

Introduction

A significant urban challenge in Tamaki Makaurau, Auckland, New Zealand, is the availability of adequate transportation services to low-income groups. Suburbanisation and expansion of the motorway network throughout the 1950s and onwards have led to a spatially challenging environment to provide sufficient transport service, where most individuals depend on access to a private vehicle to access opportunities city-wide.

This has been exacerbated by decades of deliberate underfunding for public transportation services such as rail, tram, and bus networks, which has recently created a deficit in public transportation services. This issue needs to be urgently addressed, as low accessibility can limit opportunities, particularly for employment and education, or force households into expensive car ownership, which further exacerbates existing poverty cycles.

Low-income communities are more likely to live in the suburbs, where housing and rent are cheaper; this trend has been dubbed the suburbanisation of poverty. This trend is challenging, as these outer suburbs face the most significant transportation deficits. Even households with access to a private vehicle find it inconvenient due to congestion and a considerable expense, often causing other essentials like food to be forgotten.

Understanding the spatial equity of the Australian transportation network can help inform policymakers better, directing investment into the most disadvantaged areas, improving accessibility, and addressing transport-related poverty and, on a larger scale, urban poverty.

Literature review

Defining transport equity

Transport equity can be understood as the equal opportunity of access to transportation. (Ministry of Transport & MRCagency, 2020) Transportation equity can be further explored using transport disadvantage, poverty and transport-related social exclusion. (Ministry of Transport & MRCagency, 2020) Transport disadvantage refers to a lack of access to transportation due to personal circumstances, including income, location of settlement, and more, whilst transport poverty refers to a household's inability to afford transportation costs. (Ministry of Transport & MRCagency, 2020)

Transport-related social exclusion.

Transportation-related social exclusion refers to the knock-on effects of transportation poverty and disadvantage, and refers to the inability of individuals to participate in everyday activities, and the adverse impact of this, such as perpetuating unemployment, due to a lack of access to adequate transportation to enable these activities (Ministry of Transport & MRCagency, 2020; Rose et al., 2009)

Limited access to car ownership due to its high costs means that access to public transportation is essential for low-income communities. (Liu & Bardaka, 2021) Transport-related social exclusion is a key issue in Auckland due to the historical, institutional and cultural dominance of car-dependence, which has led to suburbanisation, increasing travel distance, and inadequate public transport services. (Rose et al., 2009)

The suburbanisation of poverty and lack of transport access

Over the past century, many cities have experienced a suburbanisation of poverty. Suburban sprawl, coupled with increasing prices for inner-city housing, has led to low-income households settling in outer or fringe suburbs. (Allen & Farber, 2021; Liu & Bardaka, 2021) However, these outer and fringe suburbs often experience severe lack of access to high-quality public transportation; this, coupled with long journey distances due to suburbanisation, usually leads to the need for car ownership, despite low-income communities lacking car ownership, due to its high costs. (Allen & Farber, 2021; Liu & Bardaka, 2021)

Forced car ownership

Forced car ownership often results from a mismatch of housing location, usually suburban and cheaper, with employment centres, frequently urban and more expensive, and a lack of public transportation networks providing sufficient transport corridors between the two. (Allen & Farber, 2021; Curl et al., 2018)

The high cost of car ownership can severely constrain the budget of low-income households, forcing other essential household needs to be forgone, including food. (Allen & Farber, 2021; Rose et al., 2009)

Historical, institutional, and cultural car-dependence in Auckland

Auckland is one of the most car-dependent cities in the world. It has become this way due to the dominance of extremely automobile-oriented transportation policies in the 1950s and onwards. (Mees & Dodson, 2001, 2006)

A key turning point in the region's transport policy was in the 1950s, when a decision had to be made whether to pursue a plan prepared by the New Zealand Railways to electrify and improve the rail system or an alternative strategy to create a motorway network. (Mees & Dodson, 2001, 2006)

The Auckland Regional Council adopted the motorway plan, disregarding the railway plan entirely. (Mees & Dodson, 2001, 2006) Following this decision, a US consultancy firm would be hired to prepare plans for the motorway network, and even though Auckland Regional Council pointed to US transport policies in choosing the motorway network and disregarding the rail plan in their decision, the US consultancy firm proposed the creation of rapid transit alongside the motorway network. (Mees & Dodson, 2001, 2006) However, the rapid transit scheme was later refused, leading to the regional council proposing closing it in 1983, before being defeated due to public opposition. (Mees & Dodson, 2001, 2006)

A change in rhetoric came by the 80s when planners claimed to be held hostage by the public's love affair with cars rather than due to their own volition. (Mees & Dodson, 2001, 2006) Even processes aimed at reversing the trend in the 2000s and onwards show a clear bias towards improving road capacity, mainly due to biased technical modelling and New Zealand's unique model of a national land transport fund and privatised bus operations (Mees & Dodson, 2006)

Spatial equity

A key component of transport equity is the spatial distribution of transportation services. Low-income groups often lack access to car ownership due to its high cost, and therefore require access to high-quality transit services to ensure sufficient access to employment opportunities. (Welch, 2013) One way to assess the spatial distribution of transportation resources employs a spatial gini coefficient to evaluate accessibility and, therefore, equity. (Welch, 2013).

A study comparing transport equity in Auckland with three other relevant cities found that Auckland has the lowest level of transport poverty for a 50-minute travel time out of all cities assessed. (Nazari Adli et al., 2019) However, overall, high-income groups in Auckland occupy suburbs closer to the destination and have higher access to transportation; few low-income communities have high accessibility. (Nazari Adli et al., 2019)

Another study looking at the combined affordability of housing and transportation found that, once transportation costs are considered, a different affordability pattern emerges, with inner suburbs often being cheaper than outer suburbs. (Mattingly & Morrissey, 2014) This highlights the high cost of transportation and the likelihood for low-income communities in outer suburbs to suffer from transport poverty.

Transport equity in Auckland

Public transportation in Auckland falls short regarding coverage, frequency, regularity, and reliability; many work locations or access to basic goods and services such as food or healthcare are practically impossible to access utilising public transportation. (Rose et al., 2009) The performance of public transportation is inferior for cross-town services, as most suburban services concentrate on the city centre, and also for families, due to fares and logistical challenges. (Rose et al., 2009)

In Auckland, higher-income suburbs have higher transportation connectivity; this may be because they are physically closer to destinations and have a larger number of available services. (Chowdhury et al., 2017) Many lower-income communities in Auckland suffer from poor connectivity due to a lack of infrastructure and longer journey times, caused by fringe suburban locations with poor connectivity. (Chowdhury et al., 2017)

Analysis of outcomes following the implementation of walking and cycling improvements in Mangere found that social and cultural barriers, such as fear of crime or perception of walking and cycling as a symbol of poverty, have been barriers for increased uptake of walking and cycling. (Thorne, 2018) There exists a research gap regarding what interventions might be most effective for improving transport equity (MRCganey, 2020)

Built environment and walkability

Supportive built environments are linked to higher rates of walking and physical activity. (Adkins et al., 2017) Physical activity is a major contributor to health outcomes; hence, walking and cycling are often promoted by creating supportive built environments. (Smith et al., 2017) There is conflicting evidence about the effect of socioeconomic status on increased physical activity uptake in a supportive built environment. One study suggest that the impact of a built environment is negligible for low-income communities, potentially due to due to a lack of transport choices and social and environmental constraints such as fear of crime, presence of loose dogs, or having physically demanding jobs, or insufficient infrastructure, such as a lack of sidewalks or safety infrastructure, or the increased distance of land uses in more suburban low-income areas. (Adkins et al., 2017) Another study found that whilst the quality of the environment is a key factor and can be a barrier to increased physical activity, there is no difference in intervention effectiveness due to socioeconomic status. (Smith et al., 2017)

Identified gap

Whilst multiple studies have assessed the equity of the transportation network, no study has yet assessed how the equity of the transportation network can be best improved, helping to direct equitable transportation investment.

Research question

What are the most critical factors for improving transport accessibility for low-income Auckland suburbs?

Research Objectives

The objectives of this research are to:

- Understand the relative importance of key factors in determining accessibility for low-income Auckland suburbs
 - Proximity to bus stops
 - Route coverage
 - Frequency
 - Reliability
 - Time cost
 - Monetary cost
- Determine what potential improvements may have the most significant benefit for accessibility for low-income populations
- Provide an evidential basis for the equitable allocation of resources into the transportation system

Research methodology

This research will be empirical as it will rely on gathering data based on observing low-income communities in Auckland. Exploratory research will be undertaken to understand better how to improve accessibility for low-income communities. Qualitative analysis of data created through interviews will be conducted.

Semi-structured interviews with participants will be conducted to ascertain the level of improvement in accessibility from proposed interventions, such as increasing proximity to bus stops, coverage, frequency, reliability and affordability of bus routes. A semi-structured interview has been chosen to allow for variation from proposed interventions and to help

potentially uncover other vital factors. Open-ended questions can be utilised to promote the retrieval of wider information regarding the socio-cultural environmental context and for transportation.

There will need to be ethical considerations due to human involvement. Ethics approval will be sought from an ethics board. Robust anonymisation practices will be implemented to protect the identity of participants. These practices will be developed alongside a dissertation supervisor, preparing for submission to the ethics Committee. Ample time will need to be set aside for this process to ensure sufficient time to undertake other parts of the research.

Data collection

A significant difficulty with a survey-dependent study design is ensuring sufficient response rates. This proposal requires conducting in-person semi-structured interviews with participants, due to their high time commitment, many may not participate; therefore, there needs to be a large sample size to ensure sufficient data is collected, even with a low response rate. Nonprobability sampling will be carried out due to time limitations; this may lead to issues regarding the reliability of the data. However, this trade-off must be made to ensure sufficient time for other parts of the project. A snowballing sampling method will be utilised to gather many potential participants, after which quota sampling will ensure adequate representation of sub-demographics, including income, ethnicity and geographical location quotas.

Data analysis

Framework analysis will be carried out on the gathered data. Key themes from each interview will be generated following the interviews. Categorising of responses will help create an overview of data organised by theme, such as what sub-demographic groups would prefer what investment. The results from the categorisation process will be collated and mapped out utilising charting, creating a visual representation of what the overall group and sub-demographics most desire in investments. Analysis by sub-demographic will be essential to ensure that the needs of all residents are accounted for, as needs may vary significantly within the population.

Expected results

The expected results are to see a positive relationship between all proposed investment decisions and the boosting of transport accessibility. However, some factors will likely have an outsized influence on improving accessibility, such as increased route coverage and reliability, as opposed to the monetary cost. There are also expected to be slight differences between sub-demographics; for example, students may see the most significant benefit from reduced costs. In contrast, the working-age population may benefit most from increased route coverage.

It is expected that these results will help to provide an evidential and contextual basis for investments into the public transportation system by Auckland Transport in increasing the equity of the transportation network, as currently, data is lacking as to what investment decisions may have the most significant effect on transport equity and accessibility for low-income groups.

Timetable

Work on the research proposal must commence before semester two of the 2026 university calendar, to allow for adequate time during semester two to carry out the research. The ethics approval process can take multiple months and must therefore be started about two months before the start of the second semester. The first six weeks of the semester will be utilised for data collection, the mid-term break for data analysis, and the second half for synthesis, writing and visualisation.

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