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Transport-related social exclusion and mobility in developing countries: the South African case

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Introduction: Transport-related social exclusion has been studied in many countries, and from many different perspectives. In Africa, however, there is little recent research into the phenomenon, even though African cities tend to have poor transport services, urban sprawl is extensive usually resulting in long travel times and high travel costs, and certain areas experience high levels of crime. By implication, there are several factors that impact the ability of people to access economic and societal opportunities, however these are not well documented. Building on previous work from several authors, this research sought to describe transport-related social exclusion in a large metropolitan area in an emerging economy.

Methods: Using a qualitative methodology, 60 interviews were conducted with City of Johannesburg residents. The data was analyzed using manual thematic and classic content analysis.

Results: The study found that residents often did not have access to services due to availability, but also that economic, geographic and fear-based exclusion were particularly prevalent in the sample, although there were several other psychological exclusion dimensions, as well as information exclusion.

Discussion: This study is the first recent study in South Africa to consider a wide range of commuters from varying demographic strata, thus providing a novel perspective on TRSE in a major urban area in the country. The study recommends that policy actions be considered, taking into account the minibus taxi industry, which is often overlooked in government policy. TRSE should also be an inherent element in urban (and other) transport planning, as well as take into account the broader societal realities faced by citizens. Future research directions include conducting broader quantitative studies across a variety of urban areas in South Africa, and beyond, to determine specific TRSE dimensions in various urban areas. Policy analysis is also recommended, to determine TRSE policy gaps and align interventions with specific commuter needs.

KEYWORDS

transport-related social exclusion, mobility, Africa, Johannesburg, TRSE, developing country, emerging economy

1 Introduction

The basis of the United Nation's Sustainable Development Goals (SDGs) is ensuring that the poverty is eliminated, the planet is protected, and that, by 2030, all people enjoy peace and prosperity (United Nations Development Programme, 2023). A cornerstone to this is to end poverty in all its forms. This is inclusive of ensuring "that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services…" (Global Goals, 2023a), amongst others. Whilst access is a

broad term, access to basic services is frequently denied by poor transport systems, and it is critical that "rural and urban settings should be connected with the access of a proper road facility so that everybody gets equal rights to education, employment opportunities, market system, and a proper health facility" (Shrestha, 2020). Transport can thus be seen as integral to the SDGs. More specifically, in Goal 11, which aims to "make cities and human settlements inclusive, safe, resilient and sustainable" (Global Goals, 2023b), target 11.2 describes the need for affordable and sustainable transport systems, with the aim of providing "access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons" (Global Goals, 2023b).

Despite the recognition of the concepts of "inclusiveness" and "leaving no one behind" (UNSS Knowledge Centre for Sustainable Development, 2022), much of the world is unable to access a variety of societal activities, often due to the lack of adequate transportation systems. Transport-related social exclusion (TRSE) can be defined as "where limited access to transport or other issues with the transport system means that people cannot fully participate in society in the way they would like. This can include being able to access a good education, having meaningful and gainful employment, connecting with friends and family, and being able to access leisure facilities, tourist attractions, and the natural environment" (Transport for the North, 2022). Kenyon (2011) set foundational knowledge by defining TRSE as the "process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility." In essence, in this study, TRSE is regarded as any factor which limits access to transport services and, by implication, societal activities.

In Africa, with some exceptions, the level of transport service provision by the public sector tends to be low and the quality of such services poor. The current state of transport in Africa is well-described. There are poor quality public transport services (Luke and Heyns, 2020); a low level of public sector subsidies, if any (Kumar and Barrett, 2008), making transport expensive; and frequent service provision by the informal sector, which tends to provide flexible, but less safe services (Human Sciences Research Council, 2014). The low levels of road safety and high crash rates tend to be key features across most African countries. Africa has the highest road traffic death rate compared to any other region in the world (World Health Organisation, 2022). Urban sprawl and the associated impact on time and cost, imply major constraints to the ability to travel freely (Yusuf and Allopi, 2010). As stated by Guillossou in 2013 "Many African cities are now growing without a proper urban transport development plan. The result is not enough emphasis on public or mass transport, a sprawl of urban slums, a massive influx of imported cars on a limited and weak infrastructure, paralyzing congestion, widespread pollution, high rates of car accidents and fatalities, and less road safety for pedestrians" (The World Bank, 2013), which remains true 10 years later. By implication, African transport systems are limited and constrained, and the ability to participate in societal activities severely inhibited by the look and shape of the cities and their associated transport services.

Despite the clear evidence of TRSE in Africa, little research has been done in the area. Searches for the terms transport-related social exclusion and Africa through the Web of Science and Scopus databases yielded few results. Of these, several articles focused on transport-related social exclusion within particular environments, such as Lucas's (2011) work on Tshwane in South Africa; Chikengezha and Thebe's (2022) work in Harare, Zimbabwe; Olvera et al. (2013) in Douala, Cameroon; and Abebe et al. (2021) in Addis Ababa, Ethiopia. Some works focus on specific application areas such as the impact of bus rapid transit implementation (Venter et al., 2020), and toll implementation and access to education (Kett and Deluca, 2016). Others focus on specific groups of people such as people with disability (Vanderschuren and Nnene, 2021; Duri and Luke, 2023) and older people (Gorman et al., 2019). Some broad perspectives exist on mobilization on Africa's transport corridors (Enns, 2018) and mobility and access within cities (Olvera et al., 2013). To the best of our knowledge, Lucas's scoping study (Lucas, 2010) and work in Tshwane (Lucas, 2011) and Dimitrov's 2010 investigation into the link between transport and social exclusion were the last significant works on TRSE in South Africa. South Africa has gone through a number of transitions over the past years, both from a transport and socio-economic perspective, including political upheaval and the COVID pandemic. The collapse of the metropolitan railways services due to theft, vandalism and a lack of trains, reducing passenger numbers from 54 million passenger trips per month in 2008/9 to an average of 1.7 million in 2021/22 (Stent, 2022) has effectively deprived a significant portion of low-income commuters of a cost-effective transport solution. Rising transport costs and inflation (StasSA, 2022) and increasing unemployment (from 25.3% in 2013 to 32.9% in 2013) (StatsSA, 2023) imply that many South Africans may be severely affected in their ability to access services and economic and societal activities. Given the poor quality of public transport service, the economic developments and the socio-political environment within South Africa, the research question then arose as to what types of TRSE currently exist within a major South African city. This study therefore sought to provide an updated perspective of TRSE within a major urban environment in an emerging economy.

2 Literature

There are many factors that can influence the ability to access and use the transport system. This invariably affects the ability to participate in societal activities, to a lesser or greater extent. A cornerstone of TRSE is the *availability* of usable transport modes. Cass et al. (2005) refer to an "organisational dimension [which] refers to the ability to use the different modes of transport in terms of suitable and convenient timetables, network structure, the quality of the experience, frequency, reliability, and punctuality." Availability of modes may be insufficient, however, to provide services which are considered to be usable by the trip-maker. Schwanen et al. (2015) refer to motility, as the available movement options, given the various constraints that face the individual.

One of the most commonly identified categories of TRSE is *economic exclusion*, where people are excluded from societal activities, due to the unaffordable cost of transport, as identified by the seminal work of Church et al. (2000) and used by Lucas (2012) in their widely cited works on TRSE. Luz and Portugal (2020), together with Ureta (2008), Lucas (2011), and Bocarejo and Oviedo (2012), all identify that, in developing countries, the transit ticket price is a dimension of TRSE, which, in turn, implies that, where resources are limited, trips that are prioritized are those such as education and employment, over leisure and visiting friends and relatives. Affordability is however only one dimension within the total mix. Church et al. (2000) identified seven dimensions of TRSE, being economic exclusion, physical exclusion, geographic exclusion, time-based exclusion, fear-based exclusion, space exclusion and exclusion from facilities (for example, where distance between key facilities and where a person resides prevents their access).

Physical exclusion, as also identified by Hine and Mitchell (2001) and Cass et al. (2005), refers to the situation where physical barriers such as vehicle design or lack of disability facilities could prevent access to transport. Church et al. (2000) includes in this definition of physical exclusion, the lack of timetable information, however Yigitcanlar et al. (2019) refers to this as an informational dimension, encompassing the availability of information on public transport, to enable its use. Luz and Portugal (2022) identify a further dimension, namely the digital divide dimension, which may also be interpreted as access to *information exclusion*, within a modern connected society.

Another dimension can be described as *geographical or spatial exclusion* (Church et al., 2000; Lucas, 2012; Luz and Portugal, 2020) which refers to the area where a person lives, which may be too far to be able to access some or all transport services, for example, living in a rural area. The spatial dimension can also refer to neighborhood characteristics, such as quality of housing and the environment, crime, community facilities, etc. This is also closely associated with what Church et al. (2000) refers to as *exclusion from facilities*, which is related to "the distance of key facilities such as shops, schools, health care or leisure services from where a person lives prevents their access" (Lucas, 2012).

Fear-based exclusion is also associated with the fear of crime, either in the neighborhood, at waiting areas, or in the vehicle, and is where "fears for personal safety preclude the use of public spaces and/or transport services" (Lucas, 2012). Hine and Mitchell (2001) refer to this as psychological exclusion. Benevenuto and Caulfield (2019) add a further dimension, *social-position based exclusion*, which may refer to some of the pressures from a cultural perspective, for example, pressure from a group, or symbolic or subjective exclusion, which refers to marginalization/stigmatism or prejudice toward certain groups (Jaroš, 2017).

Further TRSE related dimensions may include *time-based exclusion* (Church et al., 2000; Lucas, 2012; Gössling, 2016). Gössling (2016) asserts that time spent traveling is a loss, and time-based exclusion might then refer to whether other demands on a person's time, such as work or household duties, reduce the time that is available for traveling (Lucas, 2012). *Space exclusion* is a further dimension which refers to where space management policies within an area could prevent a group's access to a public space, such as a gated or walled community, where pedestrian, bicycle or car access to, for example, a residential area, is strictly controlled (Lucas, 2012).

These dimensions of TRSE, namely, access and availability, economic, information, physical, geographic, facilities, fear-based, time-based and space exclusion were used as the basis for the development of the research instrument. The works of Church et al. (2000), Lucas (2012), and Luz and Portugal (2022) were the key resources for the questions in the semi-structured interview guide.

3 Materials and methods

To ascertain the nature and extent of transport-related social exclusion in an emerging economy, the City of Johannesburg was selected. The City of Johannesburg is a large African city with ~6.2 million inhabitants (World Population Review, 2023) and is the economic hub of South Africa, and indeed of southern Africa (Cooper et al., 2020). It is also the most populous city and is characterized by urban sprawl, described as residential growth on the urban periphery (Katumba and Everatt, 2021) and poor public transport connections (Luke and Heyns, 2020). It's similarities in terms of urban sprawl, high population growth and poor formal transport services to other developing economy cities makes the study applicable to other African cities, as well as being replicable.

In research, when deciding between qualitative and quantitative approaches, trade-offs are usually made between breadth and depth of data. Whilst quantitative approaches provide more breadth and generalizability across a larger population (U.S. National Science Foundation, 2002), qualitative data can provide depth and insights into the perspectives and opinions of participants (Melkert and Vos, 2010). Beirão and Sarsfield Cabral (2007) asserted in their study on travel choice behavior that mode choice studies tend to be conducted using researcher-selected variables which are limited, yet in travel decision-making, emotions tend to play a major role. Lucas (2013) also asserts that qualitative research is useful in transport as it can uncover underlying motivations in travel behavior and find hidden attitudes and perceptions. Similarly, TRSE tends to be strongly associated with an individual's perceptions, attitudes and experiences of the travel environment and physical environment. The difficulty in defining TRSE emanates from the fact that poor access results from "complex interactions of built, cultural, locational, socio-economic and demographic variables" (Ma et al., 2018). Exploratory research into the field in a relatively unknown context can therefore use qualitative research techniques to allow respondents to specify the factors that are important to them, and possibly provide new insights into the phenomenon. To obtain first hand lived experiences of transport in Johannesburg, Gauteng, a qualitative approach was used.

Semi-structured interview guides were developed, based on the works of Church et al. (2000), Lucas (2012), and Luz and Portugal (2022). The interview guide firstly sought to obtain basic demographic information (gender, age, employment status, residential area and salary). The second section determined information about the available modes of transport in the participants' local areas, their familiarity with the use of the modes, and regular modal use for commuting and discretionary trips. The

third section sought to establish perceptions and opinions on the various TRSE dimensions, and the final section sought to establish the impact that any of the TRSE areas had on participants' lives and what they thought could be done to improve the situation in their local community.

Interviews were conducted by research assistants who had been trained on the survey instrument. Permission was obtained from the participants to record the interviews. Participants were also assured that their participation was anonymous, that their identities would be safeguarded and that data would be kept safely. All participants signed an informed consent form. Several theories exist on the appropriate sample size in qualitative research and several works attempt to determine an appropriate number of interviews. Bekele and Ago (2022) synthesize many works on appropriate sample size, including Cresswell (1998), Morse (2000), Sim et al. (2018), and Kindsiko and Poltimae (2019). They determine that there are several factors that may impact sample size such as research design (phenomenological research requiring fewer participants, whereas grounded theory research requires higher numbers), composition of the sample, scope of the study, nature of the topic and quality of the data. They conclude that it is typical that sample sizes of between 20 and 60 participants be used. Fugard and Potts (2015) attempt to determine a methodology for determining sample sizes for qualitative research, using power to detect instances of a theme and the prevalence of the theme. Using this type of formula, to have 80% power to detect four instances of a theme with ten percent prevalence, a sample size of 54 is required. Several authors (Guest et al., 2005; Mason, 2010; Hennink and Kaiser, 2022) assert that interviews be conducted until saturation is achieved, however it is difficult to determine this point prior to the onset of the study. A total of 60 interviews was therefore considered appropriate, which were conducted so as to establish a broad range of opinions from participants with varying demographic profiles. Nonetheless, data saturation was achieved after ∼20 interviews, whereafter no new themes emerged. The sampling frame was residents of the greater Johannesburg area, aged 18 years or older. Selection for participation was based on access to willing and suitable participants, thus constituting convenience sampling. This was considered appropriate, as the study was exploratory, intended to lay the groundwork for future studies, did not seek generalizability, and was cost effective and less time consuming (Stratton, 2021). There was no stratification of the sample based on residential area, age, gender or other criteria, as the study sought to gain a broad range of perspectives.

Males and females were more or less equally represented, with participants residing in a diverse range of residential areas (inner city, suburbs or townships) across the city. Most participants were young (below 35), which was appropriate given the young population of Johannesburg, although people in their late 30s, 40s, and 50s were also represented. No people in their 60s or above were represented. A wide range of incomes were reported, however there was no participant that reported an income of above R40,000 per month, although there were several participants who preferred not to state their income. Most participants indicated that they were spending between 10 and 20% of their disposable income on transportation, with some participants spending as much as 50%. This is aligned with the General Household Survey (StatsSA, 2018). Recorded interviews were transcribed and analyzed. A combination of manual thematic analysis, constant comparison and classical content analysis was used to make certain that the data was refined, the themes accurately defined, and the collective experiences comprehensively described (Broom, 2005; Leech and Onwuegbuzie, 2007).

4 Results

The participants were asked to describe the transport options that were available to them. Invariably there was a range of available options, although in one or two cases there were only cars and e-hailing services. In general, however, there was a minimum of minibus taxi services, but usually more than one mode, such as buses, train, Gautrain and Rea Vaya. As expected, many areas were not serviced by trains, however a surprisingly large number of areas were not serviced by buses. One participant stated that her residential area was new and therefore bus services were not yet expected, however several established residential areas did not have any bus services. Most people who were regular users of public transport had previously had experiences of using all the forms of public transport in their area, before settling on the modal combinations most suited to their mobility requirements, thus indicating a broad range of familiarity with the Johannesburg transportation system. A small cohort of participants had had very limited previous experience of public transport and were mostly familiar with cars and e-hailing for their mobility requirements. This is aligned with the Gauteng Household Travel Survey that states that, in the City of Johannesburg, the percentage of households with access to cars is ∼3.7% and average car access per household ranges between 0.16 and 0.76, dependent on the residential area (Gauteng Province, 2020). Where such participants were familiar with public transport, their only exposure tended to be the Gautrain. As the Gautrain is a high-speed rail system that caters to middle income users, it is expected that regular car users who were unfamiliar with the normal public transport system, might only be familiar with the Gautrain, which is more expensive, but also perceived as safer and more comfortable than other forms of public transport.

For commuting purposes, most participants used public transport. This consisted of a wide range of transport options, including minibus taxis and various buses (Metrobus, Rea Vaya, Putco). Although many of the participants indicated that they had previously used trains, none of the participants indicated that they used normal trains as their regular commuting mode. A small number of participants used private cars for regular commuting. In general, participants highlighted convenience, availability and affordability as the reason for their commuting mode selection. The situation was, however, markedly different for non-regular trips indicated as visiting friends, going out, going to church, etc. In these instances, private cars and e-hailing services were, by far, the preferred option, although some participants indicated walking and minibus taxis. The preference for car and car services is indicative of the relative lack of public transport services outside of normal commuting hours, with participants indicating that most forms of public transport were not available after hours.

> *"Any buses and a train and taxis. I need to work . . . . . , need to work at distance and they not available 24/7" (P13, female, age 35).*
>
> *"Gautrain doesn't run at night" (P25, male, age 26).*
>
> *". . . bus because it runs on a schedule that values people that go to work on weekdays" (P15, female, age 35).*

Participants were requested to describe whether they were excluded from transport because of the cost thereof. In general, most participants stated that they found most forms of public transport to be affordable, with the exception of the Gautrain. As the Gautrain service has generally been aimed at the middle class commuter, and is regarded as an alternative to the private car, the service is for a longer distance commute and ticket prices are normally higher than other forms of public transport. Many participants also stated that they found e-hailing services were unaffordable, which was expected, however it is of interest that commuters considered e-hailing to be an alternative form of public transport, indicating that they regard this form of transport as part of the mobility mix, rather than as an exclusive form of private transport. Although all participants indicated that they generally had access to an affordable form of public transport, a sizable number of participants indicated that they selected buses, as they were cheaper than minibus taxis, although they were often not as accessible, and required longer walking distances to access the bus system.

Participants were asked whether they were ever too embarrassed to use any mode of transport. In general, participants were adamant that there was no stigma associated with using any form of public transport.

> *"Absolutely not" (P17, female, age 25).*

One participant indicated that he would be embarrassed to use a train. This was supported by another participant who, when asked whether there was any pressure from the community to use or not use particular modes of transport indicated that trains were not acceptable:

> *". . . there is a stigma that is for poor people" (P16, female, age 29).*

Associated with this is the perception that bicycles are commuting forms for low-income people and verified by a participant that stated:

> *"I would say bicycle is another form of transport that I feel like I will be too embarrassed to be seen in" (P23, female, age 26)*

One participant felt that his community might judge him, as "[i]t's not that common for Indian people to take taxis" and

> *". . . also I think people might judge me if they saw an Indian kid inside a taxi" (P25, male, age 26).*

In general, however, it was evident that most participants did not feel that they were excluded from any form of transport because of community pressure or because it was embarrassing to use it.

Participants were requested to describe whether they experienced harassment, which prevented them from using any form of transport. Harassment could in waiting areas or on the vehicle, either by fellow passengers or the driver. Several participants stated that they experienced harassment, particularly at train stations, with thieves and pickpockets identified as problems within the stations. General jostling was also highlighted.

> *". . . there is no order, people push each other" (P16, female, age 29).*

The lack of control within the stations, leading to harassment has resulted in a reputation which prevents participants from using trains as a service.

> *"I'll definitely say the train for that one because yeah, you know, I haven't taken it myself, but there's so many stories about what happens on these trains, so I don't use them because they're [. . .] always overcrowded, especially like the metro train. And uhm, there's too much crime and harassment on these trains, especially in the night, so I don't use the train" (P4, female, age 30).*

Waiting areas for buses were also identified as harassment areas, as some of the waiting areas were near areas with "drug addicted youth" (P5, female, age 25) and people frequently harassing commuters for money. Two participants indicated that they would not allow their children to take the bus as they had previously been sexually assaulted on buses. Several participants also indicated that they were harassed in bus waiting areas by minibus taxi drivers who were trying to prevent them from boarding the bus and rather using their services.

> *"The buses, as I said earlier, it's quite hectic for one to board a bus, because in our area we try to get a bus. And the taxi owners. Yeah. They fought tooth and nail to keep them away from the passengers" (P1, male, age 52).*

Whilst minibus taxi ranks have a bad reputation for being less clean, comfortable and controlled, only one participant indicated the waiting areas as problematic, stating that rank marshals harassed people with vulgar language. There did however appear to be some forms of control within the ranks, with one participant summarizing this as:

> *"But you know what? You can make me feel uncomfortable in this situation [but that] can be reported to [. . .] that association 'cause every taxi rank. His office is where you can go into [re]port someone on such incidences and when that happens the person either gets fined, there's some penalty that. Hello. You might be informed about it, you might not be informed. It's up to you whether you do a follow up or not" (P21, female, age 25).*

Trains were also identified as being uncomfortable to be in the vehicle, with several participants stating that there were thieves present on the train, that there was no visible security, that people were "bullied for your seat" (P5, female, age 25) and "people push you out even if it is not your stop" (P15, female, age 35).

Most participants did not indicate any harassment from bus drivers, but minibus taxi drivers were identified as being "moody" (P5, female, age 25), especially when they had not received the correct amount of money from the passengers (P2, female, age 36; P5, female, age 25; P6, male, age 25; P8, male, age 24).

Participants were asked to indicate whether there were any modes of transport that they would not travel in if they were alone. Several participants indicated that they would not travel alone in a minibus taxi, particularly at night. Many participants were concerned about traveling alone on a train. e-Hailing was also identified by several participants as unusable when alone, with participants indicating that rape, kidnapping, and trafficking were all threats, as well as the possibility that drivers could drop you off in places where you did not want to go.

In a question on safety of walking access to modes, many participants indicated that the environment that they had to walk through to trains or bus stops were often not safe. All modes were highlighted by various participants, with an emphasis on "walking past the tavern" (P6, male, age 25) and going through drug areas and fear of mugging and assault, especially near train stations. How respondents reacted to these threats ranged from:

> *"To my home to the taxi's. Normally we get accompanied to the taxi's rank because of crime… I wouldn't dare [to walk alone] …unless it's not too early in the morning" (P2, female, age 36).*

to

> *"I don't feel safe walking to taxi ranks. But I use it" (P3, female, age 22).*

With regards to the fear of being involved in an accident, the mode that was consistently singled out by almost all participants was the minibus taxi, which is notorious for unsafe driving practices (Muthige, 2022) but remained the most used form of transport. As stated by one participant:

> *"… if it is time for you to die you will die, sometimes you will not have money for the transport mode considered safe so you will be left with no option but going for the cheaper mode available" (P12, female, age 21).*

Respondents were also asked to indicate whether they felt excluded from particular modes of transport due to the distance required to access them. As expected, trains and the Gautrain were indicated as being inaccessible. In general, minibus taxis were accessible, given that they are generally present, roam routes, and can generally be flagged down, as long as potential commuters were within close range of the route. On the other hand, buses were often not considered as a viable transport alternative, because of the walking distance from participant's houses or places of work, suggesting that commuters are then forced to use the more expensive minibus taxi service.

Respondents were asked whether race, age, gender or other discrimination influenced their ability to use certain modes of transport. Whilst gender discrimination was not cited by any of the participants, the results from several other questions indicate that it is primarily women who would not use certain modes when traveling late at night, early in the morning or on their own. Most modes were mentioned in these regards. Age was also not identified, likely due to the largely homogenous age distribution within the sample. Although most participants did not indicate race discrimination as an issue, this may have been because the sample comprised primarily of black respondents. There were however several issues where race was identified as being significant in modal selection:

> *"Gautrain, because of the reason that race domination is mainly by white people, and [I prefer] to use those used mostly by black people, [I am] not comfortable while using it" (P6, male, age 25).*
>
> *"I wouldn't have a problem getting into a taxi but it in the back of my mind I do worry would they accept me inside the car, a white woman and I may be the only white woman in there, how would they accept me I've never tried it but I do worry would they accept me okay that's a big question mark in my head" (P11, female, age 45).*
>
> *"[T]axi service, because I'm Indian. And in Johannesburg. It's not that common for Indian people to take taxis. I also do not speak any of the like African languages. So the language barrier might be a thing to consider. And it might be scary" (P25, male, age 26).*

None of the participants indicated that they had issues with the physical accessibility of the various transport modes, which may be associated with the age of the respondents, where many respondents indicated that they were still "young and flexible" (P2, female, age 36), although one participant indicated that their mother had a disability, which prevented her from using almost any form of public transport. With regards to reliability, participants generally regarded minibus taxis as reliable, from the perspective that they were regular enough to provide an alternative if a vehicle broke down. Rea Vaya was regarded as reliable, however PUTCO was regarded as having maintenance issues, as did Metrorail. All forms of public transport were regarded as poor after hours, with few service providers offering services late at night or early in the morning. Where services were provided, they were likely to be provided by minibus taxis and not regarded as safe enough to use, except in an emergency. Participants generally felt that e-hailing services filled this gap, although quite a large number of participants indicated that they would not use these services either, leaving their after-hours mobility needs unmet.

If respondents had indicated that they did feel excluded from any services, for any reason, they were asked to indicate the impact they felt this had on their lives. Participants indicated that the lack of reliability often resulted in missed appointments and classes (in the case of students). Although most participants indicated that their commuting needs were met, there also seemed to be a general and constant anxiety about using public transport.

> *"Positive impact [is] the ability to access mobility in reaching places planned daily while on the negative side is the anxiety that comes with having to wonder on time arrival, destination, accident concerns, being bullied" (P5, female, age 25).*

Other impacts were that transport costs a lot of money, and that often less affordable modes could not be used because of a lack of availability and participants were forced to use more expensive modes. Similarly, some participants felt that they had to use less convenient and affordable modes because of insufficient safety levels. Many participants felt that they could not travel at night, or would never travel by public transport if they were carrying a laptop (for example). Participants felt that they were at the mercy of the system and unable to travel at will.

> *"[It has a] negative impact because we have to travel in accordance to what other people think … rather than travelling on your [free] will or like" (P10, male, age 25).*

When asked what they would like to see as solutions to their exclusion, participants indicated that they required more subsidized (bus) services, more roaming taxis to provide feeder services to corridor routes, security and lighting, access for people with disabilities, improved infrastructure and cheaper (subsidized) taxis and Gautrain. One participant specifically felt that information should be more readily available, through technology.

> *"Increasing connectivity and convenience can be done by enhancing way which traveller can connect with their trip …. For example, nowadays smartphones are essential commodities that everyone carry, through them connectivity, for example with smartphone technology" (P33, female, age 39).*

Safety, cost and coverage however appear to be the key concerns regarding the current state of the transport system.

5 Discussion

Using the structure derived from Church et al. (2000), Lucas (2012), and Luz and Portugal (2022), this exploratory research sought to determine whether availability of transport, economic, physical, geographic, facilities, fear-based, time-based and space factors were relevant social exclusion dimensions within the greater Johannesburg area.

When considering TRSE, a major indicator is the *availability* of transport modes within the area (Cass et al., 2005; Schwanen et al., 2015). Whilst most participants indicated that there were a number of transport options available to them, several people indicated that there was no public transport, only private cars or e-hailing services. Others indicated that only minibus taxis or cars were available to them. By implication, many participants only have the more expensive modes available for their trips, and then indicated that the alternative was that they would walk, forgo the trip, or pay the higher price, if they could afford it. Where public transport modes are available, they are often only available for daily commutes. Whilst it appears that weekday trips in daytime hours are relatively easy to complete, there are far more constraints to late night, early morning and weekend trips, as also indicated by Dimitrov (2010). Few public transport modes in Johannesburg operate before 5 a.m. and after 9 p.m. (inyourpocket, 2022), which is particularly problematic for participants that live on the urban periphery and have long commuting distances. Public transport is thus usually not available when it is required, especially for discretionary trips, and where it is, people often have major safety concerns about accessing the transport system and concerns about being in the vehicle, especially when there are not enough other people in the vicinity. Alternatives, such as e-hailing services, also have a poor reputation, with many participants refusing to use these services when alone or late at night, as frequently reported in the popular press in South Africa (Maphanga, 2022; Maqubela, 2022). Availability of public transport was thus a major constraint to the mobility of participants. This is exacerbated by affordability and fear, both of which severely impact the availability of suitable public transport.

Economic TRSE excludes people from socio-economic activities as they are unable to afford the transport to access the activities (Lucas, 2010). Lack of *affordability* was clearly indicated as a constraint to mobility, with many participants indicating that the bus and train systems were the only affordable options available to them, even though there were considerable constraints to using these forms of transport, including distance from the bus stop (or train station), and fear of crime and harassment enroute to the station and at the waiting areas. Although trains were indicated as an affordable mode of transport, none of the participants used it as a regular mode of transport, as the associated fear-based exclusion was a key feature, with few commuters willing to risk the use of the mode for regular trips, as also found by Onderwater [in TimesLive (2017)]. This, coupled with the lack of reliability of the service, which impacts the ability to access activities dependably, implies that the service and the facilities are considerable constraints to the use of the mode. Many respondents indicated that they found minibus taxis affordable, even though they were often more expensive than buses and trains (Masasi, 2022). Whilst the qualitative methodology prohibited statistical testing, there appeared to be an association between income levels and the perception of minibus taxis as an affordable mode of transport, with higher income levels perceiving the mode as more affordable. Some of the participants stated that they believed it to be more affordable than a car, thus indicating that the comparison was with private vehicles rather than other forms of public transport. Several respondents indicated that they did not feel that the mode was safe, and that the accident rate was a considerable factor, but they nonetheless selected the mode, largely based on flexibility, reliability and convenience. Most participants believed buses to be safer and more affordable, but less accessible, implying that they were willing to pay a higher cost to get the accessibility that they required (Schalekamp, 2018). Economic exclusion is thus particularly prevalent amongst lower income users. Such users are also generally regarded as captive users (International Transport Forum, 2017), and the indication that they would take the cheaper form of transport, regardless of the service constraints or fear of using the mode, was thus expected. Although economic exclusion was emphasized particularly amongst low-income users, most participants indicated affordability as an issue, although the extent of the exclusionary effect was reduced in less vulnerable income groups.

Although most participants indicated that there were no stigmas associated with the various modes of transport, with several participants adamantly indicating this, a few participants indicated that they would not use some of the modes of transport because they were associated with "being poor" and therefore would not find this to socially acceptable. Bicycles, and indeed many forms of public transport, are commonly recognized in the literature as inferior goods (Liu, 2007). The indication that the use of certain forms of transport would stigmatize the user, implied that *subjective or symbolic (social-position based) exclusion* was thus clearly indicated within the sample. This is similarly indicated by several participants that indicated that they did not feel comfortable using certain forms of public transport because of their race, thus being excluded from public transport because of their perceptions of acceptance onto the mode.

Physical exclusion was not indicated in this sample, most likely due to the sample being a relatively young and fit cohort of commuters, however a participant indicated that it was almost impossible for their mother, who had a disability, to use public transport. This is aligned with Duri and Luke (2023) who indicated that people with disability generally find it difficult to access and navigate the public transport system in the City of Tshwane, South Africa, and that making a trip was exceptionally difficult, thus making it difficult to participate in societal activities such as employment, shopping, etc. The sample was however too small to elicit sufficient information on the level of physical exclusion and warrants further investigation.

Fear-based exclusion was present throughout the sample. Some participants indicated that they felt safe while on the vehicle, but not on the access route or waiting areas. Others indicated that they only felt fear when traveling at night or early mornings, but not when there were a lot of people around, during the day. Others felt that they would not use certain forms of transport because of the fear they had when in the vehicle, from either a safety or security perspective. Almost all participants indicated some level of exclusion, based on fear, whether from the neighborhood or the mode. Minibus taxis were consistently identified as having a high possibility of being involved in an accident. Fears about using public transport are commonly reported in South Africa, ranging from harassment and pickpocketing to rape, assault and murder (Retief, 2019; Akin and Kona, 2021), and accidents (Chabalala, 2021). The choice of modes and travel times were thus strongly influenced by fear in this sample. Despite the high level of fear, many users felt that they were captive to the mode and had no other option than to use it—there being a lack of alternative transport arrangements. Where participant's fear levels were too high, this excluded them from the transport mode altogether, or sometimes at particular times of the day or night.

Time-based (Gössling, 2016), *geographic exclusion* (Luz and Portugal, 2020), and *exclusion from facilities* (Lucas, 2010) and were not identified by the participants in this example as dimensions of exclusion that were particularly relevant to them, possibly because of the history and "normality" of long commuting distances (Kerr, 2017; Charles, 2021). Many participants indicated that the availability of certain modes of transport were severely constrained, simply because of the distance to, especially, bus and train failities. *Space-based exclusion* (Lucas, 2012) was not highlighted by participants in the sample, possibly because gated communities tend to be the domain of the middle to upper income strata (Landman and Badenhorst, 2014), and rarely interfere with public transport routes. Over time, this may impact public transport access by gated community residents (Sun et al., 2020), especially as cities grow and there is a greater need for public transport for all, however these are not currently indicated as exclusionary, at least from a transport perspective.

Finally, *information exclusion* (Luz and Portugal, 2020), which refers to being unable to access transport because of a lack of knowledge of the available options or functioning of the system was not indicated as extremely problematic in this sample. This may be associated with the largely informal nature of the public transport system and the indication that any information on minibus taxis can be obtained from "asking around". Another participant indicated that any information was available on social media. Nonetheless, the lack of information on the City of Johannesburg's transport system is fragmented, with information available only from the individual service provider's websites, and little being available on the system as a whole (Chakwizira et al., 2014; Luke and Heyns, 2020). Respondents indicated that they, for example, would not use trains, because they didn't understand the schedules, or wouldn't know how to catch a minibus taxi, or that buses did not have schedules that were up-to-date and available. One participant indicated that having access to more information via smartphones would be very useful. Although participants were generally able to navigate the transport system, or at least elements thereof, there is a clear need for more, relevant information.

Although most participants indicated that they had access to a high level of relatively affordable transport, almost all participants indicated, when asked what could be done to improve the transport service, that they would like to see more bus services or better feeder services. From a comfort, economic exclusion and affordability perspective, buses were clearly a preferred form of travel, although access, from both a distance and safety perspective, were problematic. Almost all participants indicated that they would like to see an increase and improvement in affordable government subsidized public transport services.

6 Conclusion

Transport related social exclusion is prevalent, to a certain extent, in all countries in the world (Yigitcanlar et al., 2019). In developing countries, specifically in Africa, where transport services are not readily available, or are not of the required standard, people are constrained in terms of the societal activities in which they are able to participate. This research was exploratory research that was intended to determine the current nature of TRSE in a major African developing city. The results indicate that several key forms of TRSE exist, and fear-based exclusion, geographical exclusion, economic exclusion and social exclusion were particularly prevalent. Although physical exclusion was not clearly indicated in this research, several participants indicated that this would be an issue, if they were not in the same physical state as they were at present. On the other hand, time-based exclusion was not indicated as an issue, most likely because participants felt that

they were captive to the current public transport system and that they needed to take the trip, regardless of the time available to them. Many of the dimensions of TRSE were also clearly intertwined, for example, the distance between residences and affordable modes of transport, were clearly linked with fear-based exclusion. Similarly, availability of modes after hours was linked to safety as well as affordability, amongst others.

The results also indicated that some forms of transport were more acceptable than others, whilst others were completely unusable, in their opinions. Trains, for example, were perceived as being affordable, but unacceptable from an availability and safety perspective. Buses were acceptable from a cost and comfort perspective, but generally unavailable, inaccessible, or unreliable, although most participants indicated that if there were more services, which were closer to their place of work or their homes, they would rather use these services. Minibus taxis were regarded as the form of transport in which users were most likely to be involved in an accident, which tended to cause anxiety in the commute, however they were the preferred mode from an availability and convenience perspective. For many of the participants, minibus taxis were the only available form of public transport. The results suggest that commuters feel captive to more dangerous and more expensive forms of transport, due to the relative lack of availability of other forms of transport.

Exclusion from societal activities has a major impact on commuters, ranging from missing work, classes or appointments, spending excessive portions of disposable income on transport, to feeling unable to participate in societal activities, at certain times, amongst others.

Whilst several studies have investigated the connection between poverty and transport in South Africa, there are few recent studies and, to the researcher's knowledge, no current studies that consider transport-related social exclusion across a broad and diverse range of demographic backgrounds in South Africa. This study is thus the only recent study to document transport-related social exclusion across a typical range of South Africans citizens. Whilst this research provides a wide range of opinions and perceptions, a limitation to the study is the qualitative methodology, which implies that the narratives only represent the views of the participants and cannot be extrapolated to the total population. The exploratory nature of the study, together with the purpose of the research, which was to elicit new understandings of a previously underexplored phenomenon in an urban environment in Africa, based on the lived experiences of participants, and thus provides basis on which future research endeavors can be built. A second limitation was the application within the City of Johannesburg. Whilst the city was selected because it is the largest city in South Africa, and is thus likely to encompass the range of typical transport issues experienced in the country. There are however diverse transport service offerings in different cities and even within different areas within the cities, and thus the experiences of the participants in this sample may differ significantly from those in other samples.

The study has however provided important insights into a more diverse range of people than has previously been considered, therefore providing some guidance into possible future policy directions. These include a strong focus on government subsidized public transport, as participants have generally identified that trains and buses could be preferred transport modes, given availability, frequency and safety. The South African public transport policy, which focuses on public rather than private transport, and larger modes of transport for corridors, emphasizes the role of trains and bus rapid transport for longer haul commutes. These services are currently under-funded and under-provided, in terms of services. Similarly, buses form part of both the corridor and feeder approaches envisaged by government in its current policies and plans, however these have still to be appropriately implemented. Any policy aiming to further public transport as the commuting method of choice needs to consider TRSE and the role that this plays in attracting commuters or discouraging use of public transport. As a broader policy directive, it is critical to focus on safety on the access routes to the various forms of transport. Whilst this should be seen in conjunction with general city management, the growth in the use of the public transport modes favored by the government policy is largely dependent on the perceived safety of the mode and thus needs a higher level of attention within policy implementation structures. Finally, future policy needs to emphasize policing of the private form of public transport, the minibus taxi. There is a strong indication that participants fear using the mode, particularly from the perspective of driver behavior. The minibus taxi industry is widely renowned for unsafe driving practices and participants indicated that they would generally prefer some of the alternative safer, more comfortable and more affordable forms of public transport. Effective management of the e-hailing is also a critical policy requirement. Whilst e-hailing services are generally regarded as safe, there have been several reported incidents of kidnapping, rape and trafficking, particularly within selected geographical areas, creating anxiety amongst potential users. The Public Transport Strategy and Action Plan (2007–2020) (Seedat, 2007) required that people in urban areas would be able to access a rapid public transport network no further than 1 kilometer from their place of residence, that services would run 18–24 h per day, and that peak frequencies would be services every 5–10 min, amongst others. This policy has not been realized but needs renewed focused in future policy endeavors.

There are therefore numerous opportunities for future research directions. As this research was exploratory, it provided invaluable insights the perceptions of a wide demographic range of people, however the study was limited to 60 participants, and there is therefore considerable scope for conducting quantitative research, seeking a wide range of respondents, enabling a more representative sample. In this sample, although the demographic base was diverse, this also implied that there were insufficient members from each demographic grouping to determine specific areas that require focus. For example, the results seem to indicate that people residing within the CBD are better served from a transport availability perspective (although fear is a major factor), whilst residents from the suburbs and peripheral areas had less access to public transport, however the sample is not representative enough to determine this with statistical certainty. A broader study would enable identification of specific groups from a gender, age, residential area, or other demographic perspective, that would then indicate areas for future focus. This should also be conducted across several urban areas to enable comparative analyses, so

that policy recommendations can be tailor-made to specific urban environments. A far bigger sample would also enable comparison across various demographic groupings, ensuring that solutions are sought to address the specific mobility demands within various groups. The results also indicate that lower income people are captive to low-cost public transport and are severely disadvantaged by the low levels of availability of affordable transport. Future research endeavors should specifically focus on low-income areas and the possibility of providing better transport options in these areas. Similarly, women are most vulnerable within the public transport system in Johannesburg. Future research efforts should focus on gender disparities in transport experiences, and addressing the specific needs of women. People with disability were not represented in this sample, yet related research reveals a high level of exclusion based on physical accessibility. TRSE should be therefore researched amongst people with disability within both rural and urban environments in South Africa. Finally, although participants indicated that they were able to navigate the public transport system, information tended to be by word of mouth or through social media, rather than any formal information. A future research direction could therefore be to investigate the impact that better information would have on TRSE.

Mobility needs within South Africa, and indeed all of Africa, are highly diverse, and dependent on the services that are provided and the nature of the people to which they are provided. A study should also be considered to evaluate the current policy and related initiatives, and the extent to which this is geared to address the transport-related social exclusion concerns of South Africans. Gaps between current policies, policy implementation initiatives and citizen requirements should be identified, to be addressed in future policies. Longitudinal studies should also be conducted to determine the impact of any projects on social exclusion and to determine the changing needs over time. Many of the dimensions identified as being relevant to Johannesburg residents appear to be interrelated, such as the fear-based exclusion, which may be closely associated with geographical exclusion. It is therefore suggested that an Interpretive Structural Modeling approach be applied to establish causal interrelationships amongst the factors, which would provide an indication of the critical causal factors that need to be prioritized, given the competition for resources in transport planning in developing economies. Finally, it is evident from the results of this research, that the nature and extent of TRSE vary considerably across the sample. As per Preston and Rajé (2007), it is therefore suggested that the various identified dimensions be used to determine spatial concentrations as well as scattered manifestations of TRSE, and that these can then be used to determine appropriate and targeted policy interventions.

Data availability statement

The datasets presented in this article are not readily available, as data are transcribed interviews. Requests to access the datasets should be directed to rluke@uj.ac.za.

Author contributions

RL was responsible for the conceptualization of the study, design of the survey instrument, instructing interviewers, and analysis of the data.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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