengers interact with one another (Currie and Stanley, 2008; Green et al., 2014). Public transport also improves access to places outside one's local area, to meet family and friends or participate in social activities. There is evidence, for example, that individuals who can access reliable public transport services tend to have more social contacts (Frei et al., 2009), interact more often with those contacts (Hine and Mitchell, 2003; Utsunomiya, 2016, 2020), and take on more volunteering work (Naegele and Schnabel, 2010; KPMG, 2017). Conversely, where public transport is unavailable, individuals become more socially isolated (Ward and Walsh, 2023). These social interaction benefits of public transport access have been linked to better self-rated health (Anciaes and Metcalfe, 2023).

This paper reviews the effects of public transport in generating economic and social activity. We are interested in studies that evaluated the effects of specific public transport investments. While there is solid evidence on the wider economic and social benefits of public transport, most studies, such as the ones cited in this introduction, used cross-sectional approaches or compared the existing situation with a hypothetical "no public transport" scenario. This review focuses instead on studies with results that can be linked to specific changes to public transport systems. This allows us to identify the extent to which these changes are associated with subsequent improvements in economic and social activity.

The emphasis on specific changes is also important because the changes do not necessarily improve existing public transport systems. In fact, the last few years has seen disinvestment in public transport in several countries, especially in rural areas already geographically isolated and facing depopulation and other demographic and economic problems. This disinvestment ranges from transport subsidy cuts to wholesale termination of rail lines and public bus systems. For example, bus services have been removed from rural areas as part of austerity measures in parts of Canada (Alhassan et al., 2022). This reduced access to healthcare and social networks and affected health and wellbeing, especially among vulnerable communities (Alhassan et al., 2023). The closure of railway lines also reduces access to jobs and services for rural populations, leading to worse economic outcomes (which can then contribute to worse health outcomes) (Anciaes, 2013). As such, this paper covers evidence both on public policy decisions of investment and disinvestment in public transport.

Furthermore, our objective was to review the effectiveness of public transport changes in generating (or reducing) economic and social activity but also in equity aspects in the distribution of the benefits (or costs) related to these changes. Some of these aspects are spatial (changes in public transport may affect some areas more than others), while others are socio-economic (some groups may be more affected than others), although the two aspects are related.

## 2. Methods

This review examines the economic and social impacts of public transport changes, considering only bus and rail transport, not water and air transport. Studies deemed to be in scope were those that evaluated the effects of past interventions – i.e. actual investments or disinvestments in public transport. This excludes cross-sectional, forecasting, and appraisal studies that did not measure effects of actual investments or disinvestments in public transport over time.

In March 2023 we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher et al., 2009), implemented in COVIDENCE, a literature review software. We first searched for relevant studies in four databases (Web of Science, SCOPUS, PubMed, and PsycInfo Ovid) using the following search criteria:

transit OR "public transport\*" OR tram OR bus OR train OR rail\*

AND

employment OR "economic activity" OR "economic benefits" OR productivity OR accessibility OR "social capital" OR "social inclusion" OR "social exclusion" OR equity OR "poverty" OR "environmental justice" OR "social capital" OR "social benefits" OR "social interaction" OR "social connect\*"

The search was limited to full-text peer-reviewed studies in English and published in the last 20 years.

Fig. 1 shows the PRISMA flow diagram. The search resulted in 2809 records, 395 of which were removed as they were found to be duplicated. We then screened the remaining 2415 studies. The two authors screened all studies independently and then discussed discrepancies to arrive at a consensus on the studies to include or exclude. Studies were selected only if they evaluated the economic and social effects of a specific public transport investment or disinvestment. The screening consisted of two stages: title and abstract only (resulting in the exclusion of 2313 studies) and then full text (resulting in the exclusion of a further 81 studies). The full screening process resulted in a final set of 21 studies for full review.

We then extracted standardized information from all studies on methods, location, spatial scale, economic and social impacts, and equity aspects. We assessed the quality of the studies when selecting the results to include in the description of the findings in the following sections, where we note specific gaps and limitations in the methods used.

## 3. Effects of public transport investment on economic activity

As shown in Table 1, the selected set of studies is diverse in terms of spatial scale, from neighbourhoods to whole countries. A large proportion of the studies focus on the economic effects of the expansion of high-speed railway networks in China. The majority of the other studies are from high-income countries, with few from low- and middle-income countries. The economic impacts can be grouped into aggregated economic activity (at regional or national level), household economy (overall livelihoods or specific type of household costs), employment, and property prices. The social impacts are either social connection or disconnection. Only two of the 21 studies

**Table 1**  
Overview of selected studies.

| Study                         | Country     | Mode            | Scale          | Wider impacts of investments |                   |            |                 |            |               | Wider impacts of disinvestments |
|-------------------------------|-------------|-----------------|----------------|------------------------------|-------------------|------------|-----------------|------------|---------------|---------------------------------|
|                               |             |                 |                | Economic                     |                   |            |                 | Social     |               |                                 |
|                               |             |                 |                | Economic activity            | Household economy | Employment | Property values | Connection | Disconnection |                                 |
| Ahlfeldt and Feddersen (2018) | Germany     | High-speed rail | Counties       | x                            |                   | x          |                 |            |               |                                 |
| Alhassan et al. (2021)        | Canada      | Bus             | Individuals    |                              |                   |            |                 |            | x             |                                 |
| Baker and Lee (2019)          | USA         | Light rail      | Neighbourhoods |                              |                   |            | x               |            |               |                                 |
| Bocarejo et al. (2014)        | Colombia    | Cable car       | Neighbourhoods | x                            | x                 | x          |                 |            |               |                                 |
| Cascetta et al. (2020)        | Italy       | High-speed rail | Provinces      | x                            |                   |            |                 |            |               |                                 |
| Deyas and Woldeamanuel (2020) | Ethiopia    | Light rail      | Individuals    |                              | x                 |            |                 |            | x             |                                 |
| Diao et al. (2017)            | Singapore   | Rail            | Neighbourhoods |                              |                   |            | x               |            |               |                                 |
| Dong (2017)                   | USA         | Rail            | Neighbourhoods |                              |                   |            | x               |            |               |                                 |
| Gibbons et al. (2018)         | UK          | Rail            | Parishes       |                              |                   |            |                 |            | x             |                                 |
| Huang and Xu (2021)           | China       | High-speed rail | Cities         | x                            |                   |            |                 |            |               |                                 |
| Kim et al. (2021)             | USA         | Light rail      | Neighbourhoods |                              |                   | x          | x               |            |               |                                 |
| Lee (2022)                    | South Korea | Rail            | Neighbourhoods |                              |                   |            | x               |            |               |                                 |
| Liu et al. (2021)             | China       | High-speed rail | Cities         |                              |                   |            | x               |            |               |                                 |
| Li et al. (2020)              | China       | High-speed rail | Cities         | x                            |                   |            |                 |            |               |                                 |
| Matas et al. (2020)           | Spain       | High-speed rail | Provinces      | x                            |                   |            |                 |            |               |                                 |
| Sun and Mansury (2016)        | China       | High-speed rail | Individuals    |                              | x                 | x          |                 |            |               |                                 |
| Utsunomiya (2016)             | Japan       | Light rail      | Individuals    |                              |                   |            |                 | x          |               |                                 |
| Utsunomiya (2020)             | Austria     | Rail            | Individuals    |                              |                   |            |                 | x          |               |                                 |
| Wang et al. (2020)            | China       | High-speed rail | Cities         | x                            |                   |            |                 |            |               |                                 |
| Yu and Huang (2021)           | USA         | Rail            | Neighbourhoods |                              |                   |            | x               |            |               |                                 |
| Yu et al. (2020)              | China       | High-speed rail | Counties       | x                            |                   |            |                 |            |               |                                 |

looked at the impacts of disinvestment in public transport.

### 3.1. Economic activity

The selected studies consistently highlight the major role of public transport investments in increasing economic activity. Some studies estimated associations between income and public transport improvements such as reduction in travel time. In China, [Yu et al. \(2020\)](#) found that a 10% decrease in average travel time, as a result of investments in high-speed rail, was associated with an increase of 0.44% in county-level gross domestic product (GDP). Drawing on night-time lighting data (an indicator of economic activity), [Wang et al. \(2020\)](#) confirmed the positive economic effect of high-speed rail, which occurred mainly in big cities. The positive effect can be explained by different mechanisms. For example, [Huang and Xu \(2021\)](#) and [Li et al. \(2020\)](#) suggested that the high-speed rail increased GDP because it promoted closer economic integration and a more efficient allocation of labour and other resources across different regions in China.

High-speed rail investments also had a positive economic impact in Europe. In Germany, [Ahlfeldt and Feddersen \(2018\)](#) found that the opening of the high-speed rail line connecting Frankfurt and Cologne led to an 8.5% growth in the GDP of the counties located along the line. [Cascetta et al. \(2020\)](#) made similar findings in Italy, where the opening of high-speed rail lines was linked to a 5.6% increase in the provinces along the network. In Spain, [Matas et al. \(2020\)](#) estimated that new high-speed rail lines increased the number of companies across Spain. However, this was mostly in provinces with bigger cities, as the increased economic activity that followed the investment was linked to service sectors, which tend to be more dynamic in urban areas.

Some studies revealed that investments in public transport networks do not benefit only the regions served by the new or improved connections but also spillover into other regions. For example, [Wang et al. \(2020\)](#) showed that high-speed rail lines in China also benefited the cities not served by those lines, as some economic activity (mainly manufacturing) diffused to those cities. In Italy, regression analyses revealed that the high-speed rail network was linked to a 2.1% increase in GDP in the provinces not located along the network ([Cascetta et al., 2020](#)). This was because the population in these provinces could benefit from high-speed rail by interchanging from conventional rail services to high-speed rail to reach central areas.

### 3.2. Household economy

Investments in public transport also have positive economic impacts at the household level. For example, in China, [Sun and Mansury \(2016\)](#) found that a 1% increase in the probability of having direct access to a high-speed rail station was associated with a 3.4% increase in household income, while a 10% decrease in average travel time was associated with an increase of 3.9%. These increases were higher for households living in larger cities that already had higher accessibility, and for those working in the manufacturing or service sectors (compared to those in the agriculture, government, and education sectors).

In Ethiopia, [Deyas and Woldeamanuel \(2020\)](#) showed that the Addis Ababa Light Rail Transit had mixed impacts on household economy. About 23% of respondents in a survey indicated a mostly positive impact of the project on their livelihoods. However, this was just 1% above the proportion of respondents indicating a mostly negative impact. The study showed more consistently positive results regarding the impact on a specific component of the household economy: travel costs. The proportion of respondents spending less than 50 Birr per day (US\$1.67) more than doubled from 33% to 68%. In contrast, the study of [Bocarejo et al. \(2014\)](#) in Medellín, Colombia, did not find any significant impact of the implementation of Metrocable (a cable car transport system) on travel costs of the households living in the neighbourhoods served by the system.

### 3.3. Employment

Another economic impact of public transport investments is increasing employment opportunities. [Kim et al. \(2021\)](#) showed that investments in light rail in 12 US cities was associated with a 39% increase in labour market participation in the neighbourhoods within 0.5 miles from the stations, compared with control neighbourhoods. This was explained by increases in the number of year-round and full-time workers and the related increase in the average number of weeks worked.

The study of [Bocarejo et al. \(2014\)](#) cited above showed that the Metrocable increased accessibility to jobs in low-income neighbourhoods, widening the geographical radius within which participants could search for jobs. The number of trips to work per individual of working age also increased. However, the study did not estimate the impact on employment rates in those neighbourhoods.

### 3.4. Property prices

One of the most significant economic impacts of investments in public transport is through changing property prices. The hypothesis is that public transport improvements decrease travel times, increasing the accessibility of the areas served by the new stations, and the demand for properties in those areas. This is then capitalised into property prices.

In China, [Liu et al. \(2021\)](#) found that a decrease in travel time by 100 minutes due to investments in high-speed rail was associated with an average increase of 17% in property prices in the cities served by the new stations. The increases were higher in the less central cities in middle China, compared with those in the Eastern regions. Additionally, the specific type of property matters, such that office and residential properties had higher increases in prices associated with investments than business properties.

In Singapore, [Diao et al. \(2017\)](#) revealed that investments in the new Central Line led to a 8.6% increase in the prices of houses within 600m from a station, compared to those in the same area but further away from a station. Within the 600m buffer from the

station, the increases decreased with distance. Some of these increases in prices occurred as early as a year before the lines opened. Similar results were found in Seoul, South Korea: investments in a new Metro Line increased land values for apartments and offices within 1,000m of a station. As in Singapore, within the 1000m buffer, the increases decreased with distance to a station (Lee, 2022).

The expansion of the railway network in Orlando (US) was also associated with an increase in housing prices (Yu and Huang, 2021). The price increase was larger for properties 1–2 miles away from the stations than for those within 1 mile. This could be because properties closer to the stations are subject to increased railway noise and increased road traffic around the station. While the result in Orlando appears to contradict the results in Singapore and Seoul (where property price increases were higher closer to the stations), the analyses cannot be directly compared as the Orlando study compared price increases in two wide (1-mile) buffers while the other studies compared increases inside (smaller) buffers.

Changes in property prices associated with investments in public transport can lead to gentrification. Baker and Lee (2019) modelled the relationship between the opening of light rail stations and associated changes in the characteristics of several urban neighbourhoods in the US. They found evidence that light rail stations were associated with higher median household income in San Francisco but not in Portland. The authors explained these differences as due to urban and housing policies in Portland, which encouraged developers to create more affordable housing. This was corroborated by Dong (2017) who showed that the creation of light rail transit lines in Portland did not lead to gentrification as variables such as home affordability, average household income, ethnic mix, and housing tenure remained more or less the same in the neighbourhoods served by those lines.

#### 4. Effects of public transport investment on social activity

##### 4.1. Social connection

One of the most important impacts of investments in public transport has been how it facilitates connection for those who might be otherwise socially isolated. This point is illustrated in research by the same author in two contrasting case studies: a new light rail transit system in Toyama city in Japan (Utsunomiya, 2016) and two improved railways serving rural areas in Austria (Utsunomiya, 2020). Around 20% of participants in both studies reported an increase in visits to friends and acquaintances. The proportions rose to 27–34% for participants aged 70 and above. Participants in both case studies also reported expanded social networks (6–10%). Other impacts include going shopping more often (18–28%), meeting relatives more often (5–10%), and increased participation in sport and cultural activities (13–23%), classes and clubs (6–9%), regional festivals (6–30%), and volunteering (1–9%).

##### 4.2. Social disconnection

At the same time, investments in public transport also have the potential to create social disconnection. In some cases, the physical infrastructure to support public transport is placed between communities, leading to disconnection, a phenomenon which is known as community severance (Mindell and Anciaes, 2020) and has been linked with poorer health outcomes (Higgsmith et al., 2022). Severance can happen in the case of railways, light rail transit, trams, bus-rapid transit using dedicated lanes, or even bus services using new or widened roads. In these cases, the infrastructure can reduce the ease to move by walking, due to the existence of physical barriers, reduced number of pedestrian crossing facilities, and the danger of crossing in places without those facilities.

Deyas and Woldeamanuel (2020) have shown that after the implementation of the Addis Ababa Light Rail Transit in Ethiopia, 23% of local residents reported a reduction in social interactions, compared with a lower figure of 21% reporting an increase in social connections. However, the study did not relate this with losses in pedestrian mobility.

#### 5. Effects of public transport disinvestment

We found only two studies examining the wider effects of public transport disinvestment. Alhassan et al. (2021) used qualitative methods to analyse the effects of the closure of a bus company in Canada. From an economic point of view, the disinvestment resulted in increases in several costs for the public sector, which may even exceed the financial saving made from withdrawing the bus services. The disinvestment was also at the origin of a complex chain of negative social effects. The withdrawal of all bus services led to missed medical appointments and reduced the propensity to seek health care among the populations affected. Due to the lack of transport, some individuals resorted to extreme solutions such as hitchhiking and multiple-day walks to reach their destinations. In general, lack of transport reduced social interaction and increased feelings of loneliness. These negative effects were particularly acute in isolated rural areas and among vulnerable populations such as older people, individuals with a disability, and indigenous communities.

Gibbons et al. (2018) used spatial analysis to examine the demographic effects of the massive rail disinvestment in the UK in the 1950–70s, showing that the loss of rail access was linked to reductions in population, proportion of young people, and proportion of skilled workers. While the study did not analyse economic and social variables, the demographic decline suggests that the affected areas did suffer from economic decline and from the negative social effects associated with population ageing and reduced economic opportunities.



## 6. Discussion

### 6.1. Effectiveness of investments

This paper set out to review the effects of public transport on two determinants of population health: economic and social activity. We focused on studies that evaluated the effects of specific investments and disinvestments.

The evidence from the reviewed studies supports the idea that investments in public transport tend to increase economic activity at various scales (from countries to households) and have a positive impact on employment. In most cases, investments come in the form of creation of new rail lines or expansions in public urban transport networks. These then often trigger intermediate effects such as increased concentration of firms, reallocations in labour markets, and changes in property values, which then lead to economic growth. Most of the published literature has analysed the impacts of high-speed rail in China, where the massive investments in high-speed rail in the last decades have been linked to increases in GDP. However, similar results were found in European countries.

While most of these effects are positive, changes in housing prices are one of the main mechanisms by which investments can have negative impacts on communities, particularly where low-income populations become priced out. These findings therefore support further need for investment in public transport as a means of generating economic activity as long as the intermediate mechanisms by which negative impacts may occur are controlled. This can be achieved through urban and housing policies that promote access to affordable housing as found by [Dong \(2017\)](#) for Portland in the USA.

Public transport investments also generally tend to have positive social impacts as they can lead to increased social participation through improvements in accessibility. Through critical investments in public transport, older adults who tend to be immobile can move more leading to an increased sense of autonomy and wellbeing ([Utsunomiya, 2016, 2020](#)). That notwithstanding, through community severance, investments in public transport have the potential to separate people and places creating social disconnection, although there is still insufficient quantitative evidence on this. Proper community engagement prior to major economic investments might help mitigating this problem. In most cases, though, it is disinvestment in public transport that tends to cause social disconnection, leading to loneliness and other poor mental health outcomes ([Alhassan et al., 2021](#)).

### 6.2. Equity aspects

A critical finding from this review has been that the effects of public transport investments and disinvestments are not usually experienced equally across regions or social groups. There are spatial differences in the distribution of impacts of investments, such that regions or cities closer to high-speed rail lines may see more economic growth than those that are further away. This can increase spatial inequality, as the regions and cities that most benefit from the investment are already the most populated and economically dynamic, as in the case of Italy ([Cascetta et al., 2020](#)), Spain ([Matas et al., 2020](#)) and China ([Sun and Mansury, 2016; Wang et al., 2020](#)).

At the city level, where investments in light rail transit could create gentrification, this effect can be moderated where planners prioritize equity as part of transit-oriented development, which is characterised not only by public transport improvements but also by initiatives to increase land use density and diversity. This is what happened in Portland, where anticipated gentrification did not occur after investments in light rail ([Baker and Lee, 2019](#)).

Investments in public transport can also decrease age-based inequalities, by providing opportunities for older people to access services and social networks. For example, investments in railways in Austria and Japan had a marked positive impact on the social capital of older people ([Utsunomiya, 2016, 2020](#)).

In some cases, the positive effects of investments can be amplified for marginalized groups such as improved job prospects that benefited low-income households through the Medellín Metrocable project in Colombia ([Bocarejo, 2014](#)). While investments non-uniformly benefit marginalized groups, disinvestments consistently negatively affect marginalized and minoritized groups such as Indigenous communities, youth and people with disabilities as was the case in Saskatchewan after the loss of provincial intercity transport ([Alhassan et al., 2021](#)).

### 6.3. Directions for further research

The last decade has seen major changes in public transport policies, with many countries, regions, and communities moving towards disinvestment, often justified by economic reasons. However, few studies have set out to investigate how this disinvestment leads to reductions in economic and social activity. The limited evidence suggests that this situation leads to loneliness, poor health and health system disruptions that disproportionately affect already marginalized groups. More evidence is needed, from different countries, to document how the policy turn towards disinvestment is impacting communities.

Most of the evidence found in this review was derived in middle and high income countries. Few studies were found on lower-income countries. In these countries, the economic and social effects of public transport may be different. It is likely that public transport may have positive impacts on poverty reduction, as it increases access to employment and education. However, achieving these effects depends on how affordable public transport is for the lower-income groups.

We also note that while most of the research conducted on economic and social impacts of investment and disinvestment employs quantitative approaches, qualitative evidence is sparse. This is particularly needed in the evaluation of social impacts, as they tend to be specific for each case study and related with the characteristics, perceptions, and behaviours of the affected individuals, in a complex web of impacts which is difficult to disentangle using modelling approaches.

The evidence base on equity could be further strengthened as only a few of the included studies here have attended to the distributive issues linked to the benefits and costs of investments and disinvestments in public transport. The focus has been on distribution by region or economic sector, rarely considering the demographic and socio-economic profile of the individuals affected by the changes.

Finally, while this review focused on economic and social aspects known to be determinants of health, there are no studies linking investments and disinvestments in public transport, accessibility gains, wider economic and social benefits, and health impacts.

### CRedit authorship contribution statement

**Jacob Albin Korem Alhassan:** Writing – review & editing, Writing – original draft, Visualization, Conceptualization. **Paulo Anciaes:** Writing – review & editing, Writing – original draft, Conceptualization.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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